MASTER THESIS

The effect of servitization on the product-oriented strategic net of SMEs

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Preface

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Abstract

This research explores the effect of servitization on the product-oriented strategic net of small and medium-sized enterprises (hereinafter SMEs), emphasizing its network structure. A qualitative single case study has been conducted at a construction and installation company that focuses on the utilities market. The company is currently considering to modify their business strategy to provide not only products but an integrated product-service offering. The main drivers for this change are, according to the literature, that companies can benefit from servitization regarding marketing, strategy, and finance. However, despite these findings, it appears that research often focuses on multinational enterprises (hereinafter MNEs), as a result of which SMEs remain underexposed. Moreover, despite the fact that the existing literature has shown that SMEs need to enter into partnerships with external actors in order to supplement the internally missing resources and capabilities and make the movement to servitization possible, research often focuses on the dyadic perspective rather than the network level of analysis. Accordingly, the following research question was formulated: *"What is the effect of servitization on a product-oriented strategic net of SMEs in terms of its structure?".* By emphasizing the network structure, consisting of actor (bonds), activity (links), and resource (ties), insights have been gained into the current network (base services) as well as the changes related to the future network (advanced services). The overarching finding of the analysis is that offering advanced services requires increasing interorganizational collaboration, both within and across processes. More specifically, this implies that the activity base and underlying resources need to expand, which results in an increase of linkages. Consequently, more coordination between actors is required with regard to the reallocation and increased alignment of activities (across processes), aimed at improving the process and joint outcomes. As a result, the complexity of the linkages is increasing accordingly. Moreover, as a consequence of the increase of the activity base, the knowledge of the focal firm becomes more superficial, which requires decentralisation of responsibilities across actors. Last, the mutual relationship between actors, including the customer who needs to be engaged, must be strengthened in terms of trust, reinforcing the commitment to share resources.

Keywords*: servitization, advanced services, product-service offering, network, service networks, strategic net, ARA-framework, qualitative single case study research.*

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List of abbreviations and terminology

BaaS	Building-as-a-Service
BFA	Building physics, fire safety and acoustics
DB	Design and Build
DBMO	Design, Build, Maintenance and Operate
BIM	Building Information Model
GTM	Grounded Theory Method
HVE	Higher vocational education
MNE(s)	Multinational enterprise(s)
MO	Maintenance and Operate
PE	Primary education
ScE	Scientific education
SE	Secondary education
SME(s)	Small and medium-sized enterprise(s)
SR	Specifications of Requirement
SQ(s)	Sub-question(s)
SVE	Secondary vocational education
TCO	Total Cost of Ownership

1. Introduction

Today's manufacturing companies are becoming increasingly aware of the fact that competition in their market is intensifying. This is caused by the globalisation of products and the growth of new technologies, leading to declining prices and increasing complexity of customer demand (Gebauer, Fleisch, & Friedli, 2005). In order to tackle the challenges that arise in their operating business markets and sustain competitive advantage, manufacturers apply 'servitization' (Salonen, 2011). Servitization is the process whereby product-oriented companies intensify, broaden or redefine their (service) business towards a service-oriented company in order to create and capture value across the entire product life cycle, not only from the current position in the value chain but along the entire value chain, to generate new income streams (Bustinza, Bigdeli, Baines, & Elliot, 2015; Fliess & Lexutt, 2019). In doing so, companies can choose among three categories of servitization, including: 'base', focusing on supporting product provision, 'intermediate', focusing on maintaining product condition, and 'advanced services', focusing on capability delivered through product performance (Baines & Lightfoot, 2013; Story, Raddats, Burton, Zolkiewski, & Baines, 2017). There are three beneficial factors that encourage companies to adopt a servitization strategy. The first factor is marketing related. As servitization requires for a strong focus on customer relationship management, the manufacturer gains more insight into customer behaviour and demands (Baines et al., 2017). This is beneficial because it results into a more tailored offering and customer loyalty (Baines, Lightfoot, Benedettini, & Kay, 2009). The second factor is strategy related. Since services are intangible and more labour dependent than products, they are harder to imitate (Baines et al., 2009; Salonen, 2011). This is beneficial as it enables manufacturers to differentiate their offerings and create competitive advantage (Bustinza et al., 2015; Weigel & Hadwich, 2018). The third factor is finance related. Ultimately, the addition of service elements results in higher profit margins and income that is more resistant to fluctuations of the economic cycle (Fliess & Lexutt, 2019; Salonen, 2011).

Furthermore, servitization has positive implications for the environment and society. With regard to the environmental aspect, the additional services, such as maintenance and optimal utilization, extend the lifespan of products (Baines & Lightfoot, 2013). Next, servitization results in a more efficient use of material and energy consumption, and thus a reduction of the ecological effect of product use (Doni, Corvino, & Bianchi Martini, 2019). With regard to the society aspect, servitization will generate increased employment in the

future, regardless of the size of the company (Crozet & Milet, 2017). It is caused by the fact that service-related jobs are more labour intensive (Beuren, Gomes Ferreira, & Cauchick Miguel, 2013).

Despite the many advantages of servitization, it appears that in some cases companies do not achieve the desired results and move into the 'service paradox' (Baines et al., 2017; Dachs et al., 2014). A service paradox occurs when companies make substantial investments in order to extend their business with additional service offerings, while the expected correspondingly higher returns are not achieved (Gebauer et al., 2005). The service paradox is driven by considerable strategic changes that are, depending on the type of servitization strategy, associated with changes in the organizational architecture as well (Fliess & Lexutt, 2019). One of the changing elements within the organizational architecture is the reconfiguration of activities, resources and partnerships (Garcia Martin, Schroeder, & Ziaee Bigdeli, 2019). Apparently, companies, especially SMEs, do not have sufficient internal knowledge and resources to integrate services into their offerings (Kowalkowski, Witell, & Gustafsson, 2013). As a result, they need to expand their network and create partnerships with key actors in the value chain to get access to this missing knowledge, skills and resources (Garcia Martin et al., 2019; Gebauer, Paiola, & Saccani, 2013; Kohtamäki & Rajala, 2016).

With regards to the networks within servitization, several researchers already investigated the manufacturer-customer relationship, i.e. dyad level. It was found that customers play an active and integrated role as 'co-creator', in order to help manufacturers identify the product-service combinations that have valuable outcomes (Garcia Martin et al., 2019). Indeed, manufacturers should align their servitization strategy to customer requirements, otherwise the servitization process may fail (Raddats et al., 2019). Conversely, less attention has been given to wider scopes of analysis, i.e. the network level (Fliess & Lexutt, 2019; Garcia Martin et al., 2019). This is quite remarkable, given that servitization does not happen in isolation but requires for partnerships that can provide complementary knowledge, skills and resources (Baines et al., 2009; Story et al., 2017). This has been demonstrated in the study of Garcia Martin et al. (2019), who investigated the value constellation of servitization at different levels of analysis and discovered that multi-actor

collaboration[1] is characteristic for servitization. Additionally, it is known that the delivery of services is more complex than manufacturing products and requires for different approaches of product-service design, organizational strategy and organizational transformation (Baines et al., 2009). However, it is still unclear to what extent this affects the network in terms of its characterization, formation and utilization, in order to help manufacturers to succeed in this (Baines et al., 2009; Gebauer et al., 2013).

Thus, future research regarding the implications of servitization at the network level of analysis is needed (Garcia Martin et al., 2019). This is particular applicable for SMEs, who often do not have sufficient internal knowledge and resources available to provide an integrated product-service offering (Paiola, Saccani, Perona, & Gebauer, 2013). Despite this finding, SMEs are often overlooked in the servitization literature (Paiola et al., 2013). Furthermore, despite the proven need for partnerships to share knowledge and experiences and to save costs (Rapaccini, Mauro, Cinquini, & Tenucci, 2019), it is not clear yet to what extent the actors in the network are impacted by the service transition and how they can or cannot contribute to the success of it (Fliess & Lexutt, 2019). Further research is needed to explore how independent actors cooperate and integrate their resources to create effective networking opportunities (Story et al., 2017). Therefore, the aim of this research is to explore the effect of servitization on the network of SMEs when transforming from a product-oriented towards a service-oriented business.

The strategic net perspective is chosen as a lens to investigate the effect of servitization on the network of SMEs. A strategic net is defined as a composition of a few actors that pursue specified mutual goals and have jointly agreed and contractually defined roles and responsibilities (Möller & Halinen, 2017). It can be structured by means of two main pillars, including the value proposition and the underlying value creating system. The latter is further conceptualized by means of the ARA-framework, which consists of three interconnected layers that are mutually affecting each other: actor (bonds), activity (links), and resource (ties) (Håkansson & Snehota, 1995). Since the servitization literature indicates that value constellation in servitization is characterized by multi-actor collaboration (Garcia Martin et al., 2019), the strategic net perspective is a favourable approach to explore the

[1] Value creation by means of multi-actor collaboration is the creation, delivery and capture of value in servitization which takes place through "integration, alignment and information sharing among multiple actors participating in these processes" (Garcia Martin et al., 2019, p. 445).

cooperation and resource integration within the network when transforming towards a service-oriented business. Additionally, is argued that a relational view, which is corresponding with the strategic net perspective, is more suitable to study the network effect of servitization as opposed to the frequently applied resource-based view (Weigel & Hadwich, 2018). In fact, the relational view explores how competitive advantage can be achieved through collaboration in complex networks of multiple actors (Eloranta & Turunen, 2015). The resource-based view, on the other hand, only focuses on the individual transactions of a particular company (Eloranta & Turunen, 2015).

The strategic management perspective, especially strategic nets, is an appropriate lense to investigate the formation of networks within servitization. This is determined by the fact that within strategic nets and servitization, value is created by different actors who individually concentrate on their core business while cooperating with other network actors to contribute to the common purpose (Gebauer et al., 2013; Möller & Halinen, 2017; Reim, Sjödin, & Parida, 2019; Weigel & Hadwich, 2018). Furthermore, strategic nets are, like service networks, not infinite since the interactions in the network are represented by the horizontal and vertical dimensions of the value chain (Gebauer et al., 2013; Möller, Rajala, & Svahn, 2005). To gain insight into the topic, the following research question is formulated: *"What is the effect of servitization on a product-oriented strategic net of SMEs in terms of its structure?".* This research question is supported by two sub-questions (hereinafter SQ), including (1) *How does the product-oriented strategic net of BuildCo look like?,* and (2) *What are the changing elements regarding the service-oriented strategic net of BuildCo and how do they look like?*

This research makes important contributions to the field of servitization, emphasizing its effect on the strategic net of SMEs when transforming from a product-oriented towards a service-oriented business strategy. The overarching finding of the analysis is that the provision of an integrated product-service offering (advanced services) among SMEs requires increasing interorganizational collaboration, both within and across processes. These findings contribute theoretically to the research previously conducted by Paiola et al. (2013), who emphasize the need for additional research into the implications of servitization among SMEs on the network level of analysis. Deeper insights are obtained into the interconnected structure of actor (bonds), activity (links), and resource (ties) derived from the strategic management literature of Håkansson and Snehota (1995). This allowed the researcher to

investigate the formation and utilization of networks and, in doing so, making a contribution to the study of Gebauer et al. (2013) and Garcia Martin et al. (2019) by identifying the importance of multi-actor collaboration and its implications within the network. In particular, the results have shown that resource integration is required in order to provide process efficiency, cost savings and improved outcomes. The prerequisite for this is close cooperation and alignment between actors (and their corresponding activities), who ultimately perform a major role in achieving success with servitization. These findings contribute to the research conducted by Story et al. (2017), who indicated that follow-up research was needed with regard to the collaboration and resource allocation between the network actors, and the study of Fliess and Lexutt (2019), who mentioned that there was still uncertainty about the extent to which the individual actors could contribute to a successful transition. As far as the practical contributions are concerned, this research provides valuable insights into the alterations that managers of SMEs need to accomplish with respect to actors, activities and resources, if they do not only provide a product (base services), but an integral product-service offering (advanced services). The findings are substantiated with practical examples that make the outcomes more feasible for managers, in particular managers active in the construction and installation sector and/or utilities market, to implement in practice.

The outline of the paper is structured as follows. First, a literature view is presented to review existing literature, regarding the two central concepts of this study: servitization and strategic nets, including the conceptual model. Second, insights regarding the research design, case description, and data collection and analyses to examine the subject are provided within the methodology section. Third, an interpretation of results is given. Fourth, a conclusion is written in which the research question is answered followed by a discussion of the observations in comparison with the existing literature. Additionally, practical recommendations are given as well as limitations and suggestions for future research.

2. Literature review

This section presents the literature review. The objective of the literature review is to investigate existing knowledge about the concepts of 'servitization' and 'strategic nets', to create an appropriate theoretical foundation. The obtained information will give the researcher guidance for studying the network-related aspect in servitization. First, the phenomenon servitization will be investigated, followed by an elaboration of strategic nets, the applied lens. Subsequently, a synthesis of potential implications of servitization with regard to the network structure is provided. At the end of the chapter the literature is merged into a conceptual model, which clarifies the relationships between the variables under investigation.

2.1 Servitization

2.1.1 Definition of servitization

The term servitization is defined by Vandermerwe and Rada (1988) as the increased offering of fuller market packages or 'bundles' of customer focussed combinations of goods, services, support, self-service and knowledge. These bundles of tangible products and intangible services are also known as 'integrated solutions' (Gebauer et al., 2013), 'hybrid offerings' (Ulaga & Reinartz, 2011), or 'product-service systems' (Tukker, 2004), in which the aforementioned aspects are seamlessly combined to provide more value than the parts alone (Brax & Jonsson, 2009). With the additional product functionality created, the manufacturer increases its competitive advantage resulting in higher sales and profitability (Palo, Åkesson, & Löfberg, 2018).

Over the years, new definitions of servitization have emerged. Those definitions include "any strategy that seeks to change the way in which a product functionality is delivered to its markets" (Lewis, Portioli Staudacher, & Slack, 2004) and "a change process wherein manufacturing companies embrace service orientation and/or develop more and better services, with the aim to satisfy customer's needs, achieve competitive advantages and enhance firm performance" (Ren & Gregory, 2007). Baines et al. (2009) redefined the term as well. According to them, servitization is "the innovation of an organisation's capabilities and processes to better create mutual value through a shift from selling product to selling product-service systems" (Baines et al., 2009, p. 555). Although the definition of Lewis et al. (2004) focuses more on the idea of a functional product, all definitions converge

towards the common understanding that manufacturing companies should focus on offering integrated solutions, which is generally in line with the definition of Vandermerwe and Rada (1988). However, this study follows the definition of Baines et al. (2009) as it not only addresses the innovation of the offering, but also the organizational innovations including capabilities and processes, which makes this definition more aligned with the characteristics of this study.

