MASTER THESIS

Servitization: a design research towards service-oriented mindset

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ABSTRACT

The concept servitization can be achieved through business model innovation. Similar to the more broad concept of business model innovation, organizations face several drivers and barriers when servitizing. The barriers of business model innovation through servitization can be found in seven domains: Suppliers and partner network, Resource and capabilities, Customer relationships, Value proposition, Financial, Organizational culture and Strategy.

This research aims at creating an understanding of the key barriers to business model innovation through servitization for the case organization. The goal is to extract the most important barrier for the case organization from this prior developed understanding and to develop a method that can help the organization with overcoming this most important barrier.

The body of this research consists of a diagnosis, solution design and solution evaluation. In the diagnosis, empirical analysis through semi-structured interviews with managers of the case organization showed key barriers to business model innovation through servitization for the organization. Then, the diagnosis is completed with a theoretical analysis consisting of semi-systematic literature reviews through which the empirical findings are expanded on with the goal to come to a diagnosed problem. The diagnosed problem is a change in employee mindset from product-oriented towards service-oriented

In the solution design, theoretical insights, a book review and expert interviews help to develop an appropriate solution method for the problem of the case organization. The appropriate solution method for the diagnosed problem is to let the employees engage in a set of workshops that take the employees through all the behavioral change steps in order to achieve lasting change.

Lastly, a solution evaluation was proposed using insights from theory and expert interviews. The proposed evaluation was to conduct a pre- and post-test of success factors that indicate the necessary change in mindset through an evaluation form with open-ended questions.

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1 INTRODUCTION

1.1 Situational background

Organizations these days need to keep up with ever-evolving markets, which are subject to the forces of increasing technological developments, globalization and competitive pressure. To keep up with the rapidly and continuously changing market, organizations should not just revisit their products but also their business model (Markides, 2006; Chesbrough, 2010; Teece, 2010; Zott & Amit, 2010; Schneider & Spieth, 2013). The adjustment of an organization's business model with the aim to gain or maintain a competitive advantage is also known as business model innovation. Through business model innovation, organizations are able to adjust its' business model in order to better facilitate the creation and capturing of value by exploiting the opportunities and mitigating the barriers in the market, thereby creating a competitive advantage (Chesbrough, 2007).

One of the industries that has been generating various and drastic new opportunities in recent years, is the manufacturing industry. Currently, the manufacturing industry experiences its fourth revolution, known as Industry 4.0, which fundaments lie in technological developments, progresses of ICT systems and internet-based connection of entire value chains (Kagermann et al., 2013; Burmeister, Lüttgens & Piller, 2016). Furthermore, according to Manyika et al. (2019), in Industry 4.0 the role of manufacturers is changing: manufacturing promotes innovation, productivity and growth and rely more heavily on services in order to operate. Therefore, it is suggested that Industry 4.0 is not only driven by a technology-push through digitization, but also by a demand-pull through the addition of services to the organization's core offering (Frank et al., 2019).

This shift towards the addition of services to the core offering is often referred to as servitization (Neely, 2011; Kowalkowski et al., 2017; Vandermerwe & Rada, 1988). Servitization requires fundamental change in the organization's business model and is therefore intertwined in business model innovation (Kowalkowski, Witell & Gustafsson, 2013). A common example of business model innovation through servitization is Rolls-Royce's "Power-by-the-hour", through which customers are provided with an integrated combination of product and service that focuses on the output of this combination, as the name suggests: a fixed-cost-per-flying-hour basis. Moreover, the integrated solution that is created through a combination of products and services into one offering is referred to as a Product-Service System (PSS) (Tukker, 2004; Neely, 2009). Through a PSS, customers only receive the value inherently offered by the product use, also known as value-in-use, rather than receiving value-in-exchange through affording the cost of the product itself (Svensson & Grönroos, 2008). Rolls-Royce shows how the use of digitization , such as data-driven product optimization and preventive maintenance, into its PSS can maximize the provided value-in-use and thereby aligning the interests of the manufacturer and the customer (Smith, 2013). This deployment of digital technologies to support the transformation from a product-centric to a service-centric business model is referred to as digital servitization (Ardolino et al., 2018; Coreynen, Matthysen & Van Bockhaven, 2017).

It becomes clear that through Industry 4.0, business model innovation through servitization has gained traction (Frank, Mendes, Ayala & Ghezzi, 2019). However, its implementation is not a simple process and it introduces new risks to the organization (Gebauer et al., 2005; Benedittini, Neely & Swink, 2015) According to Baveja et al. (2004), only 21% of organizations succeed with service strategies and organizations are struggling to successfully innovate their business model through servitization. Therefore, this research aims at providing theoretical and practical contributions through researching alongside the servitization implementation process of a case organization in the manufacturing industry in order to explore how manufacturing organizations should overcome its barriers to business innovation through servitization in the era of Industry 4.0.

1.2 Case organization

1.2.1 Organizational overview

Carrying out research in cooperation with a case organization is generally seen as an engaged scholarship approach that is often both rigorous and relevant and for those reasons valued highly (Van de Ven, 2007). This research was carried out in cooperation with a case organization[1] that is operating in the manufacturing industry. The case organization is one of the top manufacturers of high-end industrial machinery. The machinery is assembled in-house in the organization's facilities in the Netherlands and sold to businesses all over the world through direct sales and through dealers. The organization has been operating in this industry for over forty years and has around fifty employees. The market is segmented into two segments: around a dozen organizations that offer high-end machinery at a premium price are dominating the market, while a new stream of organizations are offering low-cost, low-quality machinery as an alternative. According to the case organization, these 'budget players' are not really competing in the same segment, as they are not able to meet the quality of the case organization's machinery that is highly valued by the customers, and are therefore not be seen as a threat yet.

The current industry development of Industry 4.0 challenges the premium players to act on the opportunities that it fosters. The case organization has been following the competition comfortably in recent years. The product innovation in the market has become stale, while the entry of new budget competition from China is making its rise. This forces the premium players in the higher segment to find new ways to seek competitive advantages. The case organization has recognized that Industry 4.0 provides opportunities that can be exploited, although it is unsure in how to approach this. Moreover, it has recognized that its competitors are not yet exploiting opportunities that are fostered through Industry 4.0 and therefore acting on these could help the case organization in gaining a competitive advantage.

What makes this case interesting, is that the organization is at the brink of taking action towards exploiting the opportunities of Industry 4.0 and is open to innovate its business model through implementing servitization in the near future. Therefore, this research is able to accompany the business model innovation through servitization in real-time and allows for the collection of data from the organization throughout this process. This enables the research to propose a method that guides the business model innovation through servitization implementation process and to evaluate this method through experimental collaboration with the case organization.

1.2.2 Exploring the problems of the case organization from an internal perspective

In order to gain a better understanding of the problem that the case organization is facing, at the start of the research an intake meeting was conducted. The intake meeting has revealed several insights into the problems that the case organization has identified. Firstly, the organization recognizes that the exploitation of opportunities through Industry 4.0 technologies, such as the Internet of Things and remote service monitoring, allow the organization to expand its traditional value proposition. Continuing, the organization recognizes that customer needs are evolving alongside these industry developments and that, if not acted on the derivative opportunities, the traditional value proposition will not meet customer needs anymore. Moreover, the organization recognizes that it currently lacks distinctiveness from the growing competition and therefore the

[1] Anonymization: *In order to ensure confidentiality of the case organization and to protect the human subjects of this research, the choice was made to anonymize the names of both the organization and the informants. Therefore, the case organization is referred to as 'the case organization' or simply 'the organization'. The interview informants are referred to as 'Interviewee' or 'Expert', followed by a number, in order to differentiate between the different informants.*

organization does not have a competitive advantage. Furthermore, the organization foresees a saturation point of its current business model in the next two years. When this happens, sales are expected to drop, which puts pressure on the organization's revenue and profitability.

Additionally, as a response to these problems, the organization has identified that the innovation of its business model may be needed. The organization recognizes a set of problems in business model innovation through servitization. The first problem that the organization sees, is that risky and high investments may be needed to accomplish business model innovation through servitization. Moreover, the organization foresees a problem in achieving the necessary change in employee mindset and organizational culture that fits the new business model, because employees are cemented in their traditional ways of working and are resistant to change. Lastly, a problem that the organization recognizes is that employees may need to develop additional capabilities, such as soft skills, to operate in a new business model.

1.2.3 Exploring the problems of the case organization from an external perspective

The goal of an external exploration is to focus on relationships between current industry developments and the wider organization, as well as the research topic (van Aken & Berends, 2018). It has become clear that in recent years the manufacturing industry has experienced a set of revolutionary developments, with the current revolution being Industry 4.0 (Kagermann et al., 2013; Burmeister, Lüttgens & Piller, 2016). Industry 4.0, according to Lasi, Fettke, Kemper, Feld and Hoffmann (2014), is characterized by the following fundamental concepts: Smart Factory, Cyber-physical Systems, Self-organization, New systems in the development of products and services, Adaptation to human needs and Corporate Social Responsibility. The exploitation of (some of) these concepts can help the case organization to solve (some of) the problems that it has identified in the intake meeting.

The suggestion that the case organization can exploit the fundamental concepts that encompass Industry 4.0 is in line with the literature, which suggests that these main features of Industry 4.0 are regarded to be a response to the industry challenges such as globalization, intensification of competitiveness, volatility of market demands, shortening of innovation and product life-cycles and increasing complexity of products and processes (Arnold, Kiel & Voigt, 2017; Bauer, Schlund & Vocke, 2015).

The concern of the case organization to innovate its business model through servitization also seems to be in line with what the literature suggests: Consequently, new and adapted business models are needed (Kagermann et al., 2013). According to Ibarra, Ganzarain and Igartua (2018), business model innovation through Industry 4.0 follows three approaches: a service-oriented approach, a network-oriented approach or a user-driven approach. It appears that the foreseen business model innovation through servitization that the organization has identified resonates with the service-oriented approach, in which the focus lies on rethinking the optimal mix between products and services through a PSS and the use of a digital part of a hybrid solution as the added service in this PSS (Ibarra, Ganzarain & Igartua, 2018).

1.2.4 Preliminary problem statement

From the intake and external exploration, it becomes clear that the case organization is currently subject to the developments of Industry 4.0, which provide both problems and opportunities that manufacturing organizations need to act upon in order to keep up with the market. In order to overcome the problems and exploit the opportunities that are generated through Industry 4.0, the appropriate response appears to be business model innovation through servitization.

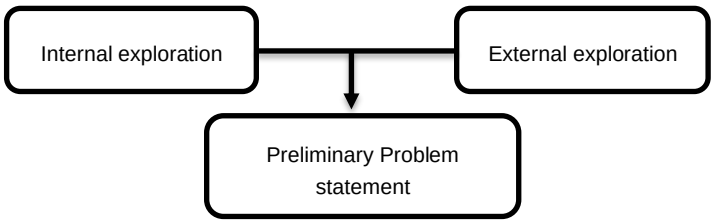


FIGURE 1 – THE INTERNAL AND EXTERNAL EXPLORATION MERGE INTO THE PRELIMINARY PROBLEM STATEMENT

However, the case organization foresees barriers to engage in business model innovation through servitization. More specifically, it initially sees a problem in the risky and high financial investments that are needed, the changing of the employee mindset and organizational culture towards being more service orientated and finally the development of the necessary additional capabilities of employees, such as soft skills, that are necessary to accommodate the innovated business model. Although these barriers have been initially identified through the intake and external exploration, this does not mean that these represents the complete set of barriers. Moreover, the organization is unsure about how to overcome its barriers to business model innovation, as there appears to be a gap in the literature on the methods to overcome the identified servitization barriers as well as the effectiveness of such methods. Therefore, the research question that guides this thesis is:

How can the case organization overcome its most important barrier to business model innovation through servitization in the era of Industry 4.0?

Through dissecting this research question it appears that, in order to answer it, a further understanding of a number of different aspects needs to be created. First, an understanding must be created of what the barriers to business model innovation through servitization in the era of Industry 4.0 are. Through the intake meeting, some (aspects) of the barriers have already been suggested, but it is likely that through extracting what is known in the literature a more comprehensive overview of these barriers can be constructed. Furthermore, following the research question, the most important barrier for the case organization needs to be identified. Because this is specific to the case organization, empirical insights from the organization are helpful in diagnosing its most important barrier to business model innovation through servitization in the era of Industry 4.0. Lastly, in order to answer the 'how', the research question demands that the research proposes a tool or plan to action that the case organization can use in order to overcome its most important barrier to business model innovation through servitization in the era of Industry 4.0.

This generates the following sub-questions and their accompanying places in the thesis:

<u>Chapter 2: Theoretical background</u>

- What is known about the barriers to business model innovation through servitization in the era of Industry 4.0?

<u>Chapter 4: Diagnosis</u>

- What is known about the most important barrier to business model innovation through servitization in the era of Industry 4.0 for the case organization?

<u>Chapter 5: Solution design</u>

- What is known about the solutions to the most important barrier to business model innovation through servitization in the era of Industry 4.0?

- How should the solution to the most important barrier to business model innovation through servitization in the era of Industry 4.0 for the case organization look like?

Chapter 6: Solution evaluation

- What is known about the evaluation methods for the proposed solution to the most important barrier to business model innovation through servitization in the era of Industry 4.0 for the case organization?

- How should the evaluation method for the proposed solution to the most important barrier to business model innovation through servitization in the era of Industry 4.0 for the case organization look like?

- To what extent is the developed solution to solve the most important barrier to business model innovation through servitization in the era of Industry 4.0 for the case organization effective?

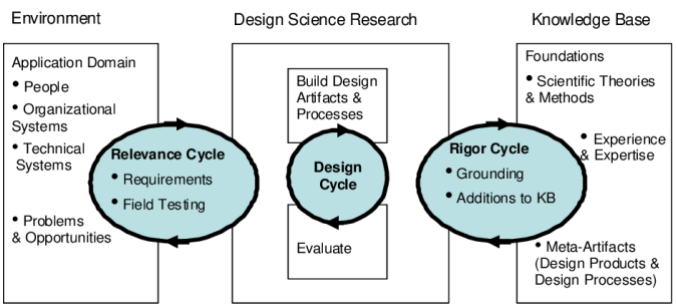
1.3 The research approach

1.3.1 Criticism on traditional research approaches

Results from academical research have received criticism from numerous researchers, practitioners and policy-makers for having little impact on practice or even the evolution of theory (Haertel & Means, 2003; Lagemann, 2002). The practical importance of academic studies is often weighted in too little. According to Dede (2005), this can be explained by the difference in priorities between scholars and those who are emerged in policy and practice. As a resolution to these problems, Dede (2005) suggests to conduct design research, which is most effectively executed through partnerships between researcher and educators immersed in the crucible of practice and bridging the gap between rigor (theory) and relevance (practice).

Research in which a tool or plan to action (artifact) is developed and evaluated is generally referred to as ‘design science‘ or ‘design research’. According to Laurel (2003), design research creates a place to braid theory and practice to make work stronger and is a method that of intervention that focuses on finding out rather than finding the already found. Design research, unlike traditional qualitative or quantitative research paradigms, follows an iterative design cycle that is the embodiment of three closely related activity cycles: The relevance cycle provides requirements from the contextual environment and allows the artifact to be introduced into this environment for evaluation, the rigor cycle provides theoretical grounding as well as domain experience and expertise from the knowledge base and adds the new knowledge from the research back into the knowledge base and finally the design cycle supports the research activity for developing and evaluating the design artifact (Hevner, 2007). This is visualized in below in Figure 2.

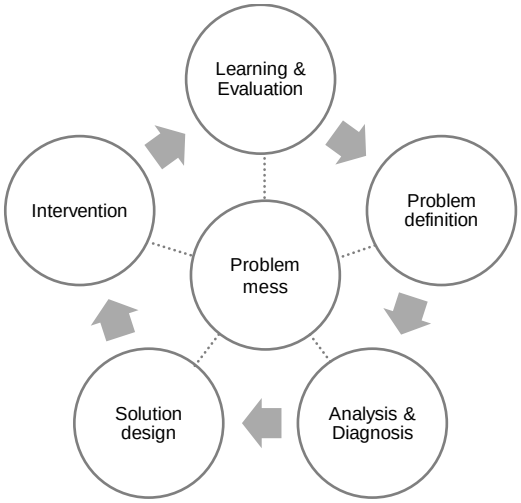
FIGURE 2 – DESIGN SCIENCE RESEARCH CYCLES (HEVNER, 2007)



1.3.2 The problem-solving cycle

Although there is a variety of literature on approaches for design research, the general line of thought in design research remains similar. According to Offermann, Levina, Schönherr and Bub (2012), the literature on a design research methodology generally follows three phases: Problem identification, Solution design and Evaluation. While there are a number of literary resources that provide guidelines to design research along these phases, in consultation with the thesis examiner the choice was made to follow the problem-solving approach by van Aken and Berends (2018) as described in the book 'Problem Solving in Organizations'. This approach resonates with the model of Hevner (2007) as it takes into account the interest of the case organization to solve its business problem. However, a higher emphasis is lied on the theoretical aspect in order to conform with the master thesis assessment. The problem-solving cycle model according to van Aken & Berends (2018) is presented in Figure 3.

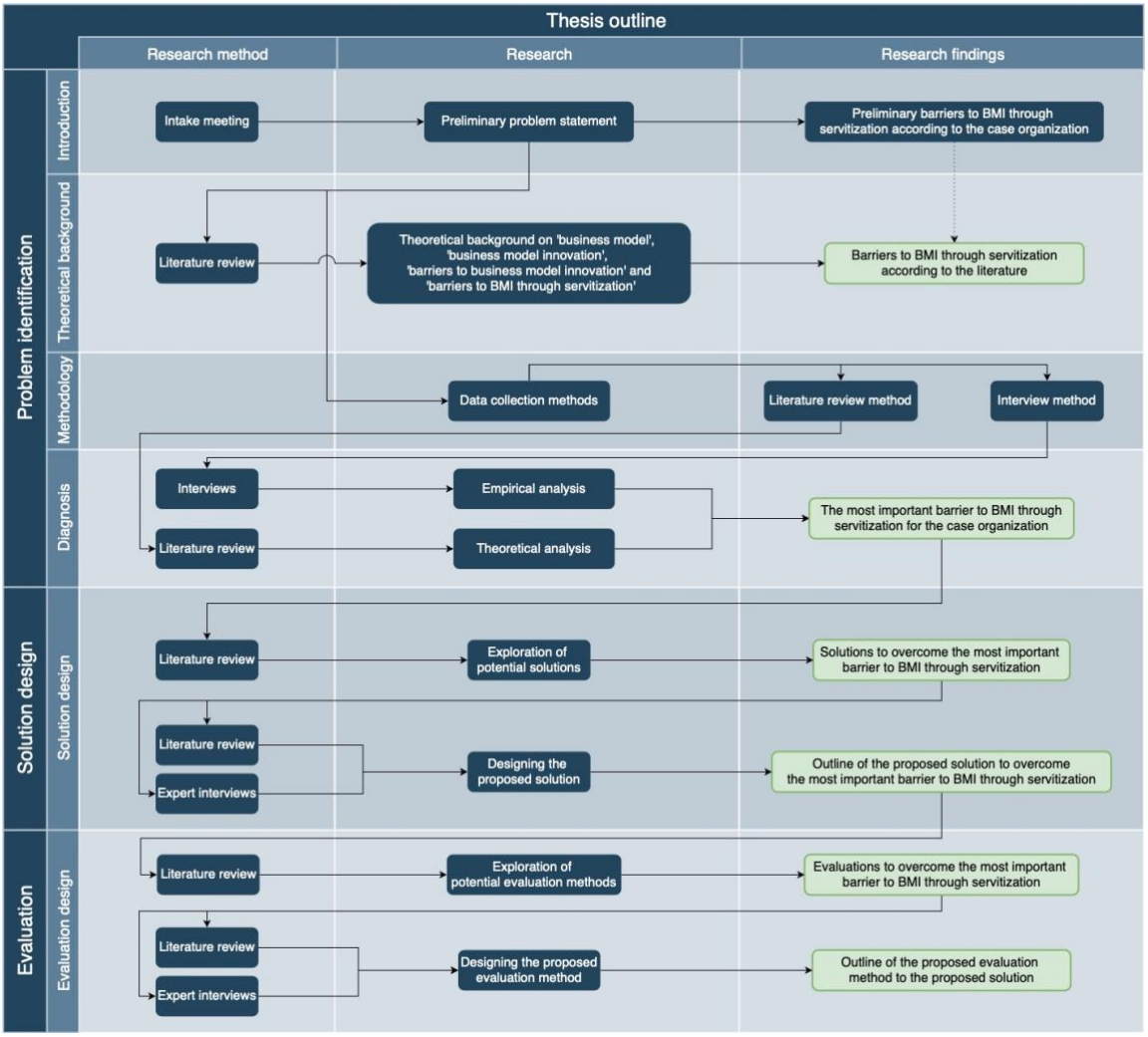
FIGURE 3 - THE PROBLEM-SOLVING CYCLE (VAN AKEN & BERENDS, 2018)



1.4 Research outline

The problem-solving approach of van Aken and Berends (2018) suggests that, throughout the research project, (sub)assignments are completed by the researcher. These (sub)assignments produce deliverables, which are in accordance to the steps of the problem-solving cycle: a problem identification, a solution design and an evaluation design. A complete overview of the research outline and its corresponding deliverables are presented in Figure 4.

FIGURE 4 – RESEARCH DESIGN OUTLINE (ANSWERS TO SUBQUESTIONS IN GREEN)



2 CONCEPTUAL BACKGROUND

Through the conceptual background, a foundational understanding is developed through discussing key concepts that this research revolves around. The first concept that is addressed, is the concept of 'business model'. Then, the concept of 'business model innovation' is touched upon. Finally, a closer look is taken at the 'organizational challenges to business model innovation'.

2.1 Business models

Throughout the literature, the concept 'business model' has been approached in a variety of ways. Slywotsky (1996) defines the business model as 'the totality of how a company selects its customers, defines and differentiates its offerings, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers and captures profits'. It appears that this description focuses primarily on the logic of creating and capturing value. Additionally, Stewart and Zhao (2000) approach the concept business model similarly as 'a statement of how a firm will make money and sustain its profit stream over time', thereby putting more emphasis on the sustainability of the organization. Mayo and Brown (1999) share this emphasis on sustainability but also concern competitive advantage, as they define business model as ''the design of key interdependent systems that create and sustain a competitive business.'

Furthermore, Teece (2010) approaches the business model as 'a design or architecture of the value creation, delivery and capture mechanisms of business'. This approach does not only concern the value creation and capturing as other studies suggests, but add a component of value delivery to be of importance in a business model. Moreover, Chesbrough and Rosenbloom (2002) propose that a business model is 'the method of doing business by which a company can sustain itself—that is, generate revenue. The business model spells out how a company makes money by specifying its position in the value chain'. Not only does this definition concern value creation and capturing of organizations, but additionally show the relevance of specifying its relative position in the value chain.

Finally, Osterwalder (2004) suggests that a business model is 'a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money. It is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams'. This final approach seems to encompass most of what the other studies have found because it touches on value creation, value delivery, value capturing and sustainability. However, it appears that this approach does not include the element of competitive advantage. Therefore, as a consensus to the literature, the concept business model can be best described as:

A business model Is a design that specifies the position of an organization in a value chain as well as the logic and mechanisms through which value is created, delivered and captured in order to sustain a competitive and profitable business that generates revenue streams from customers.

Besides conceptualizing what a business model is, the theory also discusses what the function of a business model is. According to Chesbrough and Rosenbloom (2002), the functions of a business model are to articulate the value proposition, identify a market segment, define the structure of the value chain, estimate the cost structure and profit potential, describe the position within the value network and formulate a competitive strategy. Osterwalder (2004) adds to this by suggesting a business model functions as a conceptual link, forming a triangle between strategy,

business organization and ICT. Finally, a sound business model can form the foundation of organizational competitive strategy through which an organization is able to gain a competitive advantage (Teece, 2010; Chesbrough & Rosenbloom, 2002).

2.2 Business model innovation

In the previous paragraph, a better understanding of 'business model' as a concept was created. Consequently, a closer look can be taken on the concept of 'business model innovation'. According to Amit and Zott (2012), business model innovation can create a new a market or allow an organization to exploit new opportunities in existing markets. Moreover, business model innovation can provide a way for organizations to break out of intense competition and address disruptions that demand fundamentally new competitive approaches (Lindgardt, Reeves, Stalk & Deimler, 2009). Furthermore, it is argued that organizations need to commercialize industry developments through business model innovation in order to yield economic value from these (Chesbrough, 2010; Massa & Tucci, 2013). Although these studies show the current relevance of business model innovation in the light of the revolution of Industry 4.0, it is not explained what exactly business model innovation is.

According to Frankenberger et al. (2013), business model innovation can be defined as 'a novel way how to create and capture value, which is achieved through a change of one or multiple components of the business model'. Massa and Tucci (2013) add to this by suggesting that business model innovation is twofold in that there is a differentiation to be made between business model design and business model reconfiguration: business model design refers to the entrepreneurial activity of creating, implementing and validating a novel business model for newly formed organizations, while business model reconfiguration refers to the activity by which managers reconfigure (or acquire) organizational resources to change an existing business model. Clauss, Bouncken, Laudien and Kraus (2020) add to these findings by suggesting business model reconfiguration captures altered business models that differ from the extant business model in a range between incremental changes and radical new solutions. Therefore, the concept business model innovation can be best described as:

Business model innovation is the design of a new business model or reconfiguration of an existing business model in order to create and capture value from industry developments.

Through these findings, it becomes clear that organizations at a certain point need to determine if and how the innovation should be exploited: through reconfiguration of the current business model, through design of a new business model or not pursue the innovation altogether. While in business model reconfiguration organizations needs to identify what part of the existing business model needs to be reconfigured, in business model design the organization needs to determine if the existing business model is completely replaced or an additional venture with its own business model needs to be created (Amit & Zott, 2001; Chesbrough & Rosenbloom (2002); Teece (2010); Frankenberger et al., 2013; Schneider & Spieth, 2013).

To carry out the aforementioned decisions, organizations must choose their business model innovation approach. Euchner and Ganguly (2014) suggest a six step model that follows the following steps: Demonstrate value creation, Generate business model options, Identify risks for each option, Prioritize risks, Reduce risks through business experiments and Organize for incubation. Furthermore, Geissdoerfer, Savaget and Evans (2017) propose an eight step approach: Ideation, Concept design, Virtual prototyping, Experimenting, Detail design, Piloting, Launch and finally Adjustment and diversification. Another approach to business model innovation is to implement the innovated business model alongside the existing business model (Sosna et al., 2010). Lastly, Chesbrough (2010) suggests the possibility to implement it in one go without the risk -precautions of the other approaches. Through these findings, there appear to be three main ways

to approach the implementation of business model innovation, going from least risky to most risky: The first approach is to start implementation of the innovated business model through prototypes, experiments and pilots that do not actually affect the organization, secondly is to implement the innovated business model alongside the existing business model to limit the organizational consequences and the final approach is to implement the innovated business model in one go.

2.3 Barriers to business model innovation

In the previous paragraphs, a better understanding of the concepts 'business model' and 'business model innovation' was created. It is suggested that organizations can benefit greatly from business model innovation, which raises the question why not all organizations engage in it. One of the reasons that organizations refrain from business model innovation, is that there are barriers to business model innovation that need be overcome. Rüb, Bahemia and Schleyer (2017) set out research on business model innovation barriers by suggesting a differentiation between internal and external barriers to business model innovation: Internal barriers can also be viewed as 'within the organization', while external barriers often reach beyond the internal organization, for example barriers with relation to external parties such as customers or partners. Rüb, Bahemia and Schleyer (2017) also found that business model innovations that did not succeed are more often affected by external barriers than by internal barriers, which is presumably due to the fact that external barriers generally have a higher degree of uncertainty and thereby makes it more complex to prepare for these external barriers. However, it is argued that although external barriers affect the success of the implementation of business model innovation more strongly than internal barriers do, organizations often face a combination of both internal and external barriers (Rüb, Bahemia and Schleyer, 2017). In Figure 5, a visualization of the internal and external barriers to business model innovation according to the literature is presented.

There appear to be four main domains of internal barriers to business model innovation. Chesbrough (2010) suggests that in the first of the four domains, the organizations face two significant barriers to business model innovation: the existing business model and its assets, and the managerial understanding of the barriers. Along the same line of thinking, Amit and Zott (2001) propose that engaging in the key aspects of business model innovation, namely 'novelty, lock-in, complementarities and efficiency', conflict with the traditional configuration of the organization's assets and thereby threaten ongoing value to the organization.

Secondly, according to Bouchikhi and Kimberly (2003), the organizational identity is a main constraint on an organization's adaptive capacity to business model innovation. They argue that an ambiguous organizational identity will result in internal conflicts and barriers to stable partner relationships, while a strong organizational identity brings competitive advantage.

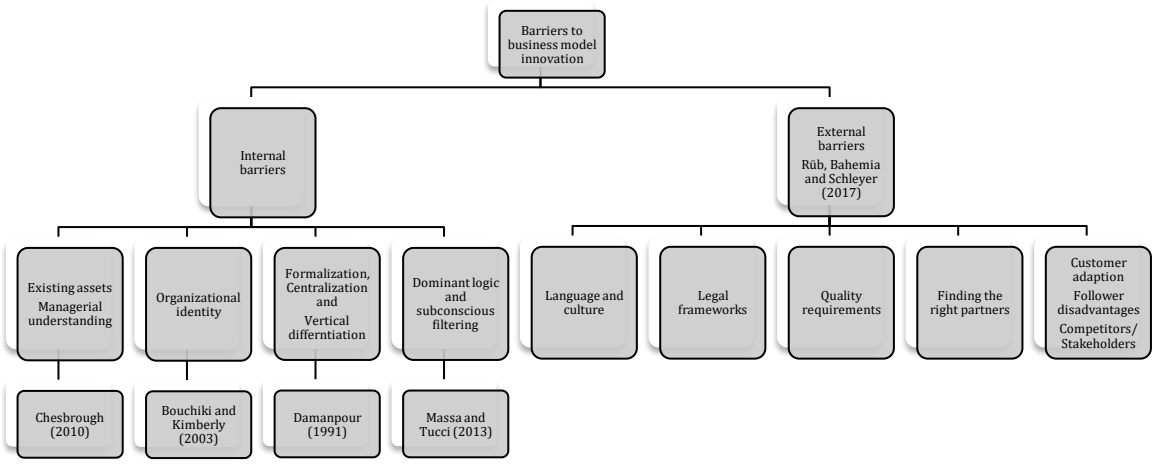
Furthermore, research by Damanpour (1991) found that the factors formalization, centralization and vertical differentiation have a negative influence on innovation and subsequently business model innovation. With low formalization, more openness in order to let innovative ideas foster. Vertical differentiation negatively influences communication and flow of information for innovative ideas. Centralization takes away the necessary power and authority from certain parts of the organization, thereby harming the fostering of innovative solutions.