The consulted literature on servitization is somewhat ambiguous about the description of the servitization process. For instance, some researchers take the perspective that the process of servitization can be considered a transition (Oliva & Kallenberg, 2003), while others argue about a transformation (Vendrell-Herrero, Parry, Bustinza, & O'Regan, 2014). However, the difference between these two perspectives is that either the companies move away from products to services (transition), or they extend their business to both products and services (transformation) (Baines, Ziaee Bigdeli, Sousa, & Schroeder, 2019). Because this study investigates the effect of servitization when product-oriented companies move away from selling physical products towards the provision of services (service-oriented), the perspective of servitization as a transition is adopted throughout this study.

In addition, it is generally stated that the service transition is characterized by a linear and gradual movement from lesser to more sophisticated services (Lütjen, Tietze, & Schultz, 2017; Oliva & Kallenberg, 2003). This would imply that there is a direct relationship between the services offered and the extent of servitization (Baines et al., 2019). However, some researchers disagree with this view. Indeed, it might be that a manufacturer does have the ability to offer the services, but is restricted in its marketability and success by their commercial environment (Windahl & Lakemond, 2010). However, these concerns are broadly eliminated because this research makes use of the definition of Baines et al. (2009), who consider servitization to be the innovation of organizational capabilities and processes and evaluates the transition in terms of the sophistication of the services offered (Baines & Lightfoot, 2013).

2.1.2 Categorization of services

The servitization transition can be divided into three categories, including base, intermediate and advanced services (Baines et al., 2017). An overview of these categories including examples, is presented in Figure 1. When applying servitization, the manufacturer has to

expand its range of activities in order to take over an increasingly proportion of the operations that were once internal to the customer (Baines & Lightfoot, 2013). This transformation process from less to more sophisticated services is characterised by equal increase in responsibility and associated risk of the manufacturer (Baines & Lightfoot, 2013; Baines, Ziaee Bigdeli, Sousa, & Schroeder, 2019). Of these services, the advanced services receive the most attention in research due to its long-term profitability (Bustinza et al., 2015) and highest valuable outcomes (Garcia Martin et al., 2019).

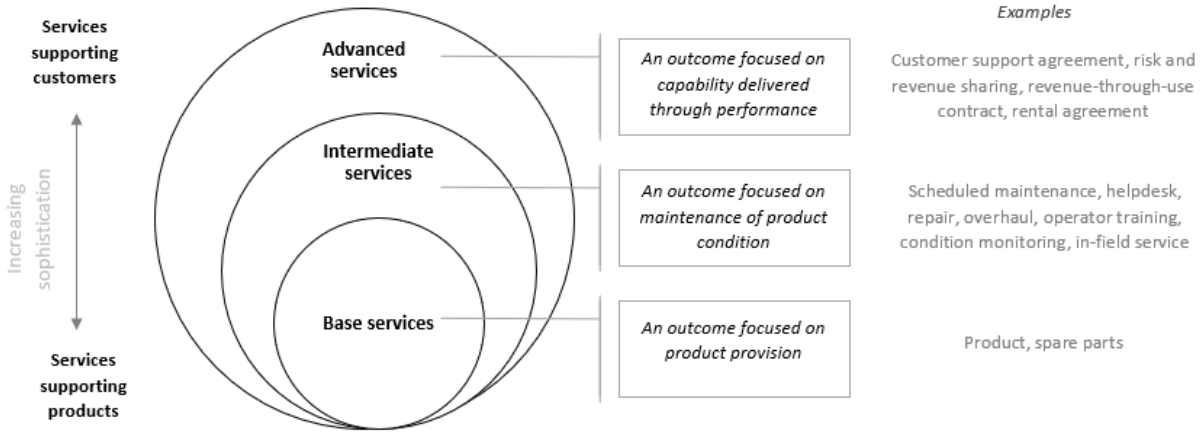

Figure 1: Classification of services within servitization strategies (Baines & Lightfoot, 2013; Mathieu, 2001)

First, advanced services are classified as output-based or outcome-based (to achieve performance) whereas base and intermediate services are classified as input-based (to perform a deed) (Baines & Lightfoot, 2013; Ulaga & Reinartz, 2011). Second, advanced services are featured by the provision of capabilities (Neely, 2009), delivered through the performance of the product (Baines & Lightfoot, 2014). The other two categories are based on the execution of production competence (base), and on the exploitation of production competences to maintain the condition of products (intermediate) (Baines & Lightfoot, 2014). Third, advanced services are characterised by integrated product-service offerings, whereas base and intermediate services offer separate goods and related services (Vandermerwe & Rada, 1988). Fourth, advanced services usually extend the life cycle of products, accompanied by long-term contracts or pay-per-use arrangements, resulting in regular revenue payments (Baines & Lightfoot, 2013; Garcia Martin et al., 2019). Fifth, advanced services are featured by much greater levels of responsibility compared to base and intermediate services (Baines & Lightfoot, 2013). This is caused by the fact that with output-based services the provider is assumed to take the full responsibility to rapidly respond to the dynamic and evolving activities of the customer in order to fulfil the

performance of the outcome of their product (Story et al., 2017). This is contrary to base and intermediate services, where the manufacturer only offers the initial warranties and guarantees while the customer takes most of the responsibility of the product functionality (Baines & Lightfoot, 2013).

2.1.3 Servitization and its implication for SMEs

While servitization is (more) often applied by MNEs, it can be advantageous for SMEs as well. The reason that servitization is applied more often by MNEs is because they possess a more extensive resource base as opposed to SMEs, making the shift towards servitization more radical, structured and beneficial (Rapaccini et al., 2019). However, Crozet and Milet (2017) indicate that in general both SMEs and MNEs, with the addition of services, can improve their profitability by 8% to 8,5% and their workforce by 0,2% to 0,4%. More specifically, based on their study they indicate that these results are even stronger among SMEs, of whom the outcomes are correlated with higher sales and production of goods as opposed to MNEs (Crozet & Milet, 2017). Their study concludes that, on average, the benefits of servitization outweigh the costs, although this particularly applies to SMEs (Crozet & Milet, 2017). The main reason for these outcomes is that SMEs have the advantage that they are flexible and easily adaptable to new markets and technology opportunities where MNEs are less willing to do so (Dachs et al., 2014).

Despite the evidence that SMEs can also benefit from servitization, it is observed that SMEs face higher barriers with regard to the implementation of servitization compared to MNEs (Dachs et al., 2014; Kowalkowski et al., 2013). Whereas both company types deal with a missing adequate service culture and customer orientation, SMEs might not have the financial and managerial resources and/or reach the critical mass needed for reaching profitability from servitization while most MNEs do (Rapaccini et al., 2019). Next to this, it is stated that due to the limited financial and managerial resources, SMEs are less able to innovate and therefore more vulnerable to competition than large companies (Lara-subiabre et al., 2007; Man, Lau, & Chan, 2002). In order to overcome the aforementioned barriers and successfully implement servitization, SMEs should create strategic alliances or partnerships with other SMEs and/or larger companies (Kowalkowski et al., 2013; Mustak, 2014). In this respect, cost can be shared and resources and knowledge can be complemented (Mustak,

2014). As a result, SMEs can sustain profitability in a product-oriented, declining market (Rapaccini et al., 2019).

2.2 Strategic nets

In recent years, 'networks' have received considerable amount of attention in the area of network management. This is due to the shift from the focus on interaction between two economic entities, i.e. dyadic perspective, to acknowledging the wider context of these interaction, i.e. network perspective, which is indicated as one of the fundamental shifts of the 21th century within the network management literature (Achrol & Kotler, 1999; Hakansson & Gadde, 2016). The development towards a network perspective is caused by an ever faster changing business and social environment in which innovation has become a prerequisite for competitive advantage and firm success (Freytag & Young, 2014). In this respect, innovation can be defined as the flow of ideas and activities driven by actors who combine and recombine resources (Freytag & Young, 2014).

Not only the servitization literature but also the network management literature indicates that most of today's firms do not have sufficient knowledge or technological capacity to pursue major innovations or systemic product offerings internally (Möller & Svahn, 2006). As a result, they need to interact with other actors in the network to get access to the inaccessible resources (Freytag & Young, 2014; Möller et al., 2005). The network management literature distinguishes between two approaches of interaction. The first approach is that of business networks (Partanen & Möller, 2012). Within business networks, the context of a firm is defined by the interactions between two economic entities having effects that ripple through virtually borderless networks (Håkansson & Ford, 2002). More specific, business networks are viewed as "borderless, self-organizing systems that emerge in a bottom-up fashion from local interactions" (Möller & Rajala, 2007, p. 986). Because the interaction within business networks consists of organizational and social relationships in which each actor pursues its own goals (Ritter, Wilkinson, & Johnston, 2004), the activities within the network are unmanageable and unpredictable (Håkansson & Snehota, 1989; Stacey, 1996). The second approach to describe the interaction of a firm's context is strategic nets (Partanen & Möller, 2012). Within strategic nets, the network is intentionally created by horizontal and vertical actors that collaborate to achieve a common purpose (Möller et al., 2005). In contrast to business networks, it is stated that strategic

networks consist of deliberately created structures and objectives, making them more efficient and manageable (Möller & Rajala, 2007). Although the two approaches differ from each other, they are interconnected. In fact, a strategic net is a range of perceived and relevant actors that participate in a certain common goal where the set of perceived and relevant actors is seen as a subset embedded in the broader business network (Alajoutsijärvi, Möller, & Rosenbröijer, 1999). However, this research uses the approach of strategic nets to investigate the formation of networks in servitization. The first reason for this is that networks in servitization, like strategic networks, are intentionally created (Möller et al., 2005; Weigel & Hadwich, 2018). The interactions are determined by the horizontal and vertical dimensions of the value chain, making the network not infinite (Gebauer et al., 2013; Möller et al., 2005). The second reason is that although network actors in servitization focus on their core business, they pursue similar goals, just like strategic nets (Gebauer et al., 2013; Möller & Halinen, 2017).

2.2.1 Definition of strategic nets

The strategic net is defined as a composition of a few actors that "pursue specified mutual goals and have jointly agreed and contractually defined roles and responsibilities" (Möller & Halinen, 2017, p. 2). This definition is complementary and consistent to the definition of an ecosystem since both network streams indicate that the network exists of a set of actors that need to interact in order to combine their individual offering into a coherent, customer-oriented solution (Adner, 2006; Möller & Halinen, 2017). The formation of the strategic net is seen as a critical process consisting of (1) the selection of members, (2) reaching agreements on the tasks and responsibilities of members, and (3) developing the operating principles of the network (Partanen & Möller, 2012). However, the outcomes of the strategic network cannot be fully predicted or controlled, as this is the outcome of the joint interaction (Valkokari, 2015). If new forms of cooperation are properly applied, it may result in a competitive advantage for the firm itself and the integrated organisations in the network as well (Freytag & Young, 2014). For this reason it is important to pay close attention to the selection of partners as poor performance of one partner has a direct negative impact on the performance of the entire network (Partanen & Möller, 2012). Because of the mutual defined roles and distributed tasks of strategic nets, it is noted that the networks have observable alignment structures (Adner, 2016).

2.2.2 Structure of a strategic net

The structure of a strategic net is defined by the following two main pillars: the value proposition and the structuralist configuration of the value-creating system (Adner, 2016; Ford, Gadde, Hakansson, Snehota, & Waluszewski, 2008). The collective value proposition is perceived as the foundation of the strategic net and defined as "the promised benefit that the target of the effort is to receive" (Adner, 2016, p. 5). However, the value proposition only describes 'what' is offered but not yet 'how' this is done. This implementation, i.e. 'how', of the value proposition is represented in concrete marketing offerings (Anderson, Kumar, & Narus, 2007). Particularly the latter is relevant in the context of servitization, since the created customer value increases by adding services to the product offering (Baines & Lightfoot, 2013; Baines, Lightfoot, Benedettini, & Kay, 2009). In this case, the value proposition of servitization can be equal among different categories of servitization whereas the offering is expected to be different. To realize this value proposition, a configuration of activities and actors is needed.

The network management literature conceptualizes the configuration of the value-creating system by means of the ARA-framework. Within the ARA-framework the outcomes of an interaction process, i.e. functioning of a network, are described on the basis of three elements: actors, activities and resources (Håkansson & Snehota, 1995). In addition, the ecosystem literature conceptualizes the value-creating system with positions and links too (Adner, 2016; Talmar, Walrave, Podoynitsyna, Holmström, & Romme, 2018). Since the network management literature indicates that positions and links are inseparably linked to actors, activities and resources, they have already integrated them into the ARA-framework (Ford et al., 2008). Because this literature stream does not see the network structure as elements but as layers that are interconnected and mutually affecting each other, they have extended the terms 'actors', 'activities' and 'resources' to: actor bonds, activity links and resource ties (Håkansson & Ford, 2002).

2.2.3 Functioning of a strategic net

The functioning of the strategic net is determined by the collective structure of elements. As previously indicated, the value proposition is the starting point of the configuration of the net. It conceptualizes the configurations of activities and sets the boundaries of the net (Adner, 2016). Furthermore, a set of specific activities is needed to be carried out by a group

of economic players, i.e. actors, in order to materialize the value proposition (Möller & Svahn, 2006). These activities can be subdivided in realization activities and support activities (Partanen & Möller, 2012). In this respect, the realization activities refer to the physical creation of goods and/or services (Parolini, 1999). The support activities, on the other hand, focus on increasing the effectiveness and efficiency of the realization activities and are independent of physical production. Furthermore, the activities are considered as outcomes of (the combined) tangible and intangible resources deployed by the actors (Partanen & Möller, 2012). These resources include the input of goods (e.g. raw materials and components), financial capital, technology, personnel, knowledge and information (Barney, 1991; Håkansson & Snehota, 1989; Partanen & Möller, 2012; Talmar et al., 2018). The flow of activities and resources deployed by actors results in observable positions and links between them (Adner, 2016). In this case, the positions indicate where an actor is located, and the links indicate the extent to which the actors are interconnected. Accordingly, the links of interconnection can be defined on the basis of three interplayed subcategories including actor bonds, activity links and resource ties (Håkansson & Snehota, 1995).

2.3 Synthesis: servitization and its expected implications on the network structure

This paragraph provides a synthesis of the existing literature on servitization and strategic nets. The synthesis is formulated by using the ARA-framework to identify possible implications of servitization with regard to the network structure. In doing so, the three elements of the ARA-framework are discussed in isolation. However, there might be some overlap between the elements, as Håkansson and Ford (2002) argue that three elements are interconnected and mutually affect each other.

2.3.1 Resources (and capabilities)

To achieve competitive advantage with servitization, companies need to deploy and combine their product- and service-related capabilities. These capabilities can be classified in two categories including (1) operational capabilities, e.g. how firms earn their living, and (2) dynamic capabilities, e.g. how firms change their operational routines (Helfat & Lieberman, 2002). In this respect, combinations of expert technical knowledge about products and processes, customer-related knowledge and integration, and problem-solving abilities need to be made (Fliess & Lexutt, 2019). The performance level of these capabilities is depending

on a firm's ability to deploy combinations of resources for a desired end result (Helfat & Lieberman, 2002). To this extent, capabilities are viewed as 'what the firm can do' (Kohtamäki, Partanen, Parida, & Wincent, 2013; Ulaga & Reinartz, 2011), and resources are viewed as the 'productive assets the firm owns' (Ulaga & Reinartz, 2011). The latter refers to, for example, committed senior managers, the development of key performance indicators to assess customer value and financial resources, digital technologies, people, and a critical mass/economies of scale in service deployment (Raddats et al., 2019). To conclude, resources do not create competitive advantage by itself but must be transformed into capabilities to do so (Ulaga & Reinartz, 2011).

There are several approaches for firms to develop their resources and capabilities accordingly. For instance, when firms develop and use them primarily internally, they make use of the 'system seller' approach (Davies, Brady, & Hobday, 2007). When this approach is applied, the company is individually responsible for developing and delivering the entire solution throughout its lifecycle, including developing the product, manufacturing and integrating components into a system and providing services to operate and maintain the solution (Salonen & Jaakkola, 2015). On the contrary, when firms make use of resources that are outside its boundaries, they apply the 'system integrator' approach (Davies et al., 2007). In this approach, the firm is the main contractor for the customer, who coordinates and integrates the components and resources provided by external suppliers and partners into a customer-specific solution (Gebauer et al., 2013; Salonen & Jaakkola, 2015). However, firms can also apply a hybrid approach in which resources and capabilities are developed and used both internally and externally (Kowalkowski et al., 2013). Since the advanced services are costly and difficult to implement due to the takeover of the customer's business process activities (Story et al., 2017), this servitization strategy reinforces the importance of a hybrid approach for developing resources and capabilities provided by the wider network, either via outsourcing or via co-developing with customers and external partners (Paiola et al., 2013). This statement indicates that, since relationships facilitate the creation and implementation of capabilities to master the activities, relationships form a key component in the servitization process (Raddats et al., 2019; Weigel & Hadwich, 2018).

2.3.2 Activities

Since the internal mastering of all activities required to provide customer oriented solutions are beyond the capabilities of individual manufacturing companies or SMEs, or does not make sense from a financial standpoint, they need to expand their traditional, vertically-integrated, supplier-customer relationship with 'service networks' (Gebauer et al., 2013). Service networks in the context of servitization are defined as "a cooperation of three and more companies that are legally independent, but economically dependent on each other" (Weigel & Hadwich, 2018, p. 3). In addition, it is stated that service networks are long-term oriented and composed to offer an integrated product-service combination to customers (Weigel & Hadwich, 2018). Furthermore, service networks make it possible to offset the lack of resources and capabilities of SMEs (Brady, Davies, & Gann, 2005; Spring & Araujo, 2013).

While integrating external parties to create and capture value within servitization, manufacturers have to 'open up' their business model (Chesbrough, 2007; Visnjic, Neely, & Jovanovic, 2018). Where the business model was traditionally one-sided, they now have to interconnect it with suppliers, partners and customers in order to effectively and efficiently deliver the integrated offering (Bankvall, Dubois, & Lind, 2016; Forkmann, Ramos, Henneberg, & Naudé, 2017). More specific, open business models allow for improvements in profitability due to cost savings by co-developing and/or value capturing from complementary resources (Alexy, West, Klapper, & Reitzig, 2017; Von Hippel & Von Krogh, 2003). When opening up the business model, a redesign of the activity system is needed, involving a selection of external firms for the execution of both the horizontal and vertical dimensions of the value chain, in order to reduce the complexity of activities and increase efficiency (Visnjic et al., 2018). In this respect the vertical dimension of the value chain reflects the upstream and downstream activities, provided by companies that collaborate in different hierarchical levels in the value chain (Gebauer et al., 2013). The horizontal dimension, on the other hand, reflects the firms that are at the same hierarchical level but in different value chains. In the latter, it is optional for providers to add service components for their products alone or for products provided by competitors and complementary products, i.e. third-party products (Raddats & Easingwood, 2010).

2.3.3 Actors

Next to the challenging deployment of the right configuration of resources and capabilities, manufacturers find it hard to establish and maintain the integrated configuration of key partnerships (Garcia Martin et al., 2019). It requires a high degree of cooperation between manufacturers and their suppliers, customers and intermediaries (Raddats et al., 2019), which is characterized by the presence of cooperative norms of behaviour, greater know-how and information exchange, relationship transparency, mutual adaptions, and tighter operational linkages (Martinez, Bastl, Kingston, & Evans, 2010). This especially refers to the delivery of advanced services, where performance guarantees are given on the outcomes that the customer aims for (Baines & Lightfoot, 2013). While this allows for higher investments upfront and results in secure and growth of revenue for the focal firm due to its long-term contract, the firm perceives higher risk and uncertainty in return (Visnjic et al., 2018). This is because of two reasons. First, the company is responsible for the outcome, which implies that they are accountable for the impositions of penalties if the outcomes are not met (Visnjic et al., 2018). Second, the company is delegating an increasing number of activities, of which it has no knowledge itself, to external parties and in doing so is transferring responsibility with them (Visnjic et al., 2018). Since manufacturers have to rely on the accountability of other actors in the network, they lose a degree of control over the activity system and face higher risks of partner opportunism and/or failure to coordinate activities with them (Visnjic et al., 2018).

In addition, the extent to which value with servitization is created is depending on the 'embeddedness' of the actors within the network (Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019). Embeddedness determines the value created by economic activities and outcomes that are not only affected by dyadic relationships but by the relational structure within the overall network as well (Granovetter, 1992). More specific, embeddedness directly affects the actions undertaken by the actors within the network and the outcomes of the relationships between them, indirectly influencing the overall structure of the network itself (Uzzi, 1996). According to Sklyar et al. (2019) there are two types of embeddedness, including (1) relational embeddedness and (2) structural embeddedness. Together the two elements facilitate a better understanding of market conditions and the complex and changing customer needs (Neu & Brown, 2005). Relational embeddedness refers to the closeness between the actors within the network, characterized by high levels

of adaption (Baraldi, Gressetvold, & Harrison, 2012). The degree of relational embeddedness influences the ability of the focal actor to access and combine resources of its actors within the network (Forsgren, Holm, Johanson, & Elgar, 2005). A distinction is made between intrafirm and interfirm relational embeddedness (Sklyar, Kowalkowski, Tronvoll, et al., 2019). A company that is more intrafirm embedded gains more knowledge of their services through in-house developments and operations (Kowalkowski & Ulaga, 2017). It enables them to have greater influence and control on the knowledge and competences of their corporate counterparts, resulting in tied up resources (Forsgren et al., 2005). If a company lacks intrafirm embeddedness, it must instead rely on interfirm embeddedness, meaning that they are dependent on other actors within the network to support their servitization efforts (Sklyar, Kowalkowski, Tronvoll, et al., 2019). This can be challenging if the external actors are large and have a lot of power, or strive for a similar servitization process (Salonen & Jaakkola, 2015). Structural embeddedness, on the other hand, refers to the extent to which actors are aware of change and are willing to adapt to it (Gulati, 1998). In this respect, it is important that actors are strongly embedded as they are more willing to share recourses, knowledge and skills (Podolny, 2001), which facilitates the adaptation of activities that are interrelated, such as service development (Lusch & Nambisan, 2015) and production processes (Håkansson & Snehota, 1989). In addition, the more the processes and routines of individual actors are adapted, in order to better align with those of other actors, the more accurately and productively they can be used (Alchian & Demsetz, 1975). As a result, a single actor becomes dependent on the resources of other actors, strengthening the linkages between them (Granovetter, 1977). By encompassing resource integration, actors create determined value for themselves as well as for the other actors in the network (Kleinaltenkamp et al., 2012; Sklyar, Kowalkowski, Sörhammar, et al., 2019), directly impacting revenue streams and economic behaviour (Sklyar, Kowalkowski, Tronvoll, et al., 2019). Next, structural embeddedness affects not only resources and their availability (Baraldi et al., 2012), but institutional arrangements as well (Koskela-Huotari, Edvardsson, Jonas, Sörhammar, & Witell, 2016). It can be concluded that structural embeddedness is important for the viability of the service network as it facilitates that implementation of change (Uzzi & Lancaster, 2003).

The aforementioned points out that embeddedness and strong linkages are important in servitization. Repetition in the integration of resources makes actors more

adaptable to each other, thereby strengthening the relationship of trust and facilitating the implementation of interrelated activities (Ostrom, 1990). However, the strong alignment between actors creates a form of standardization over time due to adaptation of their internal processes and routines to better align each other's resources, causing for rigidity in the network (Granovetter, 1977). Ultimately, this may result in limitations on the adaptability of the incumbent firm and resistance to environmental changes as well (Lieberman and Montgomery, 1988). Consequently, the only way to acquire new resources is through interaction with weakly connected actors (Sklyar, Kowalkowski, Sörhammar, et al., 2019). Therefore, it is evident that not only strong, but also weak linkages are important when formalizing networks for servitization (Granovetter, 1983).

2.4 Conceptual model

On the basis of the previously obtained literature, this chapter outlines the conceptual model. The conceptual model helps to investigate the research aim and question in a structured manner. Again, the aim of the research is to explore the effect of servitization on the strategic net of SMEs when transforming from a product-oriented business towards a service-oriented business, emphasizing its structure. This transformation will be investigated by answering the following research question: *"What is the effect of servitization on a product-oriented strategic net of SMEs in terms of its structure?".* As mentioned, the literature regarding 'strategic nets' will be used as a lens to identify the interaction of the network structure before (product-oriented business) and after the service transition (service-oriented business). This will be measured by identifying the value proposition and the value-creating system, consisting of actor (bonds), activity (links) and, resource (ties) (Adner, 2006; Håkansson & Snehota, 1995). In the end, a clarification can be made on the effect of servitization on the product-oriented strategic net of SMEs, emphasizing its structure.

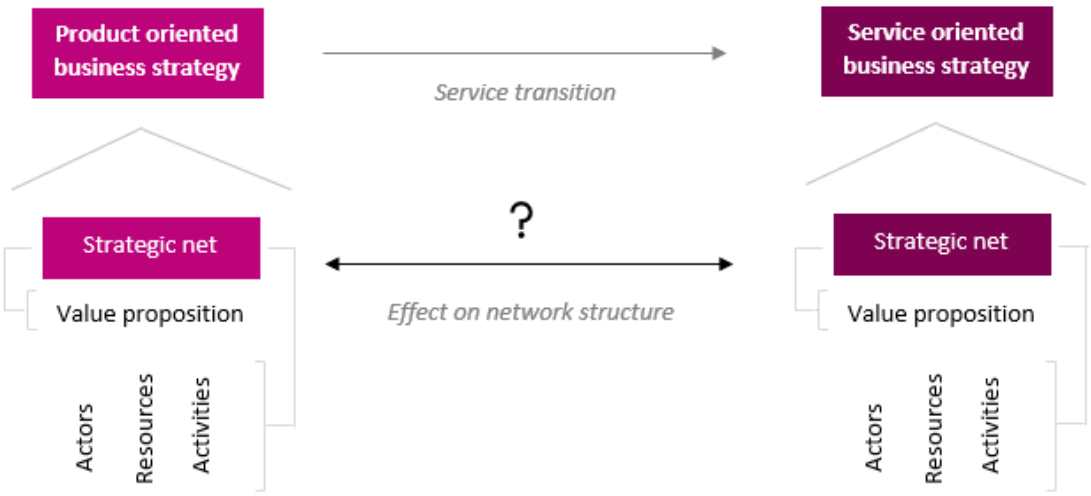

Figure 2: The conceptual model of this study

3. Methodology

This section describes the methods and techniques that are used to answer the research question and sub-questions. Additionally, a description of the selected case company is given.

3.1 Research design

A qualitative single case study was conducted in order to reflect to the aim of the research. The aim of the research was to explore the effect of servitization on the strategic net of SMEs when transforming from a product-oriented business towards a service-oriented business, emphasizing its structure. To collect detailed insights into how the underlying structure of actors, activities, and resources within the network of SMEs are interwoven before and after the service transition, a qualitative study was deliberately chosen. Since qualitative research allows for more in-depth detail in an open-ended and flexible manner, in this study, qualitative research is more appropriate than quantitative research (Creswell, Hanson, Clark Plano, & Morales, 2007). Especially because strategic nets are to a certain extend unpredictable as the outcomes are dependent on the collective interaction (Valkokari, 2015). A second characteristic of qualitative research is that it investigates experiences, meanings and perspectives from the standpoint of the participant, whereby the data is not amendable to counting or measuring (Hammarberg, Kirkman, & De Lacey, 2016). Instead of multiple case studies, a single case study was selected. A single case study allows the researcher to explore and describe the effect of a complex phenomenon more comprehensively in comparison to multiple case studies (Dawes, 2012; Siggelkow, 2007). More specific, the former allowed the researcher to investigate the observable alignment structures of strategic nets and their interaction in a more detailed way, making it easier to identify the effect of servitization.

Additionally, this study applies an exploratory, abductive research design. Within an abductive research, theoretical starting points are drawn up before the analysis is started. However, the direction of analysis remains inductive because the theory is developed on the basis of the collected data (Verhoeven, 2014). In other words, abductive research is a combination of deductive and inductive research whereby the available data of strategic nets is used as a starting point (deduction) to explore the phenomenon of servitization, and to generate a new or modify an existing theory (induction) (Dubois & Gadde, 2002;

Saunders, Lewis, & Thornhill, 2019). Since the direction of the research could change as a result of new data and insights, it was beneficial to apply an explorative design, which is characterized by flexibility and adaptability (Saunders, Lewis, & Thornhill, 2009). Similar to inductive research is that within an abductive research in-depth information of servitization and networks in the context of SMEs could be obtained and explored, which served as a basis for theory-building (Eisenhardt & Graebner, 2007). This approach was selected because of the limited literature regard the effect of servitization on the network of SMEs and, on the other hand, sufficient available data of the structure and functioning of the network within the strategic management literature. When building theory from empirical evidence, a variety of data sources needed to be included in order to produce theory that is accurate, interesting and testable (Eisenhardt & Graebner, 2007; Yin, 1994). For a detailed explanation of the applied data sources, see Chapter 3.4.

3.2 Case description

BuildCo is the case that was selected to explore the concepts of the research problem. This section describes the corporate story of BuildCo, which customer groups it serves and the reason for the transition to servitization.

3.2.1 Sampling procedure

The case of BuildCo, a building and installation company located in the east of the Netherlands, was selected to investigate. This case was chosen because the construction industry nowadays applies servitization strategies more frequently as it realizes that offering products alone is not enough to remain profitable (Visnjic et al., 2018). This 'awareness' was also present at BuildCo, that realises that if it wants to remain profitable and gain competitive advantage, it needs to take the next step by transforming from input to output based activities and expanding the scope of activities through partnerships along the value chain (i.e. construction process). In addition, BuildCo has collaborated extensively with external partners in recent years and has built up a number of strong relationships. This enabled the researcher to investigate the network of BuildCo.