Lastly, Masssa and Tucci (2013) suggest that business model innovation in incumbent organizations are always influenced by the existing organizational structures. These incumbent firms usually have established a dominant logic. This logic may be counterproductive to the business model innovation, as it prevents the organization to think from different perspectives. The dominant logic therefore subconsciously filters out everything that does not fit the current business model, leading to path dependency along the lines of the current business model (Prahalad and Bettis 1986, Chesbrough 2003). Therefore, it appears that the internal barriers to business model innovation are the conflict with existing assets that provide ongoing value, the organizational

identity, the formalization, centralization and vertical differentiation of the organization and finally the dominant logic that is embedded in the organization and its accompanying subconscious filtering process that leads to path dependency.

Moreover, literature on the external barriers of business model innovation seems to be more scarce. The reason for this could be that business model innovation is affected for a larger degree by internal factors than external factors, according to Rüb, Bahemia and Schleyer (2017). Nevertheless, Rüb, Bahemia and Schlever (2017) found that external barriers to business model innovation can be categorized into five domains: Language and culture, Legal frameworks, Quality requirements, Finding the right partners and finally Customer adaption, follower disadvantages and competitors and stakeholders.

FIGURE 5 – BARRIERS TO BUSINESS MODEL INNOVATION



2.4 Barriers to business model innovation through servitization

Now that an understanding is created of the barriers to business model innovation, a closer look can be taken at the barriers that are specific to business model innovation through servitization.

Throughout the literature, various barriers to business model innovation through servitization are discussed, which was recognized in particular through the theoretical analysis (Chapter 4.2). Key research on servitization barriers overlap and can be placed in seven key domains: Suppliers and partner network, Resource and capabilities, Customer relationships, Value proposition, Financial, Organizational culture and Strategy (Figure 6).

Suppliers and partner network

One of the key barriers to servitization is the network in which the servitizing organization, its suppliers and its partners are operating. Firstly, through collaboration, all actors in the network have the expectancy to share in the risks, costs and revenues when services are launched (Kowalkowski & Kindström, 2013; Zhang & Banerji, 2017). However, not all changes in the relationship between the servitizing organization and its customers are reflected in the relationships with the organizations suppliers(Martinez et al., 2010). Furthermore, the transactional relationship prevents the external network from effectively supporting the integrated offering by the

servitizing organization (Martinez et al., 2010). This transactional relationship is embedded in the traditional supplying of goods rather than servitized offerings, which also requires a shift of mindset in the supply chain partners (Zhang & Banerji, 2017). Without this shift, it is difficult for the servitizing organization to get coordination and cooperation with the different actors in the network (Hou & Neely, 2013). Lastly, the servitizing organization often lacks understanding of how the actors in its network view their servitization initiatives (Kowalkowski & Kindström, 2013).

Resources and capabilities

Servitizing organizations often are faced with the barrier of a lack in the necessary resources and capabilities for servitization. Kowalkowski and Kindström (2013) argue that this is due to the challenge that servitizing organizations face in continuously adapting their resources and capabilities towards the changes in customer requirements and ICT developments. To cope with this, according to Kowalkowski and Kindström, three capabilities are needed: sensing, seizing and reconfiguring. Sensing is the capability to collect relevant information about new customer needs and the value of new services, seizing is the capability to capture and realize service innovation opportunities and reconfiguring is the capability to effectively transform resources, processes and operational skills (Kowalkowski & Kindström, 2013). Hou and Neely (2013) add to these findings by suggesting that servitizing organizations often lack expertise, understanding of the customer and innovative ability as well as have difficulty in knowledge and information management. Furthermore, Zhang and Banerji (2017) stress the importance of servitizing firms to leverage the workforce and materials across departments as well as to acquire new resources in order to reconfigure the internal structure. Moreover, Martinez et al. (2010) suggest that performance metrics should be adapted to measure the organizations collective ability to deliver the integrated offering, as the traditional manufacturing based metrics are not suitable for measuring PSS. Lastly, it is required to align product and service design processes in order to design integrated offerings and respond effectively to customer needs (Martinez et al., 2010).

Customer relationships

Customers are often highlighted in the literature as one of the main drivers or barriers to servitization (Kowalkowski & Kindström, 2013). The key problems that arise as a barrier to servitization, are that it is difficult for servitizing organizations to receive cooperation and acceptance from customers (Hou & Neely, 2013). This can usually be explained by the heterogeneous customer demand and their lack of trust in the servitizing organization (Hou & Neely, 2013). The reason that these factors are difficult for the servitizing organization to deal with, is that the human-based performance of servitization often involves unstable factors that can be disadvantageous for the long-term relationship and lacks control over customer behavior (Zhang & Banerji, 2017; Hou & Neely, 2013). Moreover, in order to overcome these barriers, servitizing organizations need to gain an in-depth understanding of the buying centre, create new customer touch points and mutual adaptation towards servitization is required (Kowalkowski & Kindström, 2013).

Value proposition

Challenges with regards to the value proposition that accompanies servitization can provide a barrier to servitization. Martinez et al. (2010) suggests that the product-centric orientation of the value proposition has to be replaced with a service-centric orientation, which can be inhibited by a lack of organizational responsiveness and requires multiple touch points between provider and customer. By moving from basic field services to an integrated PSS, the value proposition shifts from product oriented towards process orientated and from input based towards output based, thereby becoming more service-centric oriented (Kowalkowski & Kindström, 2013). Furthermore, Kowalkowski and Kindström (2013) suggest that the more service-centric the value proposition becomes, the more complexity and risk is introduced as resources, capabilities and actors need to

be integrated and coordinated. Moreover, the servitizing organization needs to find a balance within the portfolio between what services to offer and how extensively, which requires co-creation with customers and suppliers instead of unidirectional value delivery (Zhang & Banerji, 2017). Lastly, Hou & Neely (2013) imply the difficulty in designing a service package and the measurement of such services.

Financial

Through servitization, the servitizing organization faces a variety of barriers with relation to finances. Firstly, it is recognized that servitization allows for a better alignment with the customer value creation process through value-in-use, but that the servitizing organization needs to be able to manage traditional pricing schemes and revenue mechanisms in parallel with the new methods, which provides higher value potential but simultaneously higher financial risks (Kowalkowski & Kindström, 2013; Hou & Neely, 2013). Zhang and Banerji (2017) suggest that servitized organizations need an increased investment in order to facilitate the business transformation, which could offset financial returns in the early stages. Moreover, Hou and Neely (2013) add to this by suggesting that servitizing organizations often face unexpected costs and may suffer from the servitization paradox: a servitized organization that generates higher revenues than pure manufacturing organizations, but delivers lower profits. This also is in congruence with the finding that servitization does not necessarily increase the chance of business survival (Zhang & Banerji, 2017). Furthermore, it was suggested that it is difficult to price services and that therefore an integrated costing and pricing system needs to be redeveloped for the PSS (Hou & Neely, 2013; Zhang & Banerji, 2013). Lastly, there is a raised possibility of customer disagreement on the prices of the PSS, because the costing and pricing mechanisms are mainly related to the value created and therefore the prices of the PSS are often much higher than the sum of production costs (Zhang & Banerji, 2017).

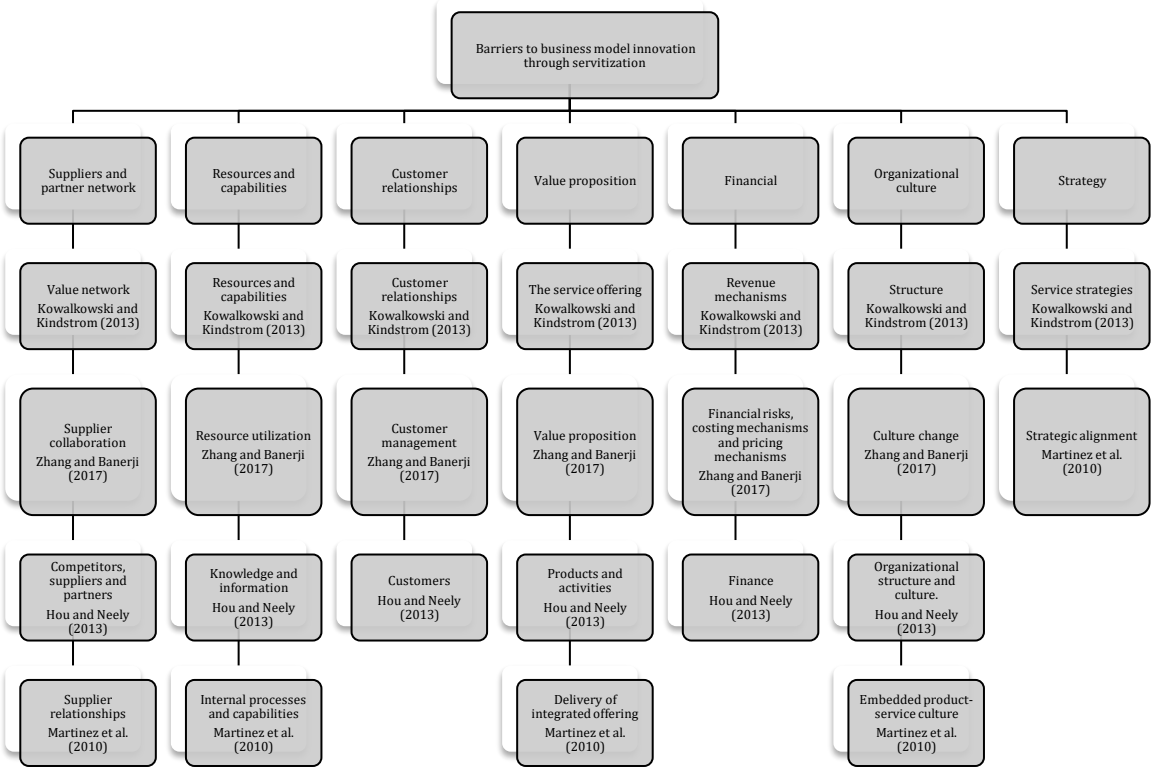
Organizational culture

One of the main barriers to servitization that becomes clear from the literature, is the change that needs to occur with regards to the organizational culture. Hou and Neely (2013) suggest that servitizing organizations often lack a service oriented culture and find it difficult to build this necessary service oriented organizational structure and culture, because the organization innates an internal resistance to servitization and a resistance to change. According to Martinez et al. (2010), this can be explained by the finding that traditional manufacturers often have a strong technology orientation that inhibits the transformation towards a service oriented culture. Zhang and Banerji (2017) support these findings and suggest that shifting from a product-centric mindset and culture towards a service-centric mindset and culture is a key challenge to servitizing organizations.

Strategy

The final barrier that has been recognized among the literature, is the barrier of strategy. Kowalkowski and Kindström (2013) suggest that the servitizing organization faces a strategic challenge in creating internal awareness and a sense of urgency within the organization. Moreover, it was suggested that a shift towards innovative services, such as output based services, can lead to reduced product sales and cause conflict with the strategy of the traditional product business, as their goals are partially incompatible. Martinez et al. (2010) mentions that another strategic challenge of servitizing organizations is that the absence of internal cooperation, common language and strategic alignment within the organization can slow down the efforts of the transformation towards servitization.

FIGURE 6 – BARRIERS TO BUSINESS MODEL INNOVATION THROUGH SERVITIZATION



3 METHODOLOGY

3.1 Research design

In order to further investigate the context of the business problem and to find answers to the proposed sub questions and central research question, a suitable methodology and research strategy is required. Robson (2002) suggests that most research questions cannot be answered by the use of theory alone, because of the fact that often there is no literature available, the literature is too broad or the literature proposes findings from a different context. A solution to this, is to carry out empirical research in which you add real world findings to the existing theory (mixing methods) in order to answer research questions.

Therefore, a decision needs to be made between the different empirical research designs: Quantitative research which emphasizes on statistical testing of assumptions, Qualitative research which emphasizes on analyzing behaviors, events and artifacts, Design research which emphasizes on developing a useful artifact, Action research which emphasizes on the effect of an intervention or a Mixed methods approach which is a combination of the aforementioned research designs (Robson, 2002).

Because this research focuses on finding a solution to a specific business problem that requires cooperation with the case organization, the most appropriate research method appears to be design research. In design research, the benefit is that something (an artifact) is 'delivered' to the case organization, while the drawback of this design is that it is difficult to make the research full cycle as the timeline of the research is limited (Hevner, 2007; Laurel, 2003; Robson, 2002). In order to mitigate this drawback, the developed artifact is aimed at being valuable regardless of whether the research project is terminated ex-ante.

Continuing, appropriate research strategies, constituted of data-collection and data-analysis methods, must be found in order to answer the research questions and central research question.

3.2 Data collection

Among the literature, a variety of data collection methods are proposed. Harrell and Bradley (2009) propose the following data collection methods: Surveys, Interviews, Focus groups, Observation, Extraction and Secondary data sources. It is key to determine what data collection method is most appropriate to gather the necessary information in order to answer the research questions.

By taking a closer look on the research questions that were constructed in the preliminary problem statement, it becomes clear that the research questions are a mix of descriptive and exploratory questions, which is often the case in empirical research: the descriptive questions are focused on what is already known (secondary data), while the exploratory questions focus on uncovering new insights (secondary data) (Robson, 2002). Based on these findings, appropriate data collection methods were selected. For the descriptive questions, secondary data sources were consulted, such as academic research papers and books, in order to conduct a semi-systematic literature reviews and book reviews about the current knowledge on the topics. While in the theoretical analysis literature is the preferred data source due to its credibility, in the solution and evaluation design the preferred data source are books, because these often provide more practical and context specific information compared to academic articles (Harrell & Bradley, 2009). For the exploratory questions, semi-structured interviews were conducted with people from the case organization as well as with experts in the domain of the diagnosed problem. The interviews are

semi-structured in that a clear outline is followed in order to systematically uncover the necessary information, but that there is also room for elaboration by the interviewee (through probing) and room for follow-up questions by the interviewer through the conversational style of interviewing, which allow for more complete insights than through the more strictly managed structured interviews (University of Twente, 2017a). Semi-structured interviews provide the researcher with insights directly from the actors in the organization, allow for more freedom to elaborate than a survey and have a higher likelihood to reap more unbiased insights from multiple perspectives compared to a focus group (Harrell & Bradley, 2009). McIntosh and Morse (2015) add to this by suggesting that semi-structured interviews are often used in situations where objective knowledge about the phenomenon is known, but subjective knowledge is lacking. However, interviews often take up much more time of both the interviewer and interviewees as well as create a larger disruption in the workflow of the organization because of the absence of employees on the work floor during the interview, which should be taken into consideration (University of Twente, 2017a).

3.3 Semi-systematic literature reviews

3.3.1 Semi-systematic literature review approach

The literature review can be approached in various ways. Snyder (2019) identified three distinct approaches: a Systematic, Semi-Systematic or Integrative approach. When it is not possible to review every single article that could be relevant to the topics, because the topics have been conceptualized differently and studied by various groups of researchers from different disciplines, a semi-structured literature review approach is used (Snyder, 2019). A semi-structured literature review is useful for detecting themes, theoretical perspectives or common issues within a specific research discipline and that have been developed over time (Snyder, 2019). Furthermore, Snyder (2019) suggests that a clear methodology including search terms, databases, inclusion and exclusion criteria is required in the design of a semi-structured literature review.

3.3.2 Theoretical analysis of the diagnosis

The first semi-systematic literature review focuses on expanding on the findings of the interviews, in order to further diagnose and justify the need for the case organization to servitize and the foreseen problems in the servitization process. The theoretical analysis is an essential part of the research, as it validates the empirical findings from the diagnosis on which the rest of the research is built. Because servitization and business model innovation are intertwined and sometimes used interchangeably, both terms are included as search terms. Moreover, because the theoretical analysis expands on the findings from the interview, the search terms can be fully defined after the empirical analysis is conducted. The phrase <key finding from the interviews> serves as a placeholder for the actual finding from the interview, f.e. “Finances” or “Employees”. The search terms that were used in this literature review, are:

“Business model innovation” AND “servitization” AND <key finding from the interviews>
“Servitization” AND <key finding from the interviews>
“Servitization barriers” AND <key finding from the interviews>
“Business model innovation barriers” AND “Servitization” AND <key finding from the interviews>

These search terms have been utilized through search in two databases: Scopus and Google Scholar. Google Scholar provides the most extensive range of articles, although the quality of the literature is disputable, as there is no review board or other admission filter that reviews the quality of the available literature. Scopus, on the other hand, do have more strict admission criteria (such as an independent review board) to safeguard the quality of the available literature, although this also limits the offering of these databases compared to Google Scholar. In many cases, Google Scholar does not grant full access to the paper, which was dealt with by looking up the paper in the other two databases through which full access can often be achieved. This logically also means

that the article suffices to the admission criteria of the concerning databases, which increases the overall quality of literature used. The use of high quality articles is desirable as these will provide more useful and credible information.

Another method used, is the snowball method. Through this method, references of selected articles can lead to other relevant articles, and references of these articles can then do the same, hence the 'snowball' effect (Naderifar, Goli & Ghaljaie, 2017). Although this method is effective in uncovering a large portion of the relevant and frequently-cited articles, due to the chronological order, this method naturally points the researcher towards older articles which may not provide the most up-to-date and credible findings (Naderifar, Goli & Ghaljaie, 2017). Therefore, the publication date of articles should be taken into consideration when using the snowball method.

Furthermore, besides the publication date, articles were included or excluded through the assessing the citation frequency, credibility, correctness and completeness. A general rule of thumb for this research is that more recent and more frequently cited articles are favorable, and literature that was published before the year 2000 and / or with no citations is excluded.

A flowchart of the semi-systematic literature review for the theoretical analysis is presented in Appendix 1.

3.3.3 Solution design

Similar to the theoretical analysis, the solution design will also consist of a semi-structured literature review that (partially) follows up on empirical findings that are discovered during the research: logically, the diagnosis must first be conducted before the appropriate solution to the diagnosed problem can be developed. Through this literature review, an outline of the proposed solution can be developed. Firstly, an overview of potential methods to the diagnosed problem is constructed, after which the most appropriate method is used to further develop the solution. Because practical solutions to business model innovation are related to change management, theory from the 'change management' domain is reviewed (Prats, Sosna & Velamuri, 2012). Once again, the phrase <Diagnosed problem> serves as a placeholder for the actual diagnosed problem that was specified in Chapter 4: Diagnosis. The keywords that were used, are:

"Change management" AND <Diagnosed problem>
"Change management" AND "Servitization" AND <Diagnosed problem>
"Intervention" AND <Diagnosed problem>
"Intervention" AND "Servitization" AND <Diagnosed problem>

This literature review has been conducted similarly to the literature review of the theoretical analysis, meaning that similar databases, inclusion and exclusion criteria as well as the snowball method were used.

A flowchart of the semi-systematic literature review for the solution design is presented in Appendix 2.

3.4 Semi-structured interviews

3.4.1 Semi-structured interview approach

Semi-structured interviews, just like any other data collection method, has its strengths and weaknesses that accommodate certain research aims. According to Newcomer, Hatry and Wholey (2015), semi-structured interviews are particularly effective when uncovering new insights that could reveal potential momentous issues and the interviewees need maximum latitude to gain these insights and elaborate on them. In the design of semi-structured interview approach,

informants need to be selected and contacted, interview questions should be drafted in accordance to the topic and an interview briefing/scheme/protocol should be created that explains the layout of the interview (Newcomer, Hatry & Wholey, 2015). Furthermore, because the interviewees are not the unit of analysis but rather speak on behalf of the organization, they are called 'informants' rather than 'respondents' and for that reason are selected through non-probability sampling (University of Twente, 2017a). The semi structured interviews are based upon the found theory in the theoretical background (for the empirical analysis) as well as the findings from the diagnosis (for the solution design and evaluation design), in order to guide the interview in a direction through which only the most relevant information is gathered.

In order to efficiently capture the data that is produced in the interview, while allowing the interviewer to draw maximal attention on conversing with the interviewee, the interviews are audio recorded (Kvale, 2008). Because both the interviewees and the interviewer are native Dutch speakers, the choice was made to conduct the interviews in Dutch. After the interviews were conducted, the recordings were transcribed in Dutch and relevant quotes from these transcripts were translated into English and anonymized in order for these to be used as empirical data. These quotes are extracted through content analysis, which is visualized in Figure 7. When interpreting semi-structured interview transcripts as the primary document, the appropriate method of extracting information is by coding the data through content analysis (University of Twente, 2017b). This content analysis allowed for meaningful findings (quotes) to be extracted from the raw interview data.

3.4.2 Semi-structured interviews in the diagnosis

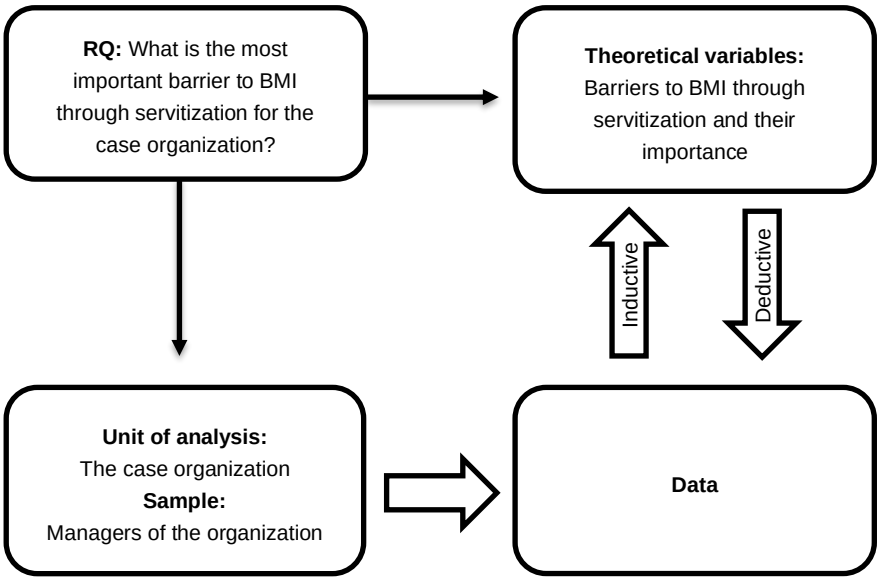
In order to identify insights about the organization as a whole, informants should be able to provide a comprehensive set of perspectives (van Aken & Berends, 2018). In order to accomplish this, the informants that were selected for the interviews of the empirical analysis are the managers of each department of the organization. This includes the Area Sales Manager, Head of Engineering and Production, Head of Finance, Head of Logistics and Head of Marketing and Sales. These managers are able to provide an eagle-eyed view on their department, which allows them to represent the department as a whole, while also providing information regarding the greater (strategic) context of the organization. Moreover, because conducting interviews is a time-intensive method, selecting a concentrated group of informants makes the interview process more time efficient than for example interviewing every single employee (Newcomer, Hatry & Wholey, 2015; University of Twente, 2017a).

The interviewees received an initial briefing a week before the interview took place, as well as right before the interview started, with an overview of what they could expect from the interview (Kvale, 2008). The interviews were only conducted after the interviewees consented with the terms of the interview briefing and interviewees were given the freedom to stop the interview prematurely for any reason. The interview briefing includes:

- General information: Background of the research, topic of the interview and expected preparation from the interviewee
- Practical information: Date, time, location and expected length of the interview
- Ethical information: Data collection method (recording), data storage method (transcribing), use of the data and anonymization of the data

Through the use of the conceptual background, a general direction for the interviews is constructed through deduction. However, the unique perspective of the interviewees also adds to the theoretical findings through induction (University of Twente, 2017a). The goal of the interview questions is to create a comprehensive understanding of the barriers to servitization that have been found through the literature, the unique barriers that the case organization identifies and to find out which barrier is most important for the case organization to overcome in order to successfully servitize.

FIGURE 7 – CONTENT ANALYIS OF THE SEMI-STRUCTURED INTERVIEWS OF THE EMPIRICAL ANALYSIS



3.4.3 Solution and evaluation design

In the solution and evaluation design, semi-structured interviews were conducted with experts in the field of the proposed solution in order to utilize their expertise in developing an appropriate solution and evaluation. Two experts were found who match the criteria to be used in expert interviews, because both possess a relevant academic background (Master's degree in Psychology) and both are part of organizations that operate in a field that is relevant to the diagnosed problem (Meuser & Nagel, 2009).

The questions of the interview are aimed at uncovering more about the potential solutions as well as how the most appropriate solution to the diagnosed problem should look like. Because the diagnosed problem becomes clear through the diagnosis, the further design and selection of informants is continued after the completion of the diagnosis. The interviews were conducted through a method that is similar to the interviews for the empirical analysis, including a similar briefing, recording and transcription method.

FIGURE 8 – CONTENT ANALYSIS OF SEMI-STRUCTURED INTERVIEWS OF THE SOLUTION DESIGN

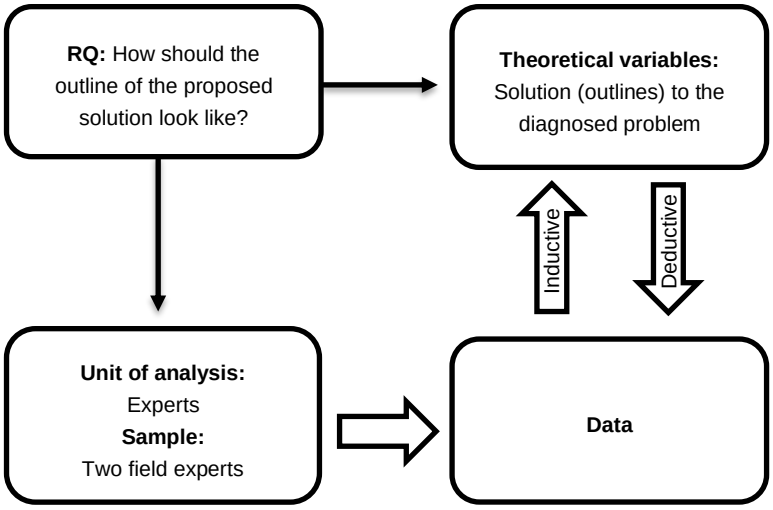
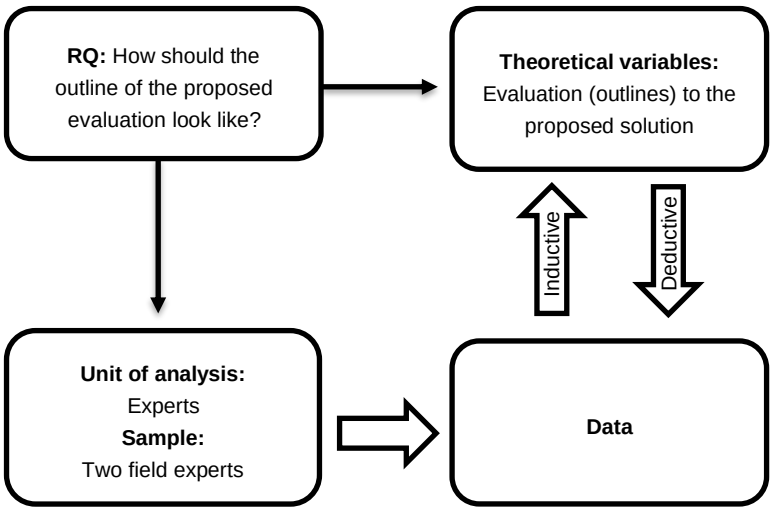


FIGURE 9 – CONTENT ANALYSIS OF THE SEMI-STRUCTURED INTERVIEWS OF THE EVALUATION DESIGN

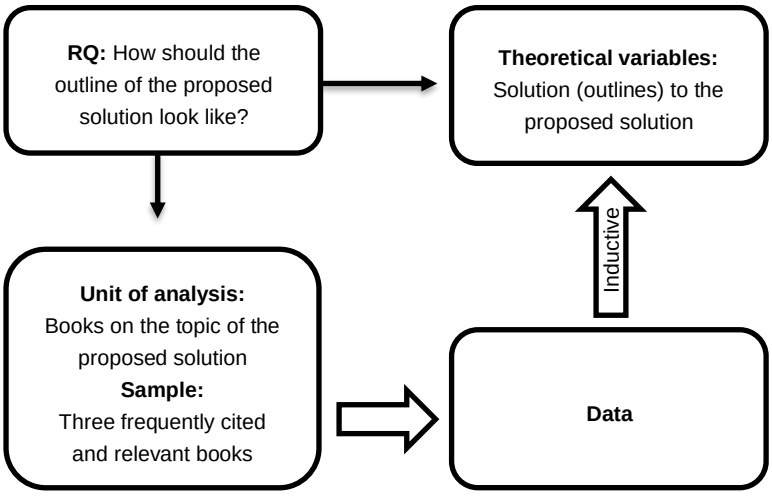


3.5 Book review for solution design

Because in this design research the goal is to develop a practical solution to the case organization, the literature may not be able to provide the necessary insights that fit the specific context of the business problem (Harrell & Bradley, 2009). Therefore, the choice was made to use other data sources to find answers to the sub-questions that are in relation to the more practically oriented solution design. Besides the primary data collected through expert interviews, also book reviews can be used to uncover more about how the solution (outline) should look like. Because a preliminary review of relevant books indicated a lack of content on evaluation, the evaluation design will solely be conducted through the expert interviews.

Because not every relevant book can be analyzed, as this would simply take too much time, a variation of expert sampling is used by selecting three books based on the relevancy to the desired solution (outline) and the frequency of citations (Etikan, Musa & Alkassim, 2016). This search is conducted through Google Scholar, because this database provides the most extensive library and provides a good indication of the number of citations. When interpreting books as the primary document, the appropriate method of extracting information is by coding the data through content analysis (University of Twente, 2017b).

FIGURE 10 – CONTENT ANALYSIS OF THE BOOK REVIEW IN THE SOLUTION DESIGN



4 DIAGNOSIS

While the intake with the case organization revealed preliminary insights into barriers to servitize, the aim of this diagnosis is to find out what the most important barrier for the case organization is. In this diagnosis, first an empirical analysis is conducted through the insights that have become clear from the semi-structured interviews with the five key managers of the case organization. Then, these empirical insights are expanded on through a theoretical analysis. The theoretical analysis consists of a semi-systematic literature review on the findings from the empirical analysis and aims at finding connections and disparities between theory and practice in order to complete the diagnosis.

4.1 Empirical analysis

Through the semi-structured interviews, a clearer picture of the case organization regarding the topic 'servitization' was created. The interviewees were able to share information about the current business model of the organization, the drivers for business model innovation through servitization and the foreseen barriers for the case organization in achieving this change. The key findings of the semi-structured interviews are discussed below and are supported by quotes from the interview transcripts.

4.1.1 Customers

4.1.1.1 Need for more support

From the interviews, it became clear that the customers of the organization have developed a need for more support. However, according to the customer this support should come at no additional expense. Especially the customers in the graphical market, which account for around 60-70% of the organizations' revenues, seem to have this need. This can be explained by the fact that customers in the other (technical) market often have their own technical team, while the customers in the graphical market often do not have the technical knowhow to maintain the machines themselves and therefore more heavily rely on the supplying organization.