3.2.2 Corporate story

BuildCo was founded in 2016 and was the result of a collaboration between a building and installation company. With this cooperation and integral approach, BuildCo tries to distinguish itself from the traditional product suppliers in the construction and installation

sector (BuildCo, 2019b). This approach resulted in a turnover of 37.5 million euros in 2019, with a total of 39 FTE working at BuildCo at that time. In comparison to 2017, this was an increase of 21,6 FTE. In addition to its own FTE, BuildCo also employed a few regular employees of the parent companies right from the start. This number decreased in recent years and in 2019 it represented 10 to 15 employees. At the moment the number of projects on an annual basis varies between 5 and 8 projects with a value among 8 and 15 million euros (BuildCo, 2017, 2019a).

Since its founding, BuildCo has focused on UAV-gc[2] contracts, where the integration of both construction and installation can be fully exploited. Typical for an integrated contract type is that tasks and responsibilities within the construction process can be combined and contracted to a single party (UAV-GC, 2015). In this respect, the customer is seen as the initiator and the contractor is the actor that realizes the project by means of designing and executing tasks. Within UAV-gc contracts the customer can decide which phases of the construction process (Design, Build, (Finance), Maintain, Operate) they want to outsource (Pianoo, 2020). An overview of the entire construction process is presented in Figure 2. Until today, most projects (except for one) of BuildCo have been focused on contracts in which the phases Design and Build (hereinafter DB) were integrated. Prior to this, a contractor must always participate in the Tender, regardless of the type of contract.

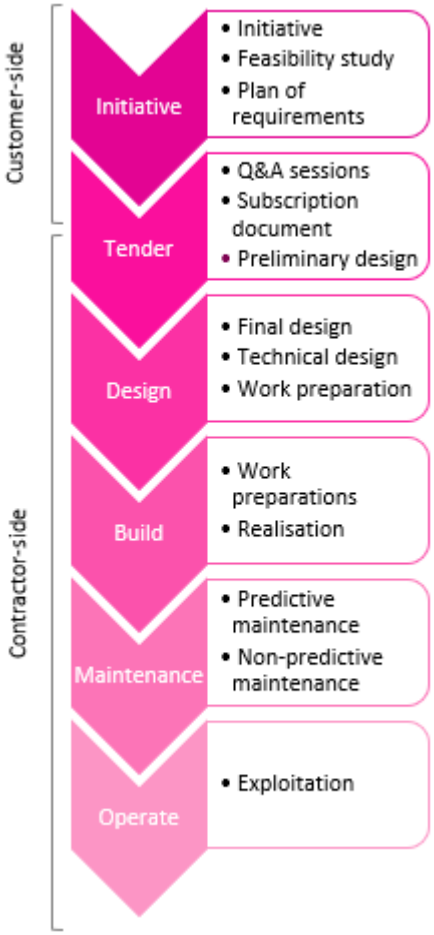

Figure 3: Construction process (BuildCo, 2019b; Pijpers & van der Woude, 2012)

3.2.3 Customer segment

With its core business, BuildCo focuses on creating innovative (multifunctional) accommodations in the utility market. This customer segment has a homogenous core task: providing good education. Conversely, the customer segment had heterogeneous preferences and requirements for a building to facilitate. The heterogeneous preferences and requirements are determined by the different visions each school has, which is defined by two aspects. The first aspect relates to the different educational systems: primary

[2] UAV-gc is defined as: uniform administrative conditions and integrated contracts (UAV-GC, 2015).

education (PE), secondary education (SE), secondary vocational education (SVE), higher vocational education (HVE) and scientific education (ScE). A comprehensive overview of these education systems can be found in Appendix I. The second aspect relates to the various educational concepts that are applied within these educational systems, including Public education, Special education, Practice-oriented education, Experient-oriented education, Free school, etc. Due to the combination of these aspects, no accommodation can be considered as 'identical'. An additional description of the customer segment can be found in Appendix II.

3.2.4 Where is BuildCo now and where does it want to go?

To be able to observe an effect, it was necessary to map out both the current and future situation in concrete terms. This was done by describing the value proposition and its implementation among different categories of servitization, including base and advanced services. This approach was chosen since the value proposition determines the structure of the value-creating system within a strategic net (Adner, 2016; Ford et al., 2008). Furthermore, the value proposition plays a major role in strategy development and implementation (Payne, Frow, Steinhoff, & Eggert, 2020).

As observed in the literature review, a firm can retain the same value proposition among different categories of servitization. This is because the value proposition itself describes the 'what' being offered, which will not change. However, it is the market offering, i.e. the 'how', that implies a change among servitization categories. An example with regard to the case context can be given as follows. Regardless which classification of servitization is provided, the final outcome will always constitute a school building. However, the way in which the school building is delivered (base, intermediate or advanced services) may change. For this reason, a single value proposition is formulated below that applies to both the current and future situation. The difference between the two situations is indicated by a description of the implementation of this value proposition, which is subsequently linked to one of the servitization classifications of Baines and Lightfoot (2013).

- *Value proposition*

The value proposition of the case company could be defined as follows: "The provision of a school building that contributes positively to the well-being of the customer, whose aim it is to provide good education".

- *Current situation – base services*

The current activities performed by BuildCo could be classified as ‘base services’. The reason for this is that, despite the fact that the design and execution of the building is realized both integrally and on a performance basis, BuildCo only provides services (maintenance) that are covered by warranty instead of services to maintain the product performance. After the completion of the building, it is not BuildCo but the customer itself who is responsible for maintaining the performance. Thus, since BuildCo is currently focused on the execution of production competence instead of on the exploitation of production competences to maintain the condition of products and does not offer an integration of goods and related services, the service activities are classified as ‘base services’.

- *Future situation – advanced services*

Based on the collected data during this study, it was assumed that BuildCo wants to provide 'advanced' services in the future, i.e. ‘Building-as-a-Service’ (hereinafter BaaS). The reason for this is that BuildCo recognises the need to expand the scope of activities along the value chain (construction process). This means that BuildCo is shifting its focus from integral DB contracts to contracts in which the phases Design, Build, Maintain and Operate (hereinafter DBMO) are offered integrally. This allows the company to achieve a performance instead of a deed, which requires for activities that are output-based instead of input-based. This means that the responsibilities and risks (e.g. defects related to building maintenance) will no longer be borne by the customer but by the contractor itself. Furthermore, the service will not be oriented to the suppliers good anymore, but to the process of the customer instead. Due to the integral product-service combinations the life cycle of the building will expand. In exchange, the customer enters into a long-term contract with BuildCo.

3.2.5 Operationalisation of variables

As previously indicated in the literature review and the conceptualization, a strategic net is structured by the value proposition and its underlying value-creating system, including actor (bonds), activity (links), and resource (ties) (Adner, 2016; Håkansson & Snehota, 1995). To measure the interrelated conceptualized structure of the strategic nets in this research, these elements were operationalized below (Table 1).

Elements	Definition	References
Value proposition	A value proposition is the promised benefit that the target of the effort is to receive	(Adner, 2016)
Market offering	The effort that the target receives. In the context of servitization the effort can be subdivided into three categories including: 1. Base services: an outcome focused on product provision. 2. Intermediate services: an outcome focused on maintenance of product condition. 3. Advanced services: an outcome focused on capability delivered through performance of the product.	(Adner, 2016; Anderson et al., 2007; Baines & Lightfoot, 2013)
Activities	The discrete actions that are undertaken to materialize the value proposition. These actions can be subdivided into realisation activities that refer to the physical creation of goods and/or services and support activities that focus on increasing the effectiveness and efficiency of the realisation activities. The latter is independent of the physical production.	(Parolini, 1999; Partanen & Möller, 2012)
Resources	Resources can be tangible or intangible and include input goods (e.g., raw materials and components), financial capital, technology, personnel, knowledge, and information required to perform network activities.	(Barney, 1991; Håkansson & Snehota, 1989; Partanen & Möller, 2012; Talmar et al., 2018)
Actors	Entities including suppliers, complementors, competitors, research institutions, public institutions and customers who perform network activities or control required resources to perform those activities.	(Adner, 2016; Partanen & Möller, 2012)
Positions	Location of actors the flow of activities and resources across the system to materialize the value proposition	(Adner, 2016; Talmar et al., 2018)
Links	Transfers between actors across the system that indicate the interconnection. These transfers exist of three interplayed subdivisions: 1. Actor bonds: the quality of the relationship between actors of the strategic net including power, commitment, closeness, trust, cooperation, expectation and understanding. 2. Activity links: the degree of interconnection between actors of the strategic net regarding the implementation of activities at firm level. 3. Resource ties: the degree of interconnection between actors of the strategic net regarding the collection of tangible and intangible resources at firm level.	(Adner, 2016; Håkansson & Snehota, 1995; Halinen, Medlin, & Törnroos, 2012; Medlin, 2004; Ramos & Ford, 2011)

Table 1: Operationalisation of the elements within the strategic net

3.3 Data collection

The data from this study was collected by field and desk research (see Table 3). The aim of field research is to generate empirical data, i.e. primary data, to build on existing theory. Before and during the field research, desk research was carried out to collect and analyse already available data, i.e. secondary data. The information obtained from desk research served as input or as additional information for the field research (Verhoeven, 2014).

First, secondary data was collected. This data contains internal documents provided by the case company and includes general documents, such as annual reports, and documents related to the customer projects, such as tenders, plans of actions and contracts. The aim of the secondary data was (1) to become familiar with the products and services

offered, (2) to get insight into the functioning of the current product-oriented strategic net and to supplement the collected primary data of it, and (3) to obtain information for the formulation of the corporate story and current value proposition. This data was not only collected at the beginning of the research but continued throughout the entire study.

Subsequently, primary data was collected. The primary data collection contains semi-structured one-to-one interviews and two focus group sessions. The aim of the semi-structured interviews was (1) to obtain in-depth information of the functioning of the current product-oriented strategic net (SQ 1) and (2) to get already insight into the future situation and its changing elements within the network (SQ 2). Ten (main) participants across the construction process were selected including five internal and six external respondents (see Table 2). During the semi-structured interviews, the operationalization of Table 1 served as a guideline to measure the structure of the net. Furthermore, both the current and future situation was questioned to make an assumption for the future value proposition and possible changing elements in the network, next to the description of the current net. See Appendix III for the questionnaire. All the one-to-one interviews were recorded through audio recording to ensure that the focus of the interview could be on the content of the conversation and that there was a realistic representation of the conversation afterwards. After the semi-structured interviews, it turned out that there was still some information missing. This information was supplemented by small conversations with employees. These conversations were summarized and recorded in a 'logbook'.

The aim of the focus group sessions was to (1) identify, together with the respondents, why and how certain aspects with regard to the underlying structure of the current process would change, (2) what needs to be done to realize this change and (3) to map out the functioning of the strategic net in the future (SQ 2). To effectively manage the session, previously obtained interview data and secondary data served as a guideline. The composition of the focus group consists mainly of respondents who participated in the individual interviews for the current situation as well (see Table 2). Four of the interviewed respondents were not able to participate again. Instead, two internal business developers have been selected. So far, they are closely involved in the servitization process of the case company. Advantageous of a focus group is that several respondents can be interviewed at the same time and that the respondents, given the varying composition, are able to judge each other’s arguments. However, given the occurrence of COVID-19, that took place during

the study, the focus group sessions had to take place online instead of in a physical setting. To be able to manage the sessions more effectively, two groups were formed instead of one. Next, the researcher got active support of a colleague researcher. Prior to the focus group sessions, respondents were asked if they could identify three objectives for improvement, regarding securing technical and service-related building performance in the operational phase. After a short group discussion of the identified objectives, two voting rounds took place to create a top 5 of most important objectives, followed by a top 3. Given the time frame of two hours it was only possible to discuss one point for improvement per group in detail. The mail explaining the purpose of the focus group session and asking the respondents to make a short preparation is enclosed in Appendix IV. The presentation that served as a set-up for the session can be found in Appendix V.

Respondent/ Focus group	Position	Internal/external	Interview	Focus group
R01	Technical director	Internal	X	
R02 / FG01	Tender manager	Internal	X	X
R03 / FG01	Customer support	Internal	X	X
R04 / FG02	Project leader (incl. supervisor construction)	Internal	X	X
R05	Supervisor installation	Internal	X	
R06 / FG01	Business developer	Internal		X
R07 / FG02	Business developer	Internal		X
R08	Architect	External	X	
R09	Building management agency	External	X	
R10 / FG02	Building management agency	External	X	X
R11 / FG02	Structural engineer	External	X	X
R12 / FG01	Advisor BFA	External	X	X
R13	Board member of the foundation	External	X	
R14 / FG01	Supplier lighting	External		X
R15 / FG01	Facility services	External		X
R16 / FG02	Supplier façade	External		X
R17	Logbook	Internal	X	

Table 2: Overview of respondents

Sections		Data collection method	Key informants/data source	Purpose
SQ 1: Product-oriented net	Value proposition	Content analysis	Internal documents of BuildCo	To formulate the current value proposition (base services)
	Value-creating system	Semi-structured interviews	11 participants from the construction process, each fulfilling a different role	To obtain in-depth information of current actors, activities and resources, positions and links needed for the realization of a building
		Content analysis	Internal documents of BuildCo	
SQ 2: Service-oriented net	Value proposition	Semi-structured interviews	11 participants from the construction process, each fulfilling a different role	To formulate the future value proposition (advanced services)
	Value-creating system	Semi-structured interviews	11 participants from the construction process, each fulfilling a different role	To identify and obtain in-depth information of elements that change in a service-oriented strategic net
		Focus group interview	10 participants from the construction process, each fulfilling a different role	To supplement the identified and obtained information of changing elements in the service-oriented strategic net

Table 3: Overview of data collection methods

3.4 Data analyses

The semi-structured interviews and secondary data were coded and analyzed with the grounded theory method (hereinafter GTM) of Glaser and Strauss (1967). The GTM consists of three phases, including open coding, axial coding, and selective coding. This approach enables the researcher to identify and develop new theories from the interview codes (Glaser and Strauss, 1967). As far as the interviews are concerned, these were first transcribed prior to the application of the GTM. Second, fragments were selected, analysed, and assigned by open coding. This resulted in an overview of relevant information. Third, the overview of open codes was reduced by grouping associative open codes into axial codes. Most of these axial codes were linked to the ARA-framework of the strategic net literature. This enabled the researcher to link the literature to the empirical evidence and to structure the research. Because not all coded information could be used, the final step was to select only the relevant information within these code groups. The final coding scheme enabled the researcher to merge the codes from the semi-structured interviews with those from the content analysis into one comprehensive overview, called the coding tree (see Appendix VII).

The data of the focus group interview is obtained by audio recording and a visual representation of the results. The visual representation of the two sessions can be found in Appendix VI. Together, the results are worked out in a summarizing text of the most

important remarks per session. This summary was structured by the GTM to compare and merge the collected data. It was a deliberate choice not to work out the recordings literally since it was too time-consuming.

4. Results

In this segment the results of the qualitative research are presented. First, a description of the current product-oriented strategic net and its value-creating system is given (SQ 1). This is done by explaining the current construction process of the case company. It is based on the interview data and document analysis. Second, a description of only the changing elements regarding the future service-oriented strategic net is given (SQ 2). These elements have been identified based on interview data and the focus group interview.