"We have a good feeling about what we're doing and at customer visits the reactions are generally positive. What we do see is that customers often want/ask more support. Often it are requests without payment, so people always feel they should get more for the same price" – ***Interviewee 1***

"We have many customers, but mainly in the graphical market" – ***Interviewee 3***

"I know that for about 60-70% of our revenue we are dependent on the sale of our standard GTC machines, in different dimensions and types" – ***Interviewee 1***

"I do not believe that our customers, in particular the GTC customers, have their own technical team. Those people cannot distinguish an axis from a bearing" – ***Interviewee 1***

"In our experience the customers in the graphical market are not very technical and cannot maintain the machine themselves. The customers in the technical market often have their own technical team so you do not have to help them. The customers in the graphical market may be guided more actively" – ***Interviewee 4***

4.1.1.2 Customer relationship

Another finding that became clear from the interviews, is that servitization can help to improve and maintain the relationship with the customer. Currently, the relationship between the organization and the customer fades after the purchase, because there is no further interaction. Through servitization, it is believed that the organization stays in contact with the customers which will improve the customer relationship.

> *"Once the product is delivered, the organization actually does not stay in contact with the customer"* – ***Interviewee 2***

> *"I think it [servitization] will be revenue-increasing and the customer relationships will only become better"* – ***Interviewee 3***

> *"Benefits are that you are closer to your customer, get data from the customer and to stay in contact with the customer. Because normally you deliver a machine and then when you do not hear anything you also do not have contact with that customer"* – ***Interviewee 1***

4.1.1.3 Serve different segments

Furthermore, servitization allows the organization to target customers that are looking for cheaper alternatives and not necessarily want to be the owner of the machine. Currently, the customer needs to pay a lump sum in order to obtain the machine. Through servitization, customers could pay for the output of the machine (per square meter), which will be less financially impactful for the customer. However, the organization believes that customers should also remain to have the option to buy the machine.

> *"You can reach customers who are seeking for a cheaper solution. I think there should be a good mix, you should offer the possibility, but not purely this. There are also customers who want to be the owner of the machine, so there needs to be a choice for the customer"* – ***Interviewee 5***

4.1.1.4 Time zone challenge

Finally, it becomes clear that the worldwide customer base could provide a challenge, as customers are in different time zones. This would entail that the organization needs to be available to clients beyond regular office hours in order to provide the promised services that come with servitization.

> *"We are in the European time zone and we sell worldwide, so you need to deal with customers who are in a different time zone. Indirectly, you imply that you are able to serve them anytime they have a problem"* – ***Interviewee 2***

> *"An organization could choose not to servitize if it is not set up for this. For example, if you go for a certain form of contract and you cannot meet the promises. Our machines are all over the world, so if you promise to provide a solution within a certain time and you cannot meet this promise, then servitization is maybe not suitable"* – ***Interviewee 3***

4.1.2 Competitive advantage

It became clear through the interviews that servitization is seen as the only way to gain a competitive advantage. Currently, the organization does not have competitive advantage, because the product development and innovation has reached a ceiling. Competing on price is also not possible, as it cannot be further improved. Because no competitor is working on servitization yet, implementing this now will give the organization a head start over the competition.

"We have no possibilities to make the machines even better. The price can always be better, but there is no room for improvement there" – ***Interviewee 2***

"I am very positive towards servitization, because I think it is ultimately the only way to differentiate from the competition" – ***Interviewee 2***

"Looking ahead, it [servitization] is a pretty good idea. I do not think that competitors are working on this yet. I think that in the US this will provide a major competitive advantage" – ***Interviewee 1***

"If we approach servitization in the right way, I think we definitely have a head start on our competition" – ***Interviewee 3***

"Absolutely that with this [servitization] you walk ahead of the competition, so a positive influence on the competitive position" – ***Interviewee 5***

4.1.3 Employees

From the interviews, it becomes clear that the employees of the organization are mainly technically and traditionally minded. The employees think from a product-improvement perspective rather than a customer-solution oriented mindset. However, the employees are flexible to adapt and are expected to be open to the new strategy. In order to facilitate the change towards a servitization strategy, the employees would need to receive training and a change in mindset.

"The focus [of the employees] is purely technical. Technically oriented, wait and see attitude, conservative. Quite scared to change things. But people are willing" – ***Interviewee 1***

"A training would definitely be beneficial to bridge the change from the traditional way of working to servitization" – ***Interviewee 4***

"It would be a mindset change; they need to start thinking from the customers' perspective. Change within the organization takes time, but that is the case in any company I think. The company culture does facilitate it, but is not yet in line with servitization" – ***Interviewee 5***

"I think that the employees are flexible to adapt to a new business model and that the challenge lies in executing that change [implementing a new business model]" – ***Interviewee 2***

"Servitization does fit the company culture. They [employees] will be open for it, but how it will work out in practice, I actually have no clue. I think positively" – ***Interviewee 4***

4.1.4 Finance

4.1.4.1 Source of revenue

The interviews show that servitization will have a positive effect on revenues. Currently, revenues are for a large part coming from the sale of machines. Because of the high quality of the machines, revenue through maintenance is low. Through servitization, a new revenue stream will be added which will positively influence the finances of the organization.

"I think it [servitization] will be revenue-increasing and the customer relationships will only become better" – ***Interviewee 3***

"The organization makes very good machines, so it almost never breaks. If you look at it from that angle, you would never earn anything after the sale [without servitization]" – ***Interviewee 5***

4.1.4.2 Financial challenges

Besides the positive effect that servitization will have on the finances of the organization, there are also some financial challenges with regards to servitization. The key challenge, is that with servitization the organization needs to cover the upfront investment, such as the cost of the machines. The revenues that are gained through servitization will be earned back over time, which implies that the organization needs to have enough financial resources to be able to overcome this period. Moreover, not all customers are interested in the new pricing (and corresponding revenue mechanism for the organization) mechanism that is used in servitization.

"There are financial challenges. If customers pay a monthly fee or per square meter" – ***Interviewee 5***

What I do see, I think especially the financial picture. I think that we need to have big pot of money in the beginning to put the machines there or to produce them" – ***Interviewee 5***

"It will not be financially interesting for all of our customers. Not everyone values these kind of things as much, I think" – ***Interviewee 4***

4.1.5 Summary of empirical analysis

From the empirical analysis, it became clear that there are a number of key drivers and barriers that the organization has identified. The key drivers that for servitization that were uncovered, are:

- New needs from customers
- Improve customer relationship
- Serve other customer segments
- Gain a competitive advantage
- Additional source of revenue

Moreover, the interview also uncovered the foreseen barriers to business model innovation through servitization. The key barriers that were found, are:

- Ability to provide services worldwide at any time
- Developing a service-oriented mindset and culture
- Large upfront investment
- New revenue mechanism

These key findings and their effect on business model innovation through servitization for the case organization that became apparent from the empirical analysis are visualized below in Figure 11 (Drivers in green, barriers in red). Moreover, overlap between the theoretical framework and the empirical analysis was found and is visualized in Figure 12.

FIGURE 11 – VISUALIZATION OF THE KEY DRIVERS AND BARRIERS ACCORDING TO THE EMPIRICAL ANALYSIS

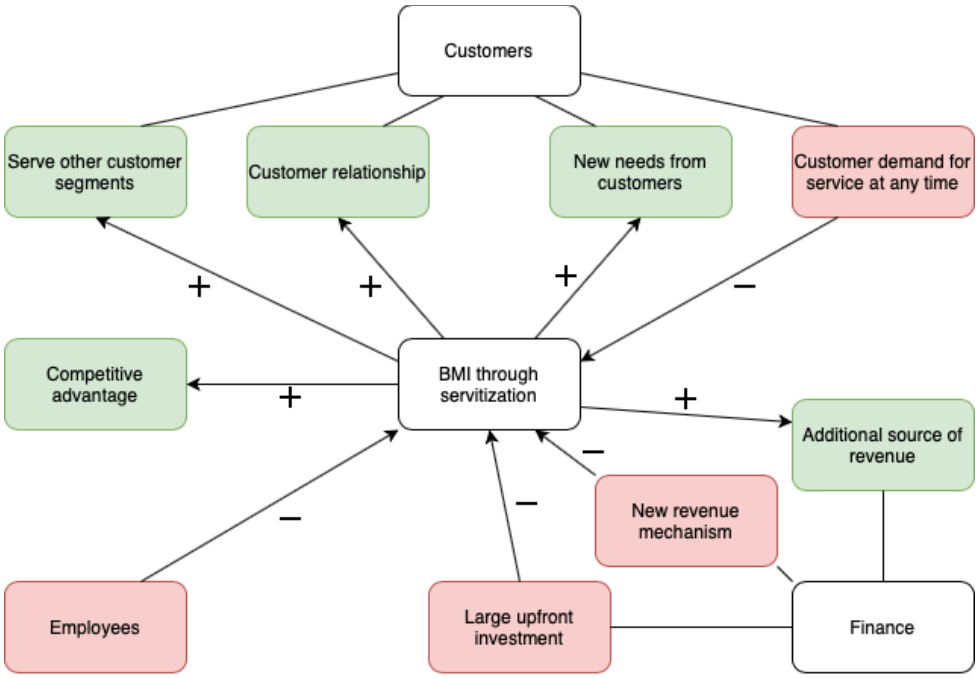
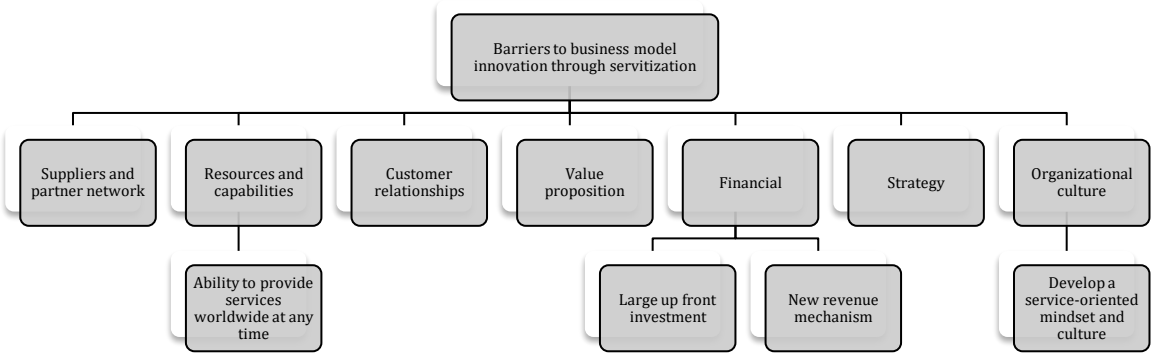


FIGURE 12 – OVERLAP BETWEEN THEORETICAL BACKGROUND AND EMPIRICAL ANALYSIS



4.2 Theoretical analysis

Through the empirical analysis, the key barriers and drivers for the case organization have been uncovered. However, just the empirical analysis does not give a complete overview and therefore through expanding on it with theoretical insights, a clearer picture regarding business model innovation through servitization in the case organization can be created. Through a semi-systematic literature review, the findings of the empirical analysis are expanded on.

4.2.1 Customers

4.2.1.1 Need for more support

The increasing need of customer to receive more support is a key driving factor for organizations to servitize. Vandermerwe & Rada (1988) suggest that servitization is driven for a large part by customers and that customers have increased demand for services. Moreover, it appears that servitization is able to better fulfil customer needs, as multiple researches found an improvement in customer satisfaction after servitization (Anderson & Narus, 1995; Vandermerwe & Rada, 1988; Wise & Baumgartner, 1999; Mathieu, 2001; Oliva & Kallenberg, 2003). Furthermore, it was suggested that advanced technologies from Industry 4.0 (as used in servitization) allow organizations to better deliver value to their customers and serve new customer needs (Bogers et al. 2016; Babiceanu & Seker, 2016; Saldivar et al., 2015; Weller et al., 2015). Therefore, it appears that the literature supports the finding that customers have developed a need for more support and that this need can be met through utilizing the technologies of Industry 4.0 through servitization.

4.2.1.2 Customer relationships

Another driver of servitization, is that it is expected to improve the relationship between the organization and the customer. Vandermerwe & Rada (1988) suggest that, while previously the focus of organizations lied upon satisfying customer needs through core activities, through the increasing demand for services by customers the emphasis now lies on building and maintaining a relationship between the customer and the organization through offering a broader range of solutions. Baines & Lightfoot (2014) support this finding by suggesting a positive effect that servitization has on the relationship between the organization and the customer. Research by Bustinza, Bigdeli, Baines & Elliot (2015), Mathieu (2001) and Oliva & Kallenberg (2003) also found that servitization increases customer satisfaction and thereby improving the relationship between the organization and the customer. Moreover, it was found that service provision enables long-term relationships with customers (Wilkinson, Dainty, Neely & Schmenner, 2009). Based on these findings, it appears that improved customer relationships is a key driver in servitization.

4.2.1.3 Serve different segments

Through servitization, organizations are able to serve different customer segments. Slack (2005) suggests that servitization reduces the risk for customers, as customers face a lesser upfront investment and maintenance costs. Neely (2008) expands on this view and found that servitization reduces risk and decreases/stabilizes maintenance and support costs for customers, which opens the door to customers who would otherwise not be able to cover the upfront investment and or take the additional risks. Therefore, it appears that servitization will lower the risk and necessary financial investment for customers, which enables the organization to also serve more risk-averse customers and customers who do not have deep pockets.

4.2.1.4 Ability to serve global customers at any time

One of the challenges of servitization, is that services need to be provided to customers around the world who may be in different time zones. Barrett & Davidson (2008) found that time zone differences is a significant barrier to the provision of global services. However, little research is done on the topic of how time zone differences affect an organizations servitization efforts. Common thinking would suggest that a difference in time zone makes it more difficult for the servitizing organization to provide immediate services to its customers.

4.2.2 Competitive advantage

A common driver of servitization is that it can enable the servitizing organization to gain a competitive advantage. According to Vandermerwe & Rada (1988), the movement of servitization is a powerful feature of total market strategy, which is being adopted by the best companies. Moreover, research by Bustinza, Bigdeli, Baines & Elliot (2015) suggests that a competitive advantage is one of the outcomes of servitization. This research shows that servitization, when done correctly, can lead to an increase in differentiation and customer satisfaction, which are fundamental to achieving competitive advantage. Other researches on servitization supports the finding that servitization can differentiate the organizations offering, which can lead to having a competitive advantage (Anderson & Narus, 1995; Wise & Baumgartner, 1999; Goffin and New, 2001). Therefore, it appears that the literature has reached some consensus on the finding that servitization helps organizations to gain a competitive advantage.

4.2.3 Employees

The literature proposes various insights towards the relationship between servitization and the employees of the organization. One of the major servitization challenges is the change in corporate culture at an organizational level (Oliva and Kallenberg, 2003; Vandermerwe and Rada, 1988; Wise and Baumgartner, 1999). In servitization, a change in the mindset of employees is inevitable in order to include a new service-orientation to the existing product-orientation (Neely, 2008). Moreover, it was suggested that creating a service-oriented environment and finding the right people for the service dimension is key to success (Baines & Lightfoot, 2009). Changing the long-standing values, beliefs, attitudes and practices of employees from the product orientation to a new service orientation seems to be the largest barrier and may trigger resistance (Davies et al., 2006; Neely, 2008; Foote et al., 2001; Vandermerwe and Rada, 1988. Continuing, Gebauer et al. (2010) suggest that this new service orientation can be achieved when the employees have reached a certain degree of understanding of the benefits that are added through an extended service business. The appreciation of adding industrial services, usually the financial, marketing and strategic opportunities, are what constructs this degree of understanding (Gebauer et al., 2010). In all, it appears that a key barrier to servitization is that the product-oriented mindset of the employees needs to be changed to a new service-oriented mindset and culture.