4.1 How does the product-oriented strategic net of BuildCo look like?

As already mentioned in the case description (Chapter 3.2.3), BuildCo focuses at the moment only on the following phases within one contract: Tender, DB (including warranty maintenance). This means that the phases Initiative, Maintenance and Operate (hereinafter MO) are excluded from the contract and the responsibilities and risks for these phases are for the customer itself. To be able to explain the functioning of the network, consisting of actors, activities, and resources, a network visualization has been made (see Figure 4). It shows the functioning of the network during the entire construction process and is composed based on one-to-one interviews with different actors within the process. The yellow lines show the responsibilities of BuildCo and the black lines the responsibilities of the customer. The light grey lines are outside the scope of both BuildCo and the customer.

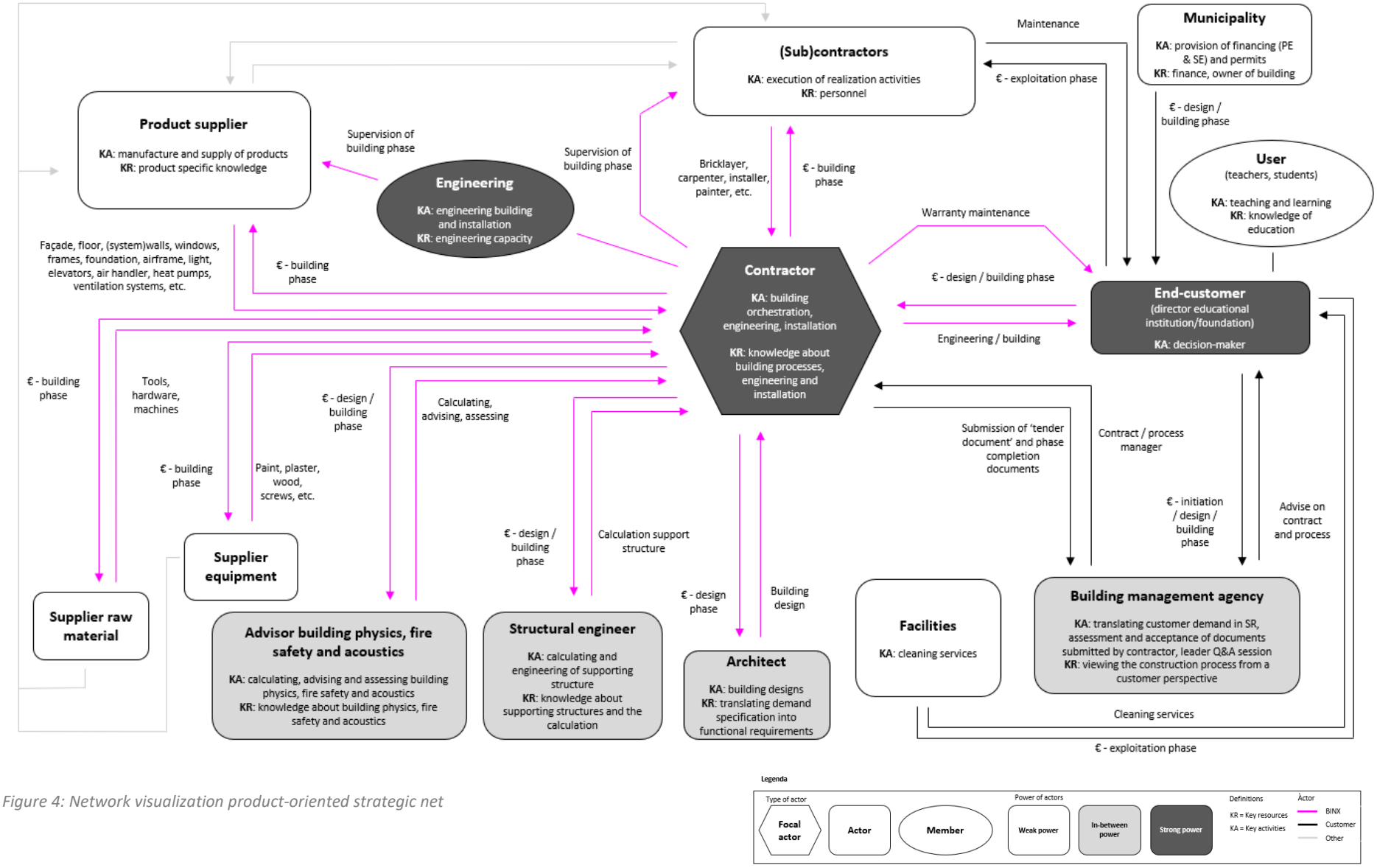

Figure 4: Network visualization product-oriented strategic net

4.1.1 Initiative

The customer (school director/foundation) initiates a housing need and is financially assisted by the municipality. This means that, in case of PE and SE, the investment of a school building is financed by the municipality/government. As a result, the building is on the balance sheet of the municipality, which means that they are 'owner'. Conversely, SVE, HVE and ScE receive money from the ministry and have the building on their own balance sheet. This makes them less budget-dependent in decision-making. In either case, the educational institutions are responsible for the exploitation costs themselves.

Because the customer segment is located in the public sector, they are required by law and regulations to submit a European Tender. In other words, if the customer has a housing demand for a new building, it must put a professional (government) contract out to tender. In general, the customer does not have sufficient knowledge of the construction process to draw up the contract and/or does not want to be risk averse. Therefore, it engages a building management agency as a 'delegated decision-maker' who, during this phase, advises the customer in the decision-making process. At the end, the customer is the one who has to make the final decision. First, the building management agency carries out a market consultation and housing study in which the overall wishes of the customer for new housing and the corresponding allocated budget are tested for feasibility. Subsequently, it attempts to identify the customer's demands, describing them functionally (performance based) in the specification of requirements (hereinafter SR) and looks for a suitable type of building organization. At this point the customer decides which phases of the construction process it wants to carry out itself, assisted by advisors[3], and which phases it wants to have executed by contractors. The more phases, the customer performs itself and the more closely it makes the specifications, the more limited the influence of the contracting parties becomes. At the end, the specifications and associated space plans will be published in the market as an 'assignment guideline'.

4.1.2 Tender

After scanning, the contractor's management signs up for tender projects if they see any potential. Subsequently, the customer makes a pre-selection of the registered parties. After being pre-selected, the contractor analyzes, based on the assignment guideline, the internal

[3] Examples of consultants: architect, building physics, fire safety, acoustics, structural engineer.

and external data requirements. Based on this the 'tender team' is composed. Table 3 shows an overview of the most frequent actors in the tender team, including the corresponding job descriptions.

Before selecting external advisors/supplies, it is first checked whether one of the 'co-makers' is suitable for this. This is a standard group of suppliers and/or subcontractors with whom BuildCo has built up a strong partnership in recent years. If it is the case that elementary items are requested in this phase that the co-makers do not have the right knowledge of, a specialist party will be called in. During the tender phase, BuildCo is very critical in the selection of partners because (1) they want to submit the best possible tender document and (2) run a high financial risk. The reason for the latter is that, in most cases, BuildCo must finance external parties and suffers a loss if the tender is not awarded. In some cases, they are compensated by the customer, although this is insufficient to cover the incurred costs.

The final document that the contractor will submit is called the 'tender document'. This document consists of an operational budget, action plan and a preliminary design. To ensure that the subscription document corresponds to the requirements of the customer and whether there is mutual agreement between both parties, Q&A sessions will be arranged. At this point, the contractor can ask the customer and/or building management agency questions about the assessment guideline. Ultimately, it is the task of the customer, in consultation with the building management agency, to allocate the project to one contracting party.

Tender team	
Intern	
Tender manager	Coordinate tender team, compile Plan of Action and Tender Document based on input provided by participants of the tender team. Maintain contact with customer.
Director	Inspire, coordinate, and control the final budget.
Project leader and supervisor installation	Identify essential information from suppliers (quotations), investigate building methods and installation systems, and make installation and structural calculations based on preliminary design of the architect.
Financial specialist	Calculation of structural and installation engineering aspects based on preliminary design and associated calculations.
Process Engineer[4]	Translating the SR to the preliminary design.
BIM-coordinator	Coordinating BIM-model and correctly implementing output in associated work models.

[4] Only when to submit a preliminary design

Extern	
Advisor building physics, fire safety and acoustics (hereinafter BFA)	Provides advice on building physics, fire safety and acoustics on design, based on the SR.
Architect[4]	Provides advice consisting of preliminary design, which is based on the analysis of dialogue sessions, technical and structural specifications, and the plan of requirements.
Structural engineer	Provides advice consisting of calculations and designs of supporting structure, based on plan of requirements and preliminary design of the architect.
Additional advisors/suppliers	If, after screening the SR, it appears that the tender team is missing specialist expertise, it engages external experts.

Table 4: Actors of the tender team

4.1.3 Project definition

Once the project has been allocated, the project must be further defined. The project team is composed, the members are briefed, the assignment will be verified, and the schedule will be made. Additionally, a follow-up meeting is organized to share the expectations between the customer and the contractor. In some cases, the contract must be optimized again according to the request of the executing party or there are cost-cutting rounds (often at the request of the customer), after which a new price is negotiated. Subsequently, a description of the project team, the working method, and any requests for modifications that the contractor has identified as a result of advancing insight, are recorded in a 'Project Management Plan' (BuildCo method, PMP). After approval, these requests for modification form, together with the Registration Document, the 'Agreement of Customer' and are leading for the remaining part of the construction process. It is desirable to continue the process with the same partners as contracted in the tender phase. However, it sometimes happens that a price comparison is made, and the team leader ultimately opts for a cheaper partner.

4.1.4 Design

This phase consists of two sub phases: the final design and the execution design. In the final design phase, a complete picture of the project as a spatial concept and technical feasibility emerges. This gives not only the design but also the specification of requirements a definitive status and suppliers' quotations for structural components can be approved. The provisionally defined aspects are finalized and the design becomes much more detailed (Pijpers & van der Woude, 2012). This phase takes the most time because alignment must be sought between the input of the actors in the project team and the customer's SR.

Subsequently, in the execution design, the design is prepared in such a way that the

design is also technically readable for implementers and the permit is applied for (Pijpers & van der Woude, 2012). As soon as the execution design is ready and there is a 'green light' for the start of construction, the price quotation for parts of the construction can be approved. After each sub-phase, the project leader must submit a phase completion document to the building management agency, which will check whether the contractor complies with the SR or not. Table 5 shows an overview of the most frequent actors in the project team. A global job description is given per team member.

Considerable attention is paid to this phase as the integral approach of the project team makes it possible to prevent errors during realization. An important 'enabler' in this respect is the Building Information Model (hereinafter BIM). BIM is more than just a model. Next to the model, it contains all project files and information from architect, structural engineer, installer, contractor, and suppliers, both structurally and installation-technically. It is an integral model that can be used simultaneously by the aforementioned actors to engineer (and eventually realize) the building. During the construction process, all parties involved can always use the BIM-model as input and output for sharing information. *"Weekly, it is uploaded, tuned, clashes extracted, and improvements identified." (R17).* Since all project members can work on the design at the same time, it leads to a high dependency between team members and close cooperation. As a result, the job description can vary per project team and per project. Also, one actor can expand the knowledge of the other actor.

Within the project team, BuildCo has the final responsibility and therefore takes care of the coordination. It means that BuildCo bears the risk when performance standards are not met. When coordinating, BuildCo connects the mutual parties with each other when necessary. This enables the internal and external actors to fully focus on their core business and own expertise. As input for their tasks, they use the performance requirements from the SR and the basic guidelines of BuildCo. Subsequently, the advisors provide output to BuildCo consisting of advice and/or design, and follow-up questions. This output is integrated into the BIM-model by BuildCo and is also discussed during the (weekly) project meetings. These reconciliation moments are perceived as important as, at the final stage, an integral document must be delivered to the customer. The participating actors in the project team indicate that they are all willing to provide input not only from their own point of view, but also to think along with them from a common interest. However, no one takes responsibility for making mistakes.

Project team	
Intern	
Project leader (supervisor construction)	Is project leader and the coordinator who maintains relations with the building management agency (including the delivery of phase completion documents) and the internal and external participants of the project team. Is also the person who requests and, in consultation with the financial specialist, confirms the quotations and applies for the permissions.
Supervisor installation	Supervisor engineers installation. Is the supervisor of the engineers. Can also be assisting where he performs calculations based on the SR and building design for mechanical installations, electrical installations, transport installations, sewerage, and water installations.
Financial specialist	Maintain a budget based on input from team members and then monitor whether it meets the allocated budget.
BIM-modelleurs and planners	Jointly design based on the SR and pick up work preparation if possible. This work preparation consists, for instance, of setting up the construction site, purchasing materials, providing the necessary equipment, and drawing up a health and safety plan. To avoid wasting information, the position of engineer and work planner is usually held by the same person. The engineers are managed by the team leaders.
Process Engineer	Translating the SR into the final design and execution design. Subsequently, check whether the phase completion documents meet these requirements.
BIM-coordinator	Receives various models including structural, installation, and structural aspect model. Next, he merges them into one BIM-model after which he identifies 'clashes'. By means of a communication file, these clashes are sent back to the participant in question, who is then directly referred to the origin of the clash.
Coordinator exploitation	Discusses planned maintenance with the customer and, if requested, preventive maintenance as well.
Extern	
Advisor BFA	Provides advice on building physics, fire safety and acoustics on design, based on the SR.
Architect	Provides advice consisting of building design, based on the specification of requirements. This also considers, for instance, the requirements of prosperity and the requirements of the Dutch Building Decree.
Structural engineer	Provides advice consisting of the calculation and design of the supporting structure, based on the specification of requirements. Is depending on architect and BIM-engineers. In addition to an advisory role, the structural engineer also provides the data required for the application for the environmental permit.
Additional advisors/suppliers	Are contracted for specialist advice for which the project team itself does not have the right expertise. Must provide correct product information so that the project team can incorporate this in the design.

Table 5: Actors of the project team

4.1.5 Realisation

As soon as all permissions are completed, the realization phase starts. BuildCo does not have any operational staff, therefore it employs subcontractors. The reason for this is that the number of ongoing projects and the required expertise is fluctuating because of its activities in the utility market. Therefore, they only realize unique projects for which different expertise is requested each time. However, BuildCo does have a coordinator on site who directs the team of subcontractors and ensures that what has been designed is realized. From this phase onwards, the advisors (structural engineer, advisor BFA and the architect)

only have a testing function where they check whether the building is still in line with the advice. At the end of this phase, the building is delivered, and all advisory roles are eliminated. The only actors that remain involved are the suppliers who are responsible for any warranties if products or installations show defects within the warranty period.

4.1.6 Maintenance and Operate

As previously explained, BuildCo only carries out maintenance that is covered by warranty. In this respect, the maintenance is mainly reactive rather than proactive. It means that as soon as failure occurs, the customer reports it to BuildCo, who subsequently repairs it, instead of BuildCo itself having already identified and solved the failure. However, this warranty is only valid for a certain period of time (depending on the product/installation in question) and not for the entire lifespan of the building. The customer itself is responsible for all the other services (predictive and non-predictive) needed to maintain product performance. They carry out the maintenance by themselves or negotiate separate contracts for this purpose after completion of the project.