4.2.4 Finance

4.2.4.1 Source of revenue

One of the key drivers for servitization, is that it provides an additional revenue source to the servitizing organization. A number of studies found that servitization can yield additional revenues, better profitability and more stable cash flow (Anderson & Narus, 1995; Wise & Baumgartner, 1999; Mathieu, 2001; Malleret, 2006). Supporting these findings, Crozet & Milet (2017) found a strong positive correlation (r=0.894) between servitization and profitability in the machinery sector. In this research, the focus lies on organizations with less than 50 employees, similar to the subject organization. The research suggests that servitized organizations are more profitable, employ more workers and have a higher sales total than non-servitized organizations. The most conservative numbers of this research show that servitization will increase profitability by 8% to 8.5%, result in higher sales and that on average the benefits gained from servitization outweigh its costs. However, research by Neely (2008) suggests that, though agreeing on increased revenues, servitized manufacturing organizations tend to generate lower net profits as a percentage of revenues than non-servitized manufacturing organizations. This can be explained by the higher average labor costs, net assets and working capital that are involved in servitized organizations. Moreover, Neely (2008) suggests that the revenues and/or margins of servitized organizations are often times not sufficient to cover the additional investment compared to non-servitized organizations. Similar to the findings of Crozet & Milet (2017), it appears that in smaller firms servitization pays off, while in larger firms it proves more problematic. Therefore, it appears that servitization provides an additional source of revenue to the servitizing organization, although this does not necessarily mean that the overall financial situation of the organization immediately improves due to the additional costs of servitization.

4.2.4.2 Financial barriers

A key barrier to servitization, is that the differences that are made in some financial aspects of the organization can cause additional challenges. The first challenge, is that the servitizing organization needs to cover upfront investment. Neely (2008) suggests that the increased investment required is one of the significant challenges that servitization holds. Baines & Lightfoot (2009) support these findings, by suggesting that servitization comes with additional costs upfront that can be earned back over time. This phenomenon where the additional financial (or cultural) investment does not immediately yield the expected high returns is commonly referred to as the ‘service paradox’ or ‘servitization paradox’ (Gebauer et al., 2005). Another financial barrier to servitization, is the different revenue model through which the organization collects value in return for the provision of services. According to Kowalkowski and Kindström (2013), organizations who servitize often utilize a revenue mechanism around ‘value-in-use’ and this conflicts with customers who demand ownership over the product through ‘value-in-exchange’. Moreover, through a revenue mechanism that involves value-in-exchange the servitizing organization receives revenues immediately, while through a revenue mechanism around value-in-use the revenues are collected over time, which can put pressure on the finances of the servitizing organization (Vargo, Maglio & Akaka, 2008). Therefore, it appears that the financial barriers around servitization are that the servitizing organization needs to put in a large upfront investment, that a portion of customers demand ownership over the product which conflicts with the delivery of a PSS offering and that the revenue mechanism around value-in-use can put pressure on the servitizing organization.

4.3 The diagnosed problem

Through the empirical analysis, a variety of new insights became apparent with regards to how the case organization sees servitization in terms of drivers and barriers. The key empirical findings were expanded on through the theoretical analysis, which helped to get a more detailed picture of what is known in the theory about these drivers and barriers and to justify the empirical findings.

It became clear that most of the drivers and barriers that have been discussed in the empirical analysis were resembled in the theory. Furthermore, the interviewees were unanimous in that they see the change in employee mindset (and accompanying organizational culture) as a key barrier in servitizing the case organization. The fact that all interviewees proposed this barrier, hints that this barrier may be the most important for the case organization.

Then, through the theoretical analysis, it also appears that a change in mindset is the most commonly addressed challenge in servitization in the literature whilst simultaneously has a high importance: The change in employee mindset and organizational culture was referred to by the literature as ‘inevitable’, ‘key to success’ and ‘the largest barrier’. Therefore, based on the combination of the empirical analysis and the theoretical analysis, the diagnosed problem (and thus ‘most important barrier for business model innovation through servitization) for the case organization is to achieve the necessary shift in employee mindset and organizational culture from product-oriented towards service-oriented. Therefore, the focus of the intervention will further focus on helping the case organization to achieve this necessary shift in employee mindset and organizational culture.

5 SOLUTION DESIGN

Through the diagnosis, both empirical and theoretical analyses led to the diagnosed problem: the necessary shift in employee mindset and organizational culture from product-oriented towards service-oriented. In the solution design, an appropriate method can be developed that can help in overcoming the previously diagnosed problem. Using theoretical findings, expert interviews and a book review, more can be uncovered about the potential solutions for the diagnosed problem and the most appropriate solution can be further developed into a meaningful artifact for the case organization.

5.1 Exploration of potential solutions

5.1.1 Theoretical findings

Changing the mindset of employees in order to accommodate the new service culture can be approached in a few ways, according to the literature. Research by Leseure et al. (2010) found successful alignment of mindset within the organization through two ways: having mobility of personnel between divisions and conducting workshops involving multi-discipline personnel. Alghisi & Saccani (2015) also suggest that a training of the employees could help shift the organizational culture from product-oriented towards service-oriented. Furthermore, it was suggested that the development of the service mindset and service culture within the organization can be further supported by hiring people who already possess a service mindset, as well as (re)training and further developing current employees (Baines & Lightfoot, 2014; Huikkola, Kohtamäki & Rabetino, 2016). Lastly, according to Wright & Geroy (2001), training was seen as the number one activity by employees to develop the appropriate mindset. Therefore, it appears from the literature that the solution to shift the mindset and organizational culture from product-oriented towards service- oriented involves training the existing employees or alternatively hiring employees who already possess a service-oriented mindset.

In order to design an effective training, the literature on cognitive-behavioral training methods was consulted. Research by Proudfoot, Corr, Guest & Dunn (2009) suggests and recognizes a number of activities that often construct an effective training: Socratic questioning, group discussions, self-observation, experimentation, individual and syndicate activities and assignments. According to Lazan (2016) and Leseure et al. (2010), the optimal training intervention in the area of changing mindset that consist of these activities is a workshop.

5.1.2 Expert interviews

Besides theoretical findings, which usually approach the problem in a more broad context, two experts who are active in the field of employee training and coaching have been consulted to provide insights from their expertise into the potential solutions to the diagnosed problem.

Expert 1 suggests that possible solutions to this problem are to conduct a training, coaching, workshop or a lecture, while Expert 2 similarly suggests that the appropriate approach to solving the problem is a series of trainings or workshops. Both experts stress the importance of creating awareness among employees as a first step in changing mindset. Expert 2 suggests that, although awareness can be created by facts and figures, a mindset is not changed by passively processing information. Expert 1 supports the finding that a lecture is rather passive, and therefore not the best method to solve the diagnosed problem. Furthermore, Expert 1 mentions that coaching would not be very time and cost effective and lacks the advantage that employees can stimulate and learn from each other. Expert 2 emphasizes that the solution would be most effective if can sustain its effects over a longer period of time, thereby allowing the employees to go through all the behavioral change stages. Therefore, a set of workshops or trainings is seen as the most appropriate method for achieving the necessary change in employee mindset and organizational culture.

I would say a workshop would be most suitable to this specific problem. A workshop, in contrast, would make them perhaps feel more involved in this problem; feel like they can contribute to the solution. Furthermore, it would stimulate them to think about this problem in an active way. In a workshop they can gain a lot of knowledge and insights in a short time. In addition, they can learn from each other: sharing conclusions and insights with colleagues. – ***Expert 1***

This specific problem asks for a mindset change. This means that in order to create a growth mindset / service-oriented mindset, these employees need to go through all the behaviour change stages. In practice, this could look like a series of workshops in which you go through these stages of change step by step. – ***Expert 2***

5.1.3 Solution choice

Based on the findings from the theory combined with the insights that were gained through the expert interviews, it becomes clear that the appropriate solution method to achieving the necessary shift in employee mindset and organizational culture from product-oriented towards service-oriented is a set of workshops. The outline for the set of workshops is further developed and presented to the case organization as the artifact of the design research.

5.2 The workshop outline

Now that the appropriate solution, namely a set of workshops, is chosen, a closer look can be taken at how this should look like. Through a book review, insights will be gained into the guidelines to outlining a workshop (or set of workshops). Then, the findings from the expert interviews combined with the findings from the book review constitute the workshop outline.

5.2.1 Book review

A set of workshop design principles were taken from the books "*That workshop book: New systems and structures for classrooms that read, write, and think*" by Bennett (2007), "The workshop book: *How to design and lead successful workshops*" by Hamilton (2016) and "Training Workshop Essentials: *Designing, Developing, and Delivering Learning Events that Get Results*" by Lucas (2009). These books were selected to be most appropriate based on relevance and availability.

The first step in workshop design is, besides the setting the goal and desired outcome, to establish the topic(s) and theme(s) of the workshop (Hamilton, 2016; Lucas, 2009; Bennett, 2007). Moreover, the scope of the workshop needs to be defined in terms of practicalities and constraints (Hamilton, 2016). The scope of the workshop is formed by the answers to the following five questions:

- Who will attend the workshop?
- Who will help facilitate the workshop?
- How long will the workshop be?
- Where will the workshop be run?
- What are additional workshop constraints?

The findings from the consulted books suggest the general structure of the workshop to consist of 1) The workshop opening, in which the reason for the workshop is explained and the atmosphere is established, 2) The workshop core, which gives new insights as well as promotes group creativity and exploration and 3) The workshop closing, which concludes the workshop, provides validation of effectiveness and creates a sense of achievement and agreement (Hamilton, 2016; Lucas, 2009; Bennett, 2007).

1) The workshop opening

The opening is often used to communicate what the goals and guidelines of the workshop are as well as what is expected from participants. Moreover, the opening establishes the atmosphere for the rest of the workshop (Bennett, 2007). Therefore, the opening should reassure the participants of a safe environment with open communication through promoting mutual trust and collegiality. It should be made clear that active participation is desired, so that the workshop is going to be useful, interesting and fun (Lucas, 2009; Hamilton, 2016).
The workshop opening consists of two parts. First, a short introduction of the facilitator, a reiteration of the workshop theme and a frame of the activities that are going to take place during the workshop are presented (Hamilton, 2016; Lucas, 2009; Bennett, 2007). Here, the goals that are desired to be achieved by the end of the workshop are also summarized and presented. It is key that the introductory part of the workshop opening is kept short, in order to remain the participants' interest (Lucas, 2009; Hamilton, 2016). Moreover, the aforementioned desire for active participation should not be contradicted at the outlet by proceeding into a lecture, which discourages participations (Hamilton, 2016). Rather, as the second part of the workshop opening, the participants are engaged in a trust/confidence building exercise to promote active and energized participations, as well as to 'break the ice' between participants (Hamilton, 2016; Lucas, 2009; Bennett, 2007)

2) The workshop core

In the workshop core, the participants get the chance to actively engage themselves in the activities of the workshop, which often involve exploration and creativity (Hamilton, 2016; Lucas, 2009; Bennett, 2007). To maximize the effectiveness of the workshop, methods that are used should be carefully selected. Methods can be used to generate ideas and evaluating these ideas, thereby first exploring the space of possibilities and then focusing on the most promising and interesting ideas (Hamilton, 2016; Lucas, 2009; Bennett, 2007). The methods that are used in the workshop should allow the opportunity for both activities to take place, thereby cycling through divergent and convergent methods (Hamilton, 2016; Lucas, 2009). Moreover, methods can be divided into active methods and passive methods. While in active methods participants have to engage and exploration is promoted, in passive methods the participants get the chance to reflect and internalize ideas (Hamilton, 2016; Lucas, 2009). Such passive methods can include the participants listening to a presentation, informal conversation in between methods or discussion about ideas during (lunch)breaks. A good balance between active and passive methods is necessary to preserve the participants interest and energy levels (Hamilton, 2016; Lucas, 2009). Furthermore, methods can involve the creation of artifacts, in which case the method encourages participants to externalize ideas. The creation of these physical representations of the exploration and creation of ideas encourages the participants to improve and elaborate on the idea (Hamilton, 2016; Lucas, 2009; Bennett, 2007). A commonly used tool for externalizing ideas are 'post-it notes', which are effective in communicating information through text and color as well as being easily ranked and moved in the physical space (Hamilton, 2016). A method that can be used to link the activities of the workshop together, is 'storyboarding'. In storyboarding, each activity links together with the following in order to synthesize a coherent narrative throughout the day (Hamilton, 2016; Lucas, 2009).

3) The workshop closing

In the workshop closing, the day is concluded by setting out for the continuing of collaboration between participants in the project from now on (Hamilton, 2016; Lucas, 2009; Bennett, 2007). The workshop closing allows for participants to reflect on the achievements of the day, validate the time and energy that the participants put into the workshop and to look at the future steps (Hamilton, 2016). By asking reflective questions, a discussion can be set out for the participants to share their experience and learn from what others experienced(Hamilton, 2016; Lucas, 2009). If the workshop involved a competitive element, the workshop closing gives the opportunity to celebrate (and possibly award) the winners (Hamilton, 2016). The workshop closing also provides an ideal moment for the researcher to gather feedback, which can be used to further develop the workshop in the future as well as to evaluate its effectiveness (Hamilton, 2016; Lucas, 2009; Bennett, 2007).

5.2.2 Expert interviews

Besides the book review, also the expert interviews have discussed how the outline of the (set of) workshop(s) should look like. Expert 1 suggests that each workshop consists three parts, similar to what the book review suggests.

In general, three parts: An introduction (with icebreaker), middle part and outro. In the middle part I would suggest alternating theory with interactive assignments. Start with the key information and then divide the participants into small groups to work on interactive exercises or assignments. Then a plenary discussion. This sequence can be repeated, perhaps alternate the groups or make pairs. In the end, there is a short summary of the key points and the option to ask questions. – ***Expert 1***

Moreover, Expert 2 emphasizes the need for multiple workshops in order to cover all the necessary steps of the behavioral change process. In order to do so, Expert 2 suggests that each workshop covers one of the five steps of the behavioral change process.

As mentioned earlier, it could look like a training or series of workshops. The underlying working mechanisms consists of a few steps. Each step could be a focus point of one workshop.
– Expert 2

According to Expert 2, the five steps of the behavioral change process and its subsequent workshops should look like following:

Step 1. Raise awareness

Discuss the problem, show them the consequences of their current behaviour and of their desired behaviour.

Step 2. Resolve ambivalence and help to choose change

People are not likely to change quickly. You need to put effort into making it seem like the most logical and beneficial choice for them to change their behaviour and mindset.

Step 3. Help identify appropriate change strategies

The most practical part of the training. As discussed before, you need to show them the benefits of the desired behaviour. In this case, changing to a service-oriented mindset. You could show facts and figures or compare your services to other companies. In addition to making them aware of the benefits, you need to help them believe that they are capable to change. Start small. Give them a product and let them come up with ideas on how to create a service around this product. Let them be creative and open-minded. Respect their knowledge and autonomy by trusting them to come up with feasible ideas.

Step 4. Help implement change strategies and learn to eliminate potential relapses

When employees are willing and trying to change, it is important to implement these change strategies throughout company policy.

Step 5. Develop new skills for maintaining recovery

The last step of behaviour change focuses on preventing relapses and maintaining recovery. Behaviour and mindset isn't changed in one day. It is a long process with ups and downs. Important is that employees feel supported in this process in order to maintain a long term change in mindset.