The customer is responsible for the facility services as well (Operate). Facility services can include services as cleaning, catering, reception, security, etc. (Pijpers & van der Woude, 2012). Regarding the current situation, the customer has only outsourced the cleaning services and still performs the other services itself (see Figure 4).

4.2 What are the changing elements regarding the service-oriented strategic net of BuildCo and how do they look like?

This chapter discusses the modifications if BuildCo makes the transition from base to advanced services. Concretely, this means that BuildCo will no longer focus on DB contracts but on DBMO contracts instead. Here the activities are output-based instead of input-based and is the contractor the risk bearer during the lifetime of the building instead of the customer itself. Because an explanation of the functioning of the entire service-oriented network results in a repetition of results, only a description is given of the elements that, compared to the current situation, need to change when offering BaaS. These aspects will have implications for the visualization in Figure 4 as well. It is decided to explain these implications descriptively since a visual expression was not clarifying enough. In describing the changing aspects, not every element of the ARA-framework is addressed in isolation. Instead, the ARA-framework has been used as a lens for studying the empiricism in which

actors, activities and resources are interconnected and mutually affecting each other (Håkansson & Ford, 2002).

4.2.1 Interorganizational collaboration within process phases

When offering advanced services, interorganizational collaboration within process phases is needed. The cause of interorganizational collaboration is the expansion of the activity base and the underlying resources, which results in an increase in the linkages and contradictions in the execution. As a result, closer coordination between actors within the process phases and decentralization of responsibilities is needed to achieve (cost-)effectiveness and reducing the risk. The following paragraphs will address these modifications in more detail.

4.2.1.1 Expansion of the activity base and its underlying resources

When offering advanced services, the scope of activities needs to expand. This implies that the contractor does not only offer the phases DB anymore, but an integral package where the phases MO are integrated as well. In other words, the consortium will design, construct, maintain and provide facility services for the school building. As a result, BuildCo and the associated co-makers (hereinafter referred to as 'consortium') must develop complementary expertise than they are currently used to. An example of an activity that requires for complementary expertise is that of maintenance. Although in the current situation BuildCo was already familiar with carrying out maintenance (on a warranty basis), they could take a reactive attitude in this. In other words, they only had to undertake action if the customer reported it. However, in BaaS the customer needs to be completely unburdened by delivering an outcome, which requires a proactive attitude. More specifically, the consortium must ensure that defects are identified in advance, even before it is defective. To make this possible, the performance of the entire building must be monitored. In doing so, complementary expertise such as data access, dashboard management and data analysis, will be required in addition to executing the usual maintenance activities.

However, not all the needed expertise to offer the integral package of DBMO is in line with the core business of the consortium. As a result, they must enter into new partnerships to supplement the missing expertise. A concrete example of an activity that is not related to the core business of the current consortium are the facility services. Where these services were initially carried out and/or contracted by the customer itself (see Figure 4), they will be provided by the consortium when offering BaaS. Since none of the current co-makers is

suitable to perform these activities, new partnerships, including a facility service provider, should be created. As a result of these changes, the number of actors and linkages between them will increase as well.

4.2.1.2 Closer alignment between actors (and their activities) within process phases

An increase in the network size causes contradictions in the execution and is therefore difficult to coordinate. To counter this barrier, and ensure (cost-)effectiveness, closer alignment between actors and their corresponding activities is needed. This results in a twofold set of implications. The first implication concerns the need to centralize activities among one single actor (if possible), thereby limiting the number of linkages and its complexity. Whether this is possible depends on how close the resource bases of these activities are to each other. To clarify this, two opposite examples are given. An example of an actor where it is possible to centralize activities is the installer. This actor could carry out the design as well as the realization and maintenance of the installation or, for example, install both the air handling unit and the WiFi. Because the aforementioned activities require identical underlying resources that are in line with the core business of the actor, the process becomes more effective which results in cost savings. Conversely, cleaning and security are examples of activities that cannot be carried out integrally by one single actor since both activities require significantly different expertise.

The second implication is that actors have to seek closer coordination with each other with regard to the required activities within process phases. This mainly applies to activities that cannot be performed by a single actor (e.g. security and cleaning). The actors need to rearrange their activities and think along with each other's processes in order to create efficiency. The reason for this modification was that the respondents were wondering: *“a cleaner runs the same round as the security guard. Why cannot the cleaner also carry out the security guard's door check directly?” (FG01)*. Given the different required competences, it is not possible to integrate all the activities of those actors and exclude one of the two actors from the network. However, it is possible for the cleaner to take over one of the activities, such as the door check, to make the process more efficient. Moreover, it also allows the security guard to continue to focus on their core business. As a result of this modification, the number of linkages and their complexity within the net is increasing. Where initially the security guard and the cleaner had a separate relationship with the

customer, now an extra link is needed which results in a more complex, 'triangular' relationship. See Figure 5 for clarification. To conclude, BaaS results in process efficiency due to the avoidance of duplication of work and therefore cost savings, as well as an increase in the complexity and strength of linkages on the other hand.

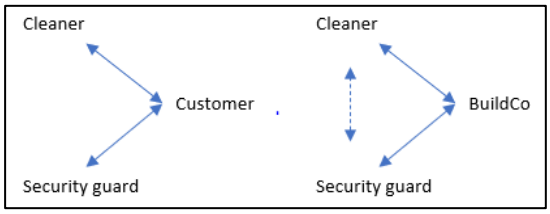

Figure 5: Example of increased network complexity and linkages

4.2.1.3 Decentralization of responsibilities

Another shift to improve the coordination of the linkages between actors and activities is the decentralization of responsibilities. In the current situation, with less activities and actors, BuildCo was responsible for all the activities performed by the consortium during the phases DB. If BuildCo continues performing this task in BaaS, they will be exposed to a very high risk by taking responsibility for activities of which they are not knowledgeable. This is caused by the fact that in BaaS the activities are output-based, which means that if the outcome is not achieved, BuildCo is responsible for the financial costs involved. To reduce the risk and the complexity of linkages, it is assumed to shift the performance responsibilities down into the value chain. They should make the expert, who in fact is most knowledgeable regarding his own product, responsible for sustaining its performance levels. *"Let the person who made the energy calculation also be (co-)responsible for achieving and maintaining it." (FG02)*. However, it is argued that most suppliers are not ready for this yet. Although desired, most suppliers are not accustomed to deliver and maintain products both according to performance standards. *"A prefab supplier has the most knowledge of its product itself, so in that respect he would be a good advisor for the Design phase. However, the problem is that this prefab supplier wants to deliver his product as quickly as possible and has no interest at all in the 'service' part (Exploitation)." (R17).* To overcome this barrier, the actor bonds need to be strengthened. Actors must be convinced of the added value of the consortium and become acquainted with it. This is discussed further in Chapter 4.2.2.2.

4.2.2 Interorganizational collaboration across processes

It was found that advanced services do not only require interorganizational collaboration within process phases, but also across the process phases in order to achieve cost savings and process efficiency. To facilitate this, more commitment and trust between actors is needed. Additionally, the customer needs to be engaged throughout the entire value creation process. The following paragraphs will address these modifications in more detail.

4.2.2.1 More alignment between activities across process phases

To provide both the existing and the complementary (new) activities as an integrated solution, the activities across the different process phases need to be aligned more closely. This relates to the activities that are performed in the phases DB (e.g. the final design), which need to be aligned with the activities performed in the phases MO (e.g. installation maintenance). "*It would make a lot more sense if the full construction process is outsourced as a single unit, rather than single parts. This allows you to make well-considered and perhaps better choices in the early stages, from which both parties can benefit later on." (R02).* If the engineers consider the maintenance and operational activities during the design, more conscious choices regarding (1) products/materials and (2) operational actions could be made. The choices regard to product/materials imply that the consortium is enabled to make a trade-off between price and quality. Two examples are given: (1) *"It sounds rude but if you do not have maintenance included you take the cheapest one. Look at carpeting. Normally, you choose one of 20 euros, but if you must maintain it for 30 years, I choose one of 35 maybe. Cause I know it will last longer over its lifetime." (R04).* And (2) *"Looking at the average building, the Resistance Construction (RC) value is about 4. If I have an RC-value of 8 for the façade, I have a thicker thermal insulation, but also more costs that I will have recouped in 100 years. That is in simple terms not a responsible investment." (R05).* The choices regarding operational actions imply that the engineers must consider the accessibility of components to ensure that it is and remains possible for maintenance and/or cleaning to be carried out. An example is given: *"If a cleaner cannot clean the window properly because the windowsill protrudes, the performance standard cannot be met. Thus, this must be considered in the design to avoid additional costs afterwards." (R17)*. Because, if it appears that the performance standard cannot be achieved due to the failure in operational actions performed by the consortium, the additional costs will be allocated to

the consortium instead of the customer. All less costs are an additional 'source of income' for the consortium. As a result of the increased linkages, the efficiency of the usage of resources increases, resulting in a lower Total Cost of Ownership (hereinafter TCO).

However, well-considered choices to increase the possibilities of achieving a lower TCO could only be made if the cashflows of the customer and the municipality become more closely linked as well. As described in the current situation, the cashflows of SVE, HVE and ScE are already linked. However, this does not yet apply to PE and SE. In case of the latter, the municipality is responsible for the investment and the school for the exploitation (see Figure 4). They have different interests, which form a barrier in the offering of advanced services. *"We (the customer) want a building that is as functional as possible and as inexpensive as possible in terms of sustainability and exploitation, which requires an extra investment at the front. This investment must be made by the municipality, but they do not have the benefits of exploitation. As a result, the municipality only wants to pay for what they are, strictly speaking, obliged to pay for." (R13).* However, it is indicated that these forms of financing are under development. There is more autonomy and self-regulation of administrations, whereby the municipality transfers the funding they receive from the government one-on-one to the school boards, who subsequently take responsibility for this themselves. Linking these cashflows enables the customer and consortium to make a better trade-off in terms of investment, resulting in lower long-term costs and therefore a lower TCO.

4.2.2.2 More commitment and trust between actors of consortium (to increase its power)

The previously identified complexity of linkages between actors (Chapter 4.2.1.2) will intensify if the actors have to seek coordination both within and across process phases, which calls for an even stronger actor bond. More specific, this implies to the commitment of actors in the first place. If the activities performed in the phases MO are more closely aligned with the activities performed in the phases DB, actors should be willing to contribute to solutions that are initially less interesting or less suitable for them as individuals, but which are interesting and suitable for the consortium as a whole. Instead of the separate cylinders of the current situation in which actors mainly behaved according to their own interests due to being independently contracted by the customer (see Figure 4), actors in BaaS should commit and act as a single entity. An example of this is as follows: *"If BuildCo*

has to meet a certain performance standard regarding energy and the architect used a lot of glass in the design, BuildCo asks the question: "can we not use a little less glass, so that we use less energy?" (R12). The example shows that the architect must be willing to abandon the goal of the individual organization (a magnificent building) and work closely with other actors in the net (e.g. engineers, users, facility manager) to create not only a unique, but also a practical building. When actors become more committed, possibilities for efficiency can be jointly identified, resulting in achievement of performance standards and accomplishment of the value proposition.

Secondly, strengthening actor bonds implies that more trust is needed. The stronger the mutual trust, the more willing an actor is to commit and share their resources. Especially the sharing, and linking as well, of resources is of high importance within advanced services cause actors are highly dependent on the information and knowledge of other actors. As an example, it was mentioned that the technical engineers are depending on the structural engineers. *"If the structural engineer makes a small change in the preliminary design, it represents a major change for the technical engineers. This often results in a lack of time" (R05).* Therefore, intensive cooperation and tied up actor bonds result in a more efficient process. *"Everyone can be very protective with his or her information, but I am convinced that when you share it, you come to better products and buildings much faster." (R08).* When all actors experience the advantages of the improvement of process efficiency and product quality, the common interest of actors strengthens. The actors will feel more responsible and behave accordingly by reacting proactive rather than reactive. Another argument that strengthens the interest of actors is that the actors of the consortium can individually learn from the knowledge and experience of the other actors involved, enabling them to continue developing themselves as a result. *"Especially in the integrated projects where many parties are present, there is a lot of knowledge and experience available that enables you to grow and develop yourself. So, it is reciprocal. For the value I add, I also get something valuable in return." (R08).* Creating and sustaining trust between actors is important as finding suitable partners with the same incentive turns out not to be easy. *"In theory, cooperation is good and leads to a smarter way of working and shared interest. But those parties also have other customers and do not only work for BuildCo. So those interests are never one hundred percent the same. They find themselves in a dilemma and are forced to make choices." (R01).*

To facilitate the strengthening of the consortium's power, it is not only important to

link the knowledge of actors but to store it as well. A database needs to be created where information is properly recorded, evaluated, and saved. The more information is stored, the more extensive and reliable the database becomes. Eventually this can be used as input for business operations, mutations, and future projects. To build this database, it is important that actors (1), if possible, include information in the BIM-model and (2) monitor and report performance standards correctly. However, until today the BIM-model has only been used to a limited extent as it only applied to the phases DB. With the addition of the phases MO, it becomes more important that a greater diversity of actors accurately enter information in the system related to installations, products and/or materials during all phases. Because the information of all phases is processed in one system, troubleshooting becomes easier. Next, no data can be used if its unreliable. Therefore, it is very important to pay attention to the activity of SMART[5] formulating of performance standards. The following quote clarifies this: *"Suppose a room should be 20℃ according to the performance requirement. If a student then opens the window or leaves the door open, we did in fact not meet the standard." (R17).* So, properly formulating performance standards allows for good evaluation. If the concrete results of this are processed, an increasingly reliable database is created. Consequently, the consortium gains better insights into the situation and is therefore more able to predict the less predictable actions. Additionally, it creates a degree of standardization in which results are reproducible and lead to fewer errors. *"Not wanting to make a unique component every time, but something reproducible. Because then you will have a more reliable product for yourself, for your foundation costs, for your reliability and for your service maintenance." (R05).* Thus, due to strengthening of linkages between actors, information sharing becomes easier and results in an increase of process efficiency, improvement of product quality, and, ultimately, a more powerful consortium.

4.2.2.3 Engaging the customer within the process

It is observed that the customer is unknown and needs to be engaged to improve decision-making during the entire value creation process. Since the customer usually only has to deal with the development of a new school building only once in its career, which is also not in line with their core business, it is common that it has insufficient or no knowledge of the technical aspects of the construction process. *"The user is mainly focused on how functional*

[5] SMART is defined as: specific, measurable, acceptable, realistic and time dependent.

it is, how spacious it is and what it looks like. They are much less concerned with the technical interpretation of this." (D4). Additionally, respondents assume that the customer is not yet ready for BaaS as it is very much focused on the present instead of the future. *"It will not let go and wants to be in control. It does not have the confidence that it is going to be all right." (R02).* Because the customer is eventually the actor who pays for the use of the building, it is necessary to engage it on behalf of the consortium. This means that where previously the customer had a high degree of involvement in the tender phase, limited involvement in the final design and involvement of zero in the execution design, they will be involved in all phases when offering BaaS. However, the degree of involvement will differ per phase. Namely, the further in the process changes are implemented, the more expensive they will be. It is therefore important that especially in the beginning of the process the customer is involved to a high degree as that is where the most impact on the design of the building can be made. In the following phases, the degree of involvement and influence will decrease. When engaging the customer, and especially the users, trust gets strengthened and the knowledge between customer and consortium can be merged. As a result, decisions will be made more deliberately, and resources are used more efficiently. An example is given: *"When drawing up the SR, a customer often does not yet know how it wants to fill in the catering facilities while we (the contractor) do take this into account when pouring the floors. By involving the customer actively and for a longer period of time in the process, engineering decisions can be made earlier." (R17).* In the end, it results into a better-quality product, which is more aligned to the customer's preferences as well. *"You want to be transparent, so you can better approach the process. This prevents mistakes afterwards, you prevent complaints." (FG01).*

4.2.3 Adjustment to existing regulations

The results have shown that the tender regulations form a barrier to the provision of advanced services. In the current situation, it was already apparent that there was often a gap between supply and demand. One of the reasons for this, according to the respondents, is that the customer is incorrectly advised by the building management agency, which causes an SR that is incomplete and/or is not expressed as intended by the customer. *"You often notice that the specifications of requirements consist of separate parts and that an integral story does not yet exist" (R08).* Consequently, the contractor itself will fill in the missing

elements, causing a possible mismatch. If that is the case, the contractor will be rejected and suffers a loss of the tender-related costs, or needs to adapt or carry out activities again, which leads to inefficiency. To prevent this, Q&A sessions have been organized to date. Although until today these sessions were seen as useful to get better insights into the subjective aspects of the project, it did not sufficiently limit the costs of 'failure' and does not ensure that supply and demand are smoothly merged. Moreover, the scarce or incorrect information in combination with the expansion of the activity base will increase the probability of a mismatch even more. Therefore, during this study, potential adjustments within the framework of the existing regulations were explored.

Since the exclusion of the tender process is against the laws and regulations, several solutions in the framework of the existing regulations are proposed. The first solution is that the consortium, with the help of investors, pre-finances the school building and the customer takes possession after its completion. However, since the requirements of this customer segment are much more heterogeneous as opposed to the commercial sector (Chapter 3.2.2), there is a chance that the customer will not take possession of the building, which is too risky. As a second solution, it is suggested that the customer should put a general demand specification on the market, giving the consortium the opportunity to complete it with their expertise. Again, this turns out to be unfavourable, as there is a good chance that the contractor in this situation will still misinterpret the customer's requirement and will be rejected as a result.

A potential, more realistic solution for adjusting the selection process while avoiding violation of tendering legislation, is to select the consortium primarily on the basis of soft skills instead of hard skills. This implies that the focus within the selection process shifts from a focus on price offering to a focus on the consortia's organization and the (organizational) quality they think they possess. *"They would be better off assessing a model that has an interest in cooperation. In other words, a selection based on soft skills: how will parties collaborate with us? What does their project organization look like? What role does the customer play in this and how will the customer be included in this? What does quality assurance look like? Etc." (R02).* This activity change has several beneficial implications. The first implication is that during the tender process the contractor's financial risk will be reduced. The contractor can submit the tender document based on their individual knowledge, instead of engaging the knowledge of co-makers who must be paid for the

expertise they deploy. The second implication is that not the expertise of the building management agency is utilized, but the expertise of the consortium, which is more experienced and has more specific knowledge. Consequently, the SR, which is set up after the tender has been awarded, enables the contractor (if selected) to bundle the required specialisms and knowledge of co-makers at an early stage. In so doing, it can be directly tailored to the requirements of both the contractor and customer, thereby avoiding duplication of work and limiting the costs of failure.

As a result, in the changes of tender regulations, the activities of the building management agency will change as well. They will no longer establish the SR, because this will be done at a later stage by the consortium itself. However, they will still supervise the customer during the tender process, because it was identified that the customer is unknowing and has no experience with these processes. To this end, the building management agency must develop new expertise to be able to advise the customer regarding the organizational qualities of the contractor.

5. Conclusion and discussion

In this chapter, the conclusion is presented first. This is followed by a discussion in which the empirical findings are compared to existing theory. After this, practical contributions are presented. Subsequently the limitations will be discussed by describing the internal and external validity, and reliability of the research. The chapter ends with recommendations for future research.

5.1 Conclusion

The objective of the study was to provide insight into the effect of servitization on the strategic net of SMEs when transforming from a product-oriented business towards a service-oriented business, emphasizing its network structure. Therefore, this study was aimed at answering the following research question: *"What is the effect of servitization on a product-oriented strategic net of SMEs in terms of its structure?"*. As support, the current network (base services) was identified first (SQ 1), followed by a description of the changing aspects relating to the future network (advanced services) (SQ 2).

The main finding of this research is that when SMEs apply servitization and make the transition from a product-oriented business (base services) to a service-oriented business (advanced services), this results in an increasing interorganizational collaboration of network actors both within and across process phases. The reason for this is the increasing activity base and underlying sources, which are generally accompanied by an increase in the number of linkages and contradictions in the execution. As a result, a stronger alignment between network actors and their activities, both within and across process phases, and decentralization of responsibilities is needed to save costs, achieve process efficiencies, and reduce risks. As a result of these modifications, the linkages and their complexity are (1) decreasing due to the centralization of activities among a single actor and (2) increasing due to the creation of an additional alignment relationship for the reallocation of activities. In doing so, it is important that the actors create more trust, increase the commitment to adapt, and share resources. Additionally, it is found that because the customer is the decision-maker, and thus one of the most important network actors, it needs to be more engaged in the entire value creation process. However, its involvement will be greater at the beginning of the process as the most impactful decisions are made there, which have a major impact on the rest of the process.

5.2 Discussion

In this chapter the theoretical and practical contributions are provided.

5.2.1 Theoretical implications

The results of this study show that to apply servitization, in which the focus lies on the transition from base to advanced services, companies need to expand their activity base and underlying resources. The reason for this is that it is no longer just a product that is delivered, but an integral combination of products and services, thereby taking over the activities that initially belonged to the customer. This means that the current actors need to enrich their competencies in order to be able to deliver activities that are no longer input-based but output-based, in which the focus is on the achieved outcome. However, the results of this research showed that SMEs do not have all the necessary capabilities and resources in-house to offer the entire range of activities in isolation and to benefit from servitization. As a result, they need to enter into new partnerships with external partners to fill this missing expertise and overcome the barrier. These findings confirm those of Kowalkowski, Witell, and Gustafsson, (2013) and Rapaccini, Mauro, Cinquini, and Tenucci (2019), who found that SMEs do not have sufficient knowledge or managerial resources to benefit from servitization, and should therefore enter into partnerships with external parties to overcome this barrier. In doing so, our results that SMEs apply the 'hybrid' approach in which resources are developed and combined both internally and externally (Kowalkowski, Kindström, & Witell, 2011).

Furthermore, it is found that an increase in the number of linkages between activities and actors is accompanied by an increasing complexity in execution and coordination. The reason for the increasing complexity is that more alignment between actors is needed to achieve process efficiency and cost savings. More specific, actors need to look for more alignment between their activities, which may require for reallocation of activities. These findings confirm the statement of Visnjic et al. (2018) who point out that companies need to open up their business model, redesign the activity system, and, according to Bankvall et al. (2016) and Forkmann et al. (2017), interconnect it with suppliers, partners and customers in order to be able to deliver the integral offering effectively and efficiently. Conversely, our results make the findings of Visnjic et al. (2018), Bankvall et al. (2016) and Forkmann et al. (2017) more specific by observing that the reallocation and interconnection of activities is dependent on the underlying resource base. Our results show that if the underlying resource

bases are closely related (e.g. the design, realization and maintenance of an installation, or install both the air handling unit and the WiFi), it is more efficient to obtain these activities integrally from one single actor. On the other hand, if they are not closely related (e.g. cleaning and security), the actors of these activities indeed have to seek for more alignment and reallocation of their activities in order to create efficiency. This was evidenced by the example of the cleaner and security guard, whose resource bases were too separated to integrate the activities within a single actor. It turns out that after a reallocation of their activities, it was possible for the cleaner to take over at least part of the security guard's activities, thereby making the process more efficient. Actually, the strengthened alignment between those actors causes a triangular relationship, which reinforces the complexity of the linkages even more. Hereby, our results study complement the statements of Visnjic et al. (2018), Bankvall et al. (2016) and Forkmann et al. (2017).

Another important finding is that strengthening the alignment between activities must be achieved not only within a process phase, but also across process phases. Eventually, this results in (cost-)efficiency, because strengthening the alignment between activities of different process phases allows for more conscious choices regarding (the trade-off between price and quality of) products and materials, and operational action. This result is to a certain extent confirmed by Martinez et al. (2010), who state that "alignment of product and service design processes is required for design of integrated offering and effective response to customer needs" (p. 14). However, complementary to the findings of the study of Martinez et al. (2010), this study indicates that the earlier the actors of the consortium are involved in the value-creation process, and the more the activities are aligned, the less risk the actor is exposed to. This is evidenced by the changes in the tender process, making it possible for actors to deploy their knowledge and bundle their expertise only after the award has been made. This also makes it possible that it is not the knowledge of the building management agency, which apparently does not have the appropriate knowledge to guide the customer with regard to technical solutions, but that of the consortium that is being utilised. In this case, the consortium, together with the customer, can consider which outcomes are the most favourable, highlighting the possibilities from both perspectives.

Next, this study shows that the customer is the decision-maker and therefore one of the most important actors in the process. It is therefore important that there is a high level

of cooperation between the consortium and the customer, which is confirmed by Raddats et al. (2019) as well. Additionally, the studies of Bankvall et al. (2016) and Forkmann et al. (2017) show that SMEs need to interconnect their business model with, among others, the customer. However, they do not identify to what extent. This research has shown that the customer needs to be closely involved at the beginning of the process as this is where the most impactful decisions need to be made. As the process proceeds, the customer remains involved, but the degree of involvement declines. In doing so, these results supplement the findings of Bankvall et al. (2016) and Forkmann et al. (2017).

Furthermore, Helfat and Lieberman (2002) state that the performance level of the capabilities[6], i.e. 'what the firm can do', depends on the resources, i.e. 'what the firm owns', that are combined (Ulaga & Reinartz, 2011). This is confirmed by this study, showing that the quality of an activity can only be adjusted, or improved, if the actors interact with each other and integrate their knowledge. Additionally, it has been found that, in order to combine resources and thus improve activities, the actors are very dependent on the willingness of other actors to share their resources. This is shown by the interaction between an architect and a cleaner, which leads to the achievement of more performance outcomes rather than one. On the basis of these findings, is can be concluded that this research complements those of Helfat and Lieberman (2002).

Moreover, Ulaga and Reinartz (2011), and hence Helfat and Lieberman (2002), adopt the resource-based view, which, according to Eloranta and Turunen (2015), is considered one of the most dominant theories in studying servitization literature. The resource-based view focuses only on "individual transactions of a particular firm, while not taking into consideration interacting and collaborating processes of various firms through which they are able to create distinct and joint capabilities" (Weigel & Hadwich, 2018, p. 3). A possible reason for this theory to be most dominant is that servitization has so far been more frequently applied by MNEs, who do have the financial and managerial resources and critical mass to benefit from servitization in isolation (Rapaccini et al., 2019). However, in contrast, this research reveals that SMEs are incapable of providing advanced services in isolation and therefore consciously interact with different companies to ensure the success of servitization. This interaction enables them to bundle knowledge, which ultimately results in

[6] In the context of this case study, capabilities are equivalent to activities (Partanen & Möller, 2012).

more streamlined processes and improved outcomes. Therefore, these findings complement the research of Ulaga and Reinartz (2011), and Helfat and Lieberman (2002), in that a network perspective is a more relevant approach to study servitization, especially among SMEs. This is confirmed by Weigel and Hadwich (2018), who indicate that a relational view, which is similar to the network perspective in that it focuses on the "joint idiosyncratic contributions of specific alliance partners and the service ecosystem" (Eloranta & Turunen, 2015, p. 404), is a better way to study the network effect in servitization as opposed to the resource-based view.

The results show that, to increase the willingness of actors to share their resources, it is necessary to strengthen the relationship between them. Especially with regard to the aspects trust and commitment. The stronger the mutual trust, the more willing an actor is to commit and share their resources. As a result, possibilities for efficiency can be jointly identified, resulting in achievement of performance standards and accomplishment of the value proposition. These results reinforce the findings of Podolny (2001) and Uzzi and Lancaster (2003) regarding structural embeddedness. According to them, strongly embedded actors are more willing to share their resources, knowledge and skills (Podolny, 2001) in order to enable change in a structure (Uzzi & Lancaster, 2003). However, these observations are contradictory to the findings of Sklyar, Kowalkowski, Sörhammar, et al. (2019), who indicate that strong relationships are needed, but ultimately lead to rigidity in the network (Granovetter, 1977). It is argued that weak linkages are needed to prevent this rigidity and make innovation possible (Granovetter, 1983). Contrary to the existing findings, this research shows that weak links are in fact unfavourable. A weak relationship between actors can cause one actor to be less willing to adapt to other actors, resulting in less favourable outcomes for both the customer and the consortium as well. Here is referred to the relational embeddedness of actors, studied by Baraldi et al. (2012) and Forsgren et al. (2005). According to them, strong relationships involve a high degree of adaptability (Baraldi et al., 2012), which influences the ability of actors to access or combine resources of other actors (Forsgren et al., 2005). In other words, if actors are weakly relational embedded, they show a low degree of adaptability which makes it difficult for other actors to access or combine their resources for a desired end result. Our results showed that when an architect is not willing to adapt his design to the wishes of a façade supplier, the two actors have a weak relationship. However, this weak relationship causes the energy technicians to have

little access to the resources of the façade supplier, which might result in the impossibility of achieving the energy performance outcomes. It is concluded that a weak relationship not only leads to negative results at dyadic level but affects the network level as well. These findings are confirmatory to the ones of Baraldi et al. (2012) and Forsgren et al. (2005), but contradicting with Granovetter (1983, 1997). Additionally, the findings are in line with Martinez et al. (2010) who found that "the absence of internal cooperation, common language and alignment of mindsets slows down transformation efforts" (p. 15). More specifically, they argue that a high degree of cooperation is needed to make the integrated supply process more effective, involving more exchange of knowledge and information, transparency between relationships, and the formation of close operational links (Martinez et al., 2010). In addition, this research has shown that not only information exchange is important, but also the processing and storage of this information. This makes it easier to predict unpredictable actions and recognize errors, which reinforces the effectiveness of the process as well.