– Expert 2

Moreover, both experts provided a list of ‘do’s and don’ts’ for conducting workshops:

TABLE 1 – DO’S AND DON’TS OF WORKSHOPS ACCORDING TO EXPERT INTERVIEWS

Do’s	Don’ts
Expert 1	**Expert 1**
Make it interactive	Not too much theory
Clear outline with time indications	Not too much passive listening for the participants
Anticipate when things are going faster/slower than expected	
Really involve participants, use their input	
Expert 2	**Expert 2**
Focus on the why and how	Use a negative approach or fear appeal
Respect their autonomy and ideas	Try to change their mindset in one day
Take it step by step	Try to apply rules from top down
Focus on setting and achieving feasible goals	Disrespect their ideas and autonomy
Focus on a positive approach: development and growth	Blame them for their current behaviour

Lastly, the International Association of Facilitators (IAF) provides a set of activities that are often used in effective workshops ("IAF Methods", 2020):

- Planning
- Problem solving
- Managing difficulties
- Warm ups
- Making decisions
- Generating ideas
- Understanding issues

6 SOLUTION EVALUATION

According to van Aken & Berends (2018), the final step in the problem solving cycle is evaluation and learning. The evaluation provides insights in four areas: First, the evaluation serves as a tool to determine the success of the current project and the desired future improvements. Second, the evaluation helps to orient towards learning for different problems in a similar context. Third, the evaluation can oriented towards advancing the scientific knowledge in this area. Fourth, the evaluation is key to personal and professional learning and development. Therefore, this chapter aims at answering the question what the evaluation for the solution should look like.

6.1 Theory

In order to evaluate whether the desired changed in mindset orientation is achieved, first an understanding of measuring mindset orientation should be developed. According to Lusch and Vargo (2008), a shift towards service-oriented (or service-dominant) mindset is recognized in eight areas: (1) a shift to the process of serving instead of the creation of goods, (2) a shift to the priority of intangibles rather than tangibles, (3) a shift from consumption of static operand resources towards the use of dynamic operant resources, (4) a recognition of the strategic advantage of symmetric rather than asymmetric information, (5) a shift to conversational dialog as opposed to propaganda, (6) an understanding that the firm can only make and follow through on value propositions rather than create or add value, (7) a shift in focus to relational rather than transactional exchange, and (8) a shift to an emphasis on financial performance for information feedback rather than a goal of profit maximization.

These differences between product-oriented mindset and service-oriented mindset are presented below.

TABLE 2 – DIFFERENCES BETWEEN PRODUCT-ORIENTED AND SERVICE-ORIENTED MINDSET (LUSCH & VARGO, 2008)

Product-oriented mindset	**Service-oriented mindset**
Goods	Services
Tangible	Intangible
Operand resources	Operant resources
Asymmetric information	Symmetric information
Propaganda	Conversation
Value added	Value proposition
Transactional	Relational
Profit maximization	Financial feedback

A pre-test and post-test evaluation, or: before-after design as proposed by Mohr (1995), is the most commonly used method to determine whether or not the implemented solution has delivered its desired effect. Van Aken & Berends (2018) suggest that an appropriately carried out diagnosis can yield necessary data that can later be used for the pre-test, which will then be compared to the post-test. However, because all employees are present during the workshop, this allows for a more thorough evaluation through testing all participants of the workshop, which will provide much richer insight into the mindset orientation of employees than to use the general findings from the diagnosis.

There are a few challenges with regards to the validity of solution evaluation. While there may be differences between the pre-test and the post-test, it is difficult to say whether these differences are solely the result of the intervention or if external factors also have had an effect (Mohr, 1995; Dimitrov & Rumrill, 2003). One way to cope with this challenge is by executing a comparative post-test, in which one group undergoes the intervention and another group does not, thereby trying to take external factors out of the equation (Mohr, 1995; Dimitrov & Rumrill, 2003). Another challenge is that commonly used summative evaluation, though essential, solely measure the effectiveness of the intervention without explaining why differences or nondifferences occur (Dimitrov & Rumrill, 2003). Formative evaluation, on the other hand, does take into account underlying causes of intervention effectiveness and its potential side effects (Dimitrov & Rumrill, 2003).

It appears that the desired change in mindset orientation can be measured in the aforementioned eight areas. However, little is known about how the service-oriented mindset (or its characteristics) can be effectively measured in order to evaluate the effectiveness of the workshops. Through the diagnosis, semi-structured interviews were conducted to uncover that a change in mindset is needed. However, establishing that a change needs to happen is not the same as measuring whether the desired change has occurred. Therefore, the experts were consulted in order to provide insights from their expertise in how to effectively evaluate the effectiveness of workshops in changing the employee mindset from product-oriented towards service-oriented.

6.2 Expert interviews

From the expert interviews, various insights became clear as to how the evaluation of the workshop should look like. Expert 1 suggests that possible evaluation methods are evaluation forms, questionnaires, interviews and focus groups. Expert 2 suggests that involving an effect and process evaluation is the most appropriate method to evaluate the complete intervention process, from the development phase until the behavioural outcome measures. Moreover, both experts stress the importance to create the evaluation plan (including evaluation questions and success indicators) in advance of conducting the workshop in order to compare the results pre and post-test.

> *I would say an evaluation form with the addition of open-ended questions is most suitable. A benefit of an interview would be that you can ask someone to specify what they mean, but in my opinion, this is way too time-consuming. Therefore, I think an evaluation form would be most suitable. –* ***Expert 1***

> *This means that you need to write down process and effect evaluation question, before the intervention starts. After, you need to develop some indicators for success and outcome measures. Through these evaluation questions, you can check if the decisions that you made before the intervention started, achieved their goal. –* ***Expert 2***

Another benefit of evaluation through the use of an evaluation form, as suggested by Expert 1, is that It's simple to conduct and time and cost-effective. The individual approach ensures that the employees cannot influence each other and will give their own honest opinion, according to Expert 1. Furthermore, Expert 1 suggests that the evaluation forms can be handed right after the intervention, which ensures the intervention is still 'fresh' in the memory and it increases the chance that the evaluation will actually be completed.

Moreover, Expert 1 indicates that the evaluation form would consist of a Likert scale in combination with open question. This can provide valuable feedback which can be used to improve the intervention in the future. However, Expert 2 contradicts these findings to a degree, by suggesting to always use open ended questions in evaluation forms and therefore rejects the finding of Expert 1 to use a Likert scale. One way to deal with this, is to first ask a question using the Likert scale and then ask an open-ended question to explain the previously given answer. However, based on the time available, it appears that both experts agree that open-ended questions will provide richer and valuable insights into the degree to which the intervention has been effective.

Furthermore, both experts stress the importance of evaluating the effects over time, in order to see if the workshop has made a lasting impact or only had an effect right after the workshop was conducted. Expert 1 stresses the importance of follow-up meetings, similar to how Expert 2 described the need for multiple workshops, in order to achieve the necessary and permanent change. However, Expert 1 also suggests to expose the employees to topic after the intervention through follow-up meetings or workgroups.

If you want to see the long term effects, it is important to evaluate over different points in time. A process evaluation in mostly done after the intervention ended. However, an effect evaluation can be repeated within a desired timeframe. – Expert 2

To make sure the effects of the intervention sustain over time, I would suggest a follow-up. One workshop would perhaps not be enough to change someone's mindset. I would be an option to organize (shorter) follow-up meetings, to make sure they are repeatedly involved in this subject. I think it would be most effective if this is also incorporated into the organization itself (so not only by an external trainer). For example, make workgroups in which employees are being occupied with this subject once in a while. This will probably highlight the importance and the repeated exposure to the subject will increase the change of employees adopting a more service-oriented mindset. – Expert 1

Lastly, both experts have suggested some do's' and don'ts for conducting an effective evaluation. These findings have been presented below in Table 3.

TABLE 3 – DO'S AND DON'TS OF EVALUATING WORKSHOP EFFECTIVENESS ACCORDING TO EXPERT INTERVIEWS

Do's	Don'ts
Expert 1	**Expert 1**
Include open questions and statements	Not available
Make it anonymous	
Should take max. ten minutes	
Expert 2	**Expert 2**
Include effect evaluation	Write an evaluation plan after the intervention has finished
Include process evaluation	Use closed ended questions
Write evaluation plan ahead of the intervention starts	Only focus on the outcome effects
Always use open ended questions in evaluation form	
Accept the results and use these to improve future interventions	

7 DISCUSSION

7.1 Interpretation of results

In the solution design and solution evaluation, an understanding was created of how to best overcome the main barrier to business model innovation through servitization for the case company and to evaluate whether or not the intervention has achieved its desired result. The solution focused on conducting a workshop to develop a service-oriented mindset in the employees of the case organization. Through the empirical and theoretical analysis that constitute the diagnosis, a clearer understanding and visualization of the various barriers and drivers for servitization for the case organization was developed. Through this diagnosis, it became clear that the current product-oriented mindset of employees provides a major barrier to the further servitization efforts of the case organization. Moreover, in the solution design and solution evaluation, once more theory and practice were combined in order to come to insights that help to aim the problem of the case organization. Therefore, throughout this research insights from theory and practice were combined in accordance to the objectives that were suggested in the introduction of this research.

7.2 What was learned

First, it becomes clear that there are a variety of barriers to business model innovation through servitization. Therefore, it is difficult to prioritize barriers in terms of their importance to the case organization. The current product-oriented mindset of employees works well for the case organization in the current situation, which makes it even more difficult for the organization to pro-actively change this. There appears to be a gap between the mindset of the managers who were interviewed and the regular employees in terms their stance towards servitization, because the managers are operating from a more strategic approach and think about the organization in a more broader sense. This misalignment of mindset makes it more difficult to continue with servitization, as the regular employees do not yet have the same awareness as the managers. Having everyone on the same page is essential to successfully servitizing the organization.

7.3 Practical and theoretical contributions

7.3.1 Practical contributions

In design research, the practical contribution weights highly. The aim of the solution is to help set the organization straight in order to achieve its goals, whereas a poorly constructed research (and the solution it proposes) can also have negative influences on the organization. This research has combined practical insights, that are specific to the case organization, with theory in order to provide a tailored, but well-grounded take on helping to solve the business problem.

The proposed solution has established a set of criteria and guidelines for the case organization that are designed to be useful in solving their specific problem. However, other organizations may be able to identify similar challenges and follow the approach of this research to solve their own problem(s). Especially when an organization is interesting in servitizing, or has identified that the current mindset is not optimal, this research can be of value to other organizations as well.

Moreover, the research provides guidelines to the case organization in how to approach the evaluation of the effectiveness of the workshop. Through the evaluation, the organization is able to find out to what extent the workshop has had its intended effect and where to improve the workshop to make it more effective in the future, which adds to the iterative implications that are often found in design research.

7.3.2 Theoretical contributions

Besides practical contributions, this research is for a large part theory based and aims at further extending the theory as well. The new empirical findings are often compared to the existing theory in this research, which allow to add new insights to existing findings or add completely new findings. The visualization of the barriers to business model innovation through servitization provide an overview of how theory and practice relate and provide a more practical overview of how these theoretical findings manifest in the organization.

Furthermore, a variety of literature seems to have recognized that the mindset of employees is a (major) barrier in servitization. However, most literature stops at the point of recognizing this barrier while failing to further develop an intervention to this problem. Therefore, although commonly recognized, this problem has not yet drawn the attention of other researchers to be approached in a way that produces a solution, which is a gap that this research aims to fill and to motivate other researchers to continue on this path.

Moreover, literature on evaluation methods to workshops specifically seems to be scarce. Through using practical insights from expert interviews, a clearer understanding was gained at what is common practice in the field of employee training and coaching. The findings of the solution evaluation can help in developing evaluation for other or similar interventions that are produced throughout the literature

7.4 Limitations and future research

7.4.1 Limitations

The main limitation of this research is the available time. Although it is common for design research projects to terminate before the solution can be implemented and evaluated, this would add strength to the research by being able to show its effectiveness to help solving the business problem. However, in the light of the available time for the master thesis, the solution and evaluation only remain as an outline for the organization to implement themselves after termination of the research.

Another limitation was the available literature for the research. While there is plenty of literature on the more broad concepts such as business model innovation and servitization, when it comes to the more specific insights such as how workshops should be conducted or evaluated the literature becomes scarce or even not available at all. However, this limitation was, to a degree, mitigated through using experts and relevant books. Although these sources are not as strong as literature, they were the strongest sources that were available for this specific situation.

Furthermore, a limitation is that the interviews were conducted with a small number of informants. While with the interviews with the case organization the maximum number of relevant respondents were included, the expert interviews with the professionals in the field of employee training only made use of two informants. Although using just two experts fits the timeframe and scope of the research, this does not give the best possible variation of insights and the findings would have more strength if the interviews were conducted with more informants.

7.4.2 Future research

Because design research is iterative in nature, this almost always provides a future research avenue, namely to reiterate the design cycle or problem solving cycle while improving every step of the cycle in order to ultimately better solve the business problem. In this specific case, three suggestions to future research are made.

It would be interesting to re-diagnose the case organization after the proposed solution of this research is implemented, in order to uncover more of the problem mess and thereby approaching the business problem from a different angle. This could be done through conducting interviews with other members of the organization or possible even outside of the organization, such as partners, suppliers or customers.

Furthermore, it would be interesting to see a different organization which faces a similar problem implement the solution and evaluate the solution that is produced in this research in order to see its' effects in a different context. This could either support the artifact of this research or ask for a reiteration or complete redesign.

Another future research suggestion, is to continue the research from the diagnosis and thereby approach the solution design and solution evaluation in a different or more profound manner. This could mean that the field experts are more closely involved in these steps or that the solution and evaluation are developed through user centered design. The reasoning behind this is that one problem can be approached in a multitude of ways. Through different solution design and solution evaluation methods, other (and potentially better) solutions can be further developed.

8 CONCLUSION

In conclusion, this research has aimed to answer the question ‘How can the case organization overcome its most important barrier to business model innovation through servitization in the era of Industry 4.0?’. It has become clear that, while Industry 4.0 drives servitization, organizations often faces barriers in servitizing. Overcoming these barriers is essential in successfully servitizing. Through the theoretical background, it was suggested that the barriers to business model through servitization can be found in seven domains: Suppliers and partner network, Resource and capabilities, Customer relationships, Value proposition, Financial, Organizational culture and Strategy. Knowing that the barriers to servitization usually can be placed in these areas, it already helps in containing the areas to look for when conducting a further empirical and theoretical analysis and narrowed down the focus.

The semi-structured interviews with the organization’s managers could be constructed from this theoretical background and were able to show practical insights into the specific barriers for the case organization. Through expanding on these empirical findings through a theoretical analysis, the drivers could be justified and the barriers could be compared to theory. It became clear that the most important barrier to overcome for the case organization is a change in mindset of the employees (and consequently the organizational culture) from product-oriented towards service-oriented. Diagnosing the problem well is essential, as the further research builds on this diagnosis. Because of the strong tendency of both empirical and theoretical findings towards changing employee mindset and organizational culture, this was accepted to be a well diagnosed problem.

Furthermore, a solution for the diagnosed problem needed to be designed. Through designing a solution, the case organization is able to implement this solution in order to overcome its business problem. Therefore, it is of upmost importance that the solution is profoundly developed. Through a look in the theory, a book review and interviews with experts it became apparent that the employee mindset can be best changed through a set of workshops. The workshops enable interactive learning between employees to achieve lasting change in their mindset.

Furthermore, to find out whether or not the workshops are effective, an evaluation needs to be carried out. The proposed evaluation is to let the employees fill in an evaluation form with open questions right after the workshop.

Therefore, this research can be concluded with the finding that the case organization can achieve the necessary change in mindset from product-oriented towards service-oriented through conducting a set of workshops.