In addition, it has been found that although activities and resources are increasing, the knowledge of the focal firm became more superficial. As a result, it became impractical for the focal firm (SME), as opposed to base services, to assume and retain responsibility for all the included activities and actors. Therefore, when moving to advanced services, SMEs need to decentralize their responsibilities and place them downstream in the value chain. This is in line with the observations of Visnjic, Neely, and Jovanovic (2018), who indicate that companies should not only transfer their activities but also their responsibilities to external actors. This is particularly evident in the advanced services, where performance guarantees are given on the outcomes the customer aims for (Baines & Lightfoot, 2013). By placing responsibilities at the bottom of the value chain, knowledge will be better utilised as, according to the results, the manufacturer of the product or service should have more knowledge of this himself as opposed to intermediaries. However, where our research shows that outsourcing of responsibilities reduces the risk of the focal firm because they are no longer responsible for activities of which they are not knowledgeable, Visnjic, Neely, and Jovanovic (2018) on the other hand, indicate that the risk of the focal firm increases, especially in terms of partner opportunism and joint coordination of activities. A possible reason for this could be that, while outsourcing responsibilities the focal firm becomes less dependent on the knowledge required for performing the activities, it might become more

dependent on the mutual cooperation between those actors and whether or not they do perform well. Since all actors are jointly responsible for achieving the goal, it means that if one actor performs poorly, it has direct consequences for the rest of the network (Gebauer et al., 2013; Partanen & Möller, 2012).

5.2.2 Practical implications

This research will help managers of SMEs to gain a better understanding of the formation and continuation of networks related to the structure when transition from base services to advanced services. They may choose to develop their resources internally to expand their capabilities and create integrated product-service offerings. However, through this research they have now recognized that outsourcing may also be possible, with positive consequences as a result. In this respect, SMEs need to pay close attention to the selection of partners as they determine the success in servitization.

First, when transitioning towards advanced services, managers need to expand their value creating activity base and its underlying resources to be able to perform an increasing number of activities that were initially performed by the customer itself. In doing so, they need to make sure that external activities are as far as possible derived from one single actor. This is advantageous since it reduces the number of actors involved in the network, thereby making it easier to manage the relationships. However, this is only possible if the underlying resources of these activities are already connected to a certain extent (e.g. design, realization and maintenance of an installation). If this is not the case, the actors need to rearrange their activities and seek for mutual coordination in order to create efficiency. Contrary to the aforementioned, this increases the complexity and number of linkages, which requires the relationship between actors to be strengthened.

Secondly, expanding the range of activities requires an increase in knowledge and responsibilities. Some activities, however, require very specific knowledge that is beyond the core business of the contractor. In that case, it is too risky for the contractor to remain responsible for these activities and is advised to outsource these responsibilities to the respective executing actor. In fact, they are the 'specialists', who have the most knowledge of their product/service being delivered.

Third, it is not only necessary to seek alignment between activities within a single phase of the process, but rather across the entire value creating process. If activities are

aligned on both sides of the firm, manufacturer-external partners, and manufacturer-customer, this will (in most cases) result in an improvement of product quality, more efficient processes and a lower TCO. In other words, it results in efficiency and effectivity of all activities involved.

Fourth, it is important that all actors within the network are committed to adapt and share information. When it comes to advanced services, it is the achievement of the common purpose that comes first, which is sometimes disadvantageous to the individual business goals. However, the willingness to adapt seems to be accompanied by trust. The more trust an individual actor has in the other network actors, the more he is willing to adapt and share information. Thus, a strengthening of the relationship between the actors is needed in order to facilitate the efficiency of the process.

Fifth, the role of the customer is more important in advanced services. By empowering it especially at the beginning of the process, where the most impactful decisions have to be taken, they will contribute both to a better understanding of the performance results interpreted by the consortium, and to the efficiency and effectiveness of the (construction) process.

5.3 Limitations

5.3.1 Internal validity

Internal validity indicates whether the researcher measures what was actually intended (Salehi, Abiri, Hosseini, & Dorostkar, 2004). Since it is suggested that qualitative research is not only objective but also subjective to some extent (Kawulich, 2005), the validity of the research may be influenced. This is reflected by the fact that the interviews were coded using the GTM, whereby the researcher only considered the relevant aspects identified by the literature review. Since this research is part of a doctoral study, the researcher was somewhat guided in the application of literature. It is therefore argued that the literature research is to some extent distorted by the opinion of the researcher, which limits the internal validity. On the other hand, the doctoral study has a positive effect on internal validity as well. The high degree of cooperation between the researchers, ensured that the researcher of this study could not or hardly deviate from the initial research goal.

Furthermore, the internal validity was limited due to the unforeseen worldwide impact of COVID-19. While the individual interviews were already conducted before COVID-

19 occurred, this was not the case for the focus group sessions. Given the circumstances, this had to be moved to another date and had to take place in an online setting instead of a physical one. Even though the session was split up into two groups and supervised by two researchers to better manage the session, the results were limited. This was caused by certain factors. First, the course of the session was dependent on the input of respondents, making it impossible to fully prepare the session. Second, both researchers had never supervised this kind of session before. As a result, it turned out during the session that time went by very quickly, allowing only one point of improvement to be discussed in detail instead of two or more. As this did not fully measure what was initially intended, it can be concluded that the internal validity is limited.

5.3.2 External validity

External validity refers to the extent the findings of the case study can be applied to other situations (Salehi et al., 2004; Saunders et al., 2009). During the research it was found that BuildCo is already very mature in terms of servitization and networking. It has already entered into many partnerships to supplement their missing expertise. These partners themselves also indicate that BuildCo is one of the pioneers regarding servitization in the utility market. This, in combination with the fact that the insights of the first part of this study (SQ 1) were given by respondents that belong to the same contractor's network within an single industry, resulted in restrictions on the identification of fresh ideas and/or major improvements and thus a limitation in the external validity. Eventually, during the focus group session, the choice was made to invite an actor from a semi different sector who had already successfully implemented servitization. As a result, different insights emerged. Despite this decision, the external validity could be improved if more individual interviews had been conducted with pioneers from other sectors in the field of servitization as well.

Next, it can be questioned if this case study organization is representative for other organizations. In this study, the organization operates in the utility market, which is highlighted by heterogeneous customer demands. This makes the results of the study strongly case specific. With the help of an in-depth case description, a clear image of the current situation of the organization and its network structure and functioning is given. These outcomes enable researchers and other organizations to compare the results and decide whether these are representative for them. Next, this study represents a single case

study. This implies that the results of this study represent a small sample size. This, in combination with the specific case study outcomes, limits the external validity. However, the degree to which the validity is limited is less pronounced, because this case study adopts a network perspective rather than a dyadic perspective. This implies that a wide range of different people and activities are invariably examined, making the validity less limited (Bryman, 2003).

5.3.3 Reliability

Reliability indicates to what extent the data collection techniques or analysis procedures will yield consisted findings (Saunders et al., 2009). According to the literature this could be related to issues of bias, including interviewer and response bias (Saunders et al., 2009). Because there were eleven individual interviews, the researcher of the doctoral study offered to conduct two interviews to lighten the workload of the researcher of this study. The remaining interviews were either conducted together or alone by the researcher of this study. Even though the questionnaire was semi-structured, the structure of the interview is appeared to be highly dependent on the questioning and interpretation of answers. Thus, the separate approach for conducting interviews negatively influenced the reliability of the research. For this reason, after the data collection and the individual analysis, both researchers analyzed the results together again, which in turn increased the reliability.

Furthermore, the reliability increased due to a high response rate in combination with triangulation. Since the researcher conducted eleven one-to-one interviews whereby the diversity of respondents was high, the consistency of results increased. This in combination with the focus group interview, content analysis and a logbook, which was kept of unexpectedly results that came up for discussion, enabled the researcher to validate the data with an increase in reliability as a result.

5.4 Future research

Based on the findings and limitations, some recommendations are made for follow-up research. First, it has been found that external actors are needed to fill in the missing competences of the focal firm. In this respect, it is no longer the customer or just the focal firm who is responsible for achieving and maintaining performance outcomes, but all the actors involved, who present themselves as specialists. It has become apparent that a different incentive is required from the actors included and that not all of them are willing to

do so. Further research could investigate what discourages these actors from complying with this incentive and what should be accomplished to make them motivated to do so.

Second, it appears that in the sector where this case study was based on it is not easy, as compared to other sectors, to pre-finance the investment required for pay-per-use contracts. This is caused in the first place by the legislation and regulations in this sector which make it necessary to tender, and in the second place by the heterogeneous customer requirements, which make pre-financing risky. Follow-up research could be conducted to investigate to what extent investors are interested in this, what their thoughts are, and how such financial construction would look like.

Third, it has been noted that the tender process represents a major bottleneck in the implementation of BaaS. However, this has not been investigated further during this study because it would go beyond the scope of the research objective. Nevertheless, it can be very valuable to examine in the future whether the tender legislation, within the frameworks of European legislation, can be mitigated in order to facilitate an early match between supply and demand.

Fourth, as already mentioned, it is a very specific case study. To generalize the results, it is necessary to repeat this study across other sectors. In this context, it may be useful to involve both current cooperation partners and partners who are not yet involved at present. In addition, instead of a single case study, a multiple case study may be carried out, making the reliability of results even higher. However, the latter will take more time for investigation. Furthermore, it was found that the company of this case study was already quite mature in terms of servitization and the involvement of external partners. To position itself with respect to competitors, it might be interesting to repeat this study by taking another case organization in the same sector. This gives the case company that is used for this research an understanding of the maturity of its organization.

Fifth, this research is mainly focused on the activities that need to be undertaken within servitization and to what extent actors can contribute to its success by providing additional resources. However, it is not investigated to what extent the internal personnel of the firm is affected. It would be a fruitful addition to this case study to find out to what extent internal staff is suitable for delivering a servitization strategy, what the preconditions are for this and how this affects the internal organizational structure.

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7. Appendix

Appendix I	Education systems in the Netherlands
Appendix II	Customer segment (additional)
Appendix III	Questionnaire
Appendix IV	Mail focus group session
Appendix V	Set-up focus group session
Appendix VI	Visual representation focus group session
Appendix VII	Coding tree

Appendix I: Education systems in the Netherlands

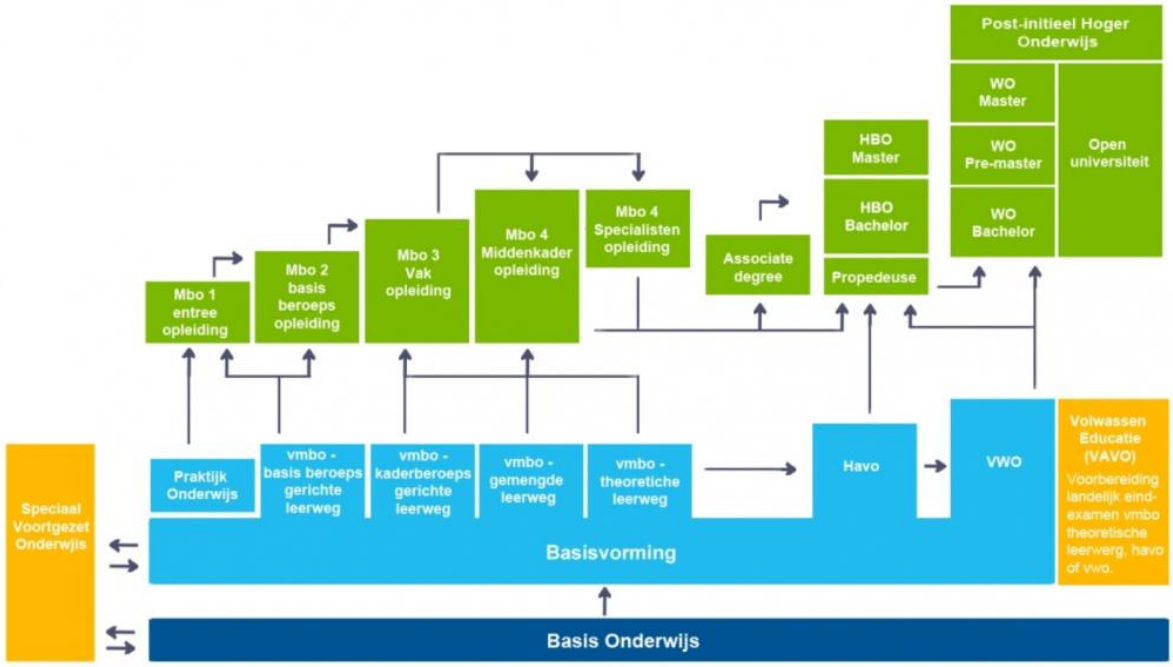

Figure 6: Education systems in the Netherlands (Lerenwerken.nl, 2016)

Appendix II: Customer segment (additional)

The demographic evolutions influence to some extent the heterogeneous customer demand within the Dutch education market as well. According to the Ministry of Education, Culture and Science, the number of pupils and students in Primary education, Secondary education and Secondary vocational education will decline at a national level until 2030, with a more significant effect for one region than another (OCW, 2018). As schools are funded per pupil, a decrease in the number of pupils will result in lower school budgets. To control this situation, schools will need to cooperate by merging governance and/or educational concepts. This results in an increasing demand for multifunctional and 'modular' buildings that are flexible and easily adaptable to change *(R08, R09)*.

Furthermore, there is an increasing demand for energy-efficient and 'fresh' schools. A fresh school is a school building that has low energy consumption and a healthy indoor climate with regard to air quality, temperature, comfort, light and noise (RVO, n.d.-b). This importance is supported by educational institutions who recognise that a good building leads to better performance of both pupils and staff *(R13)*. This trend is also reinforced by the Dutch government, which from 2021 will only approve permit applications for new buildings (housing and non-residential construction) that comply with the Nearly Energy Neutral Buildings (BENG) requirements (RVO, n.d.-a).

Appendix III: Questionnaire

Inleiding

1. Kunt u kort iets vertellen over uw organisatie?
   - Wat voor product/service wordt geleverd
   - Jaarlijkse omzet
   - # FTE
2. Kunt u kort iets vertellen over uw functie?

Waardepropositie

3. Kunt u een beschrijving van de klant (i.e., onderwijsinstellingen) geven en de core business incl. KPIs van de klant toelichten?
4. Kunt u een beschrijving geven van hoe het schoolgebouw de core business van de klant ondersteunt? Wees zo concreet mogelijk.
5. Wat zijn de (meest genoemde) eisen die klanten stellen aan een gebouw voor het uitvoeren van hun core business en behalen van KPIs?

Netwerk (bouwproces incl. initiatie en ontwerpfasen)

6. Hoe ziet het bouwproces van A tot Z (initiatie t/m exploitatie) eruit?
   - Wat is jullie rol in het bouwproces?
   - Wat zijn verder de belangrijkste rollen die nodig zijn om een gebouw te realiseren
   - Wie zijn de meest belangrijke actoren die deze rollen uitvoeren? Denk hierbij aan leveranciers, complementors, klanten, onderzoeksinstellingen, overheid of concurrenten.
   - Hoe ziet de flow van input en output eruit in het netwerk? Dus wie levert wat aan