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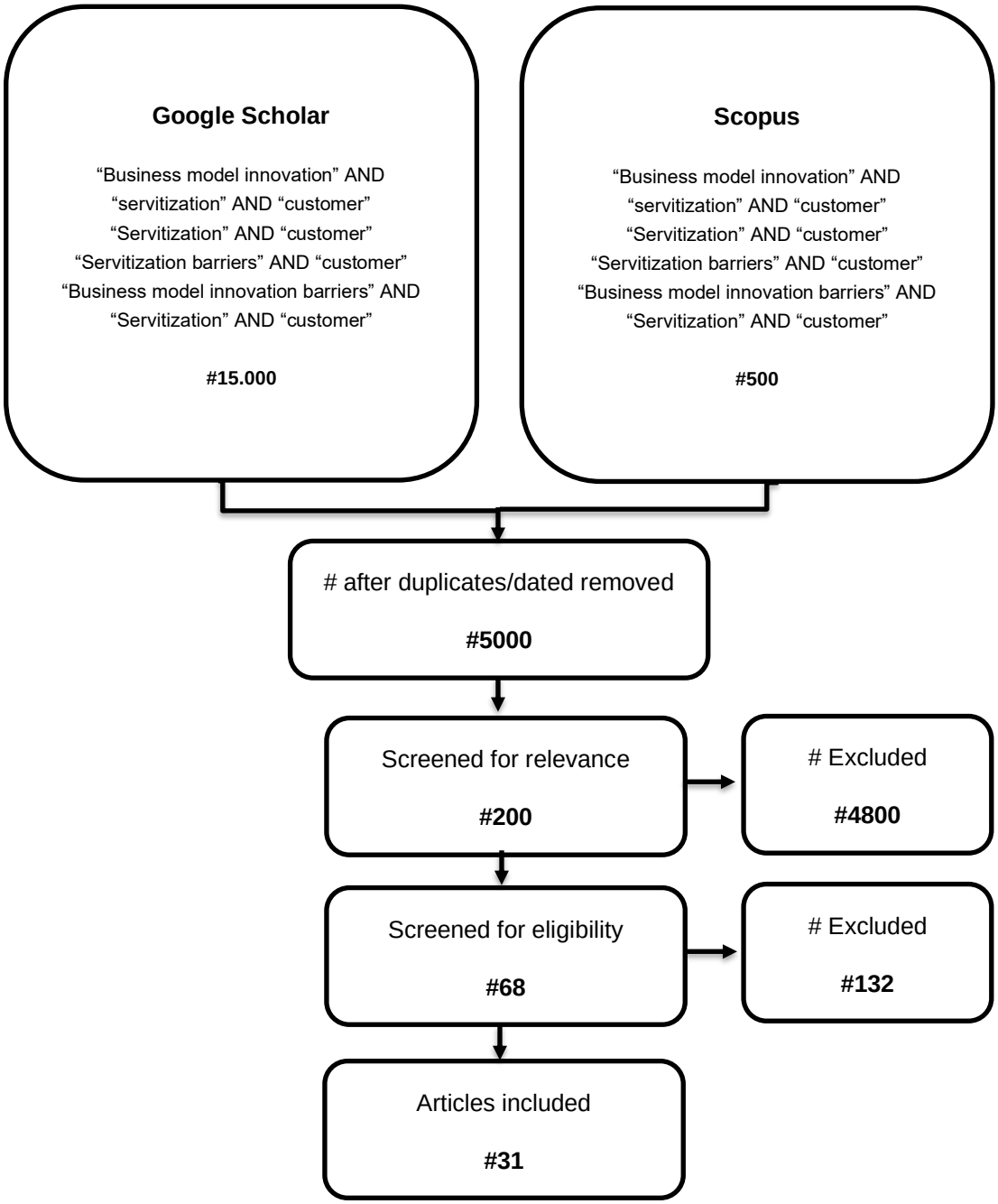
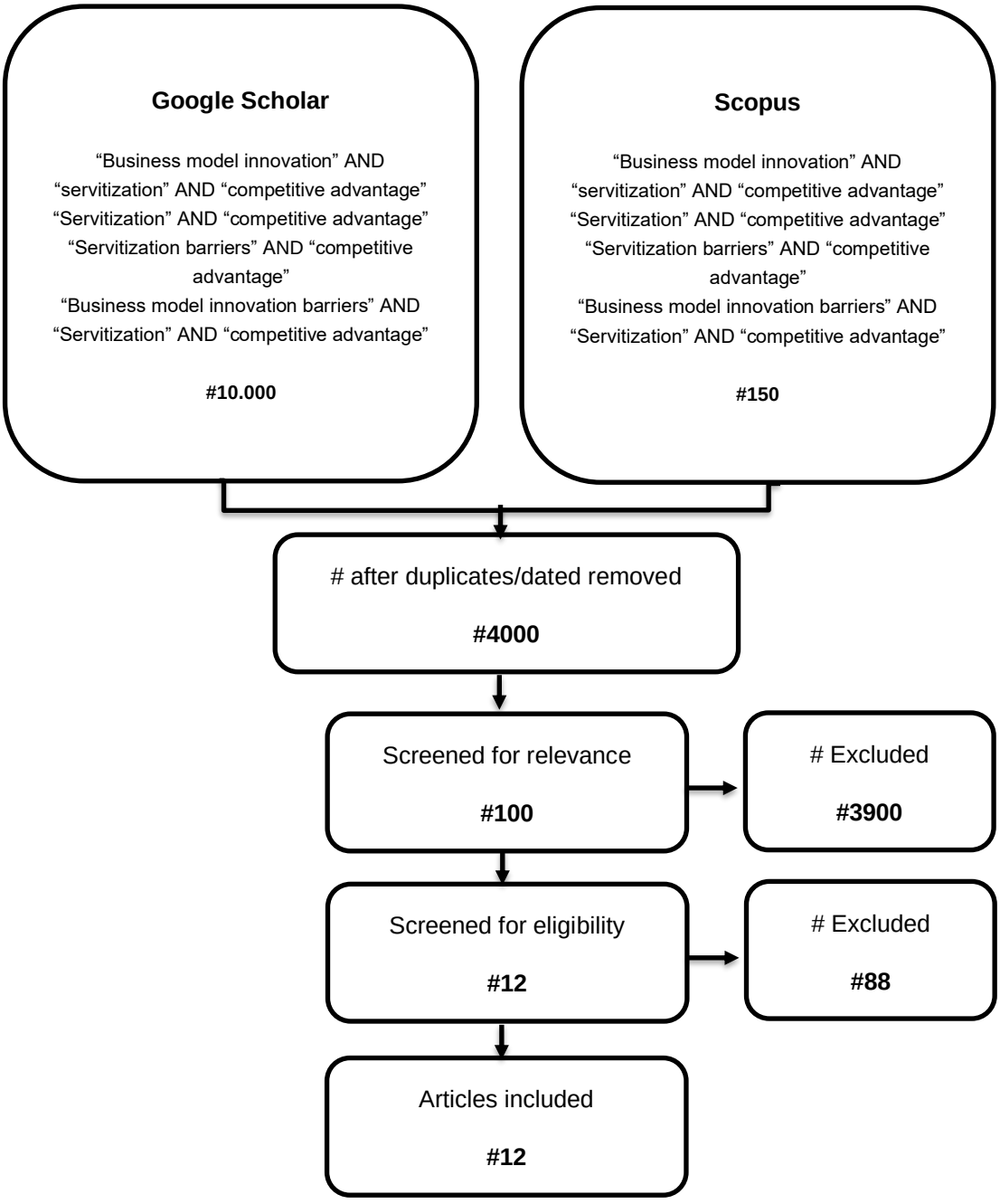
APPENDIX 1 FLOWCHART THEORETICAL ANALYSIS

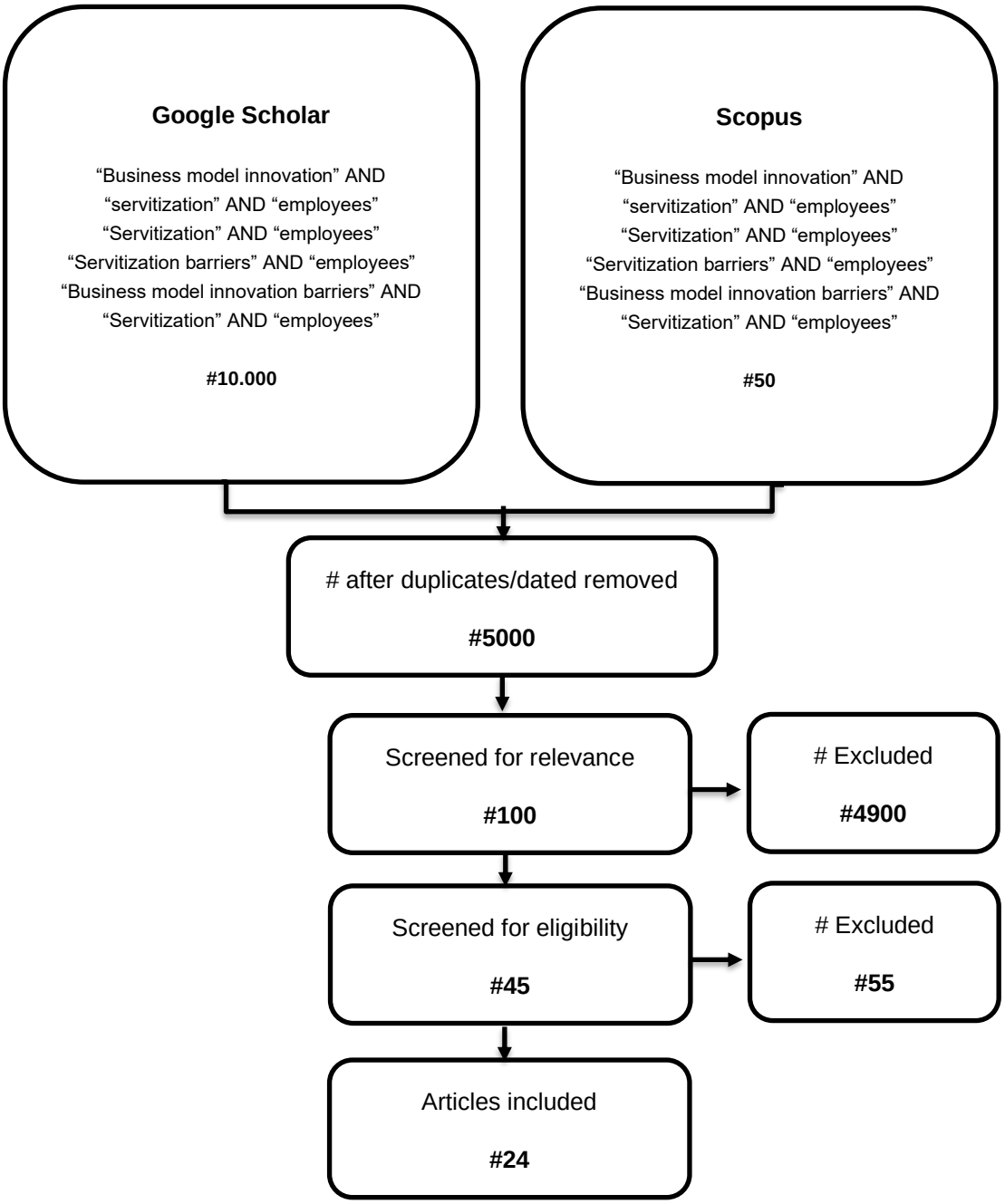
Semi-systematic literature review: Customer (Moher, Liberatti, Tetzlaff & Altman, 2009).



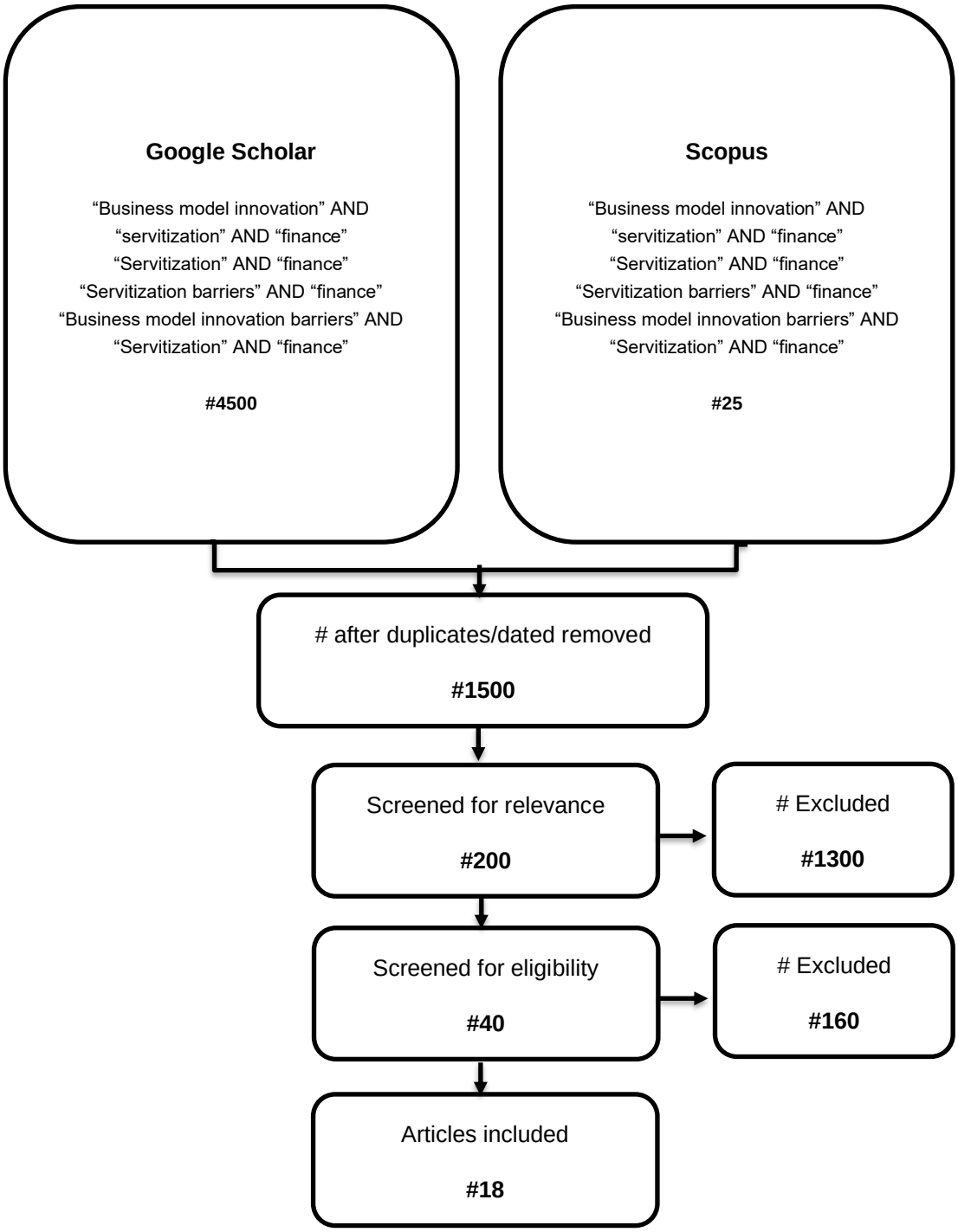
Semi-systematic literature review: Competitive advantage (Moher, Liberatti, Tetzlaff & Altman, 2009).



Semi-systematic literature review: Employees (Moher, Liberatti, Tetzlaff & Altman, 2009).



Semi-systematic literature review: Finance (Moher, Liberatti, Tetzlaff & Altman, 2009).



APPENDIX 2 FLOWCHART SOLUTION DESIGN

Semi-systematic literature review: Mindset (Moher, Liberatti, Tetzlaff & Altman, 2009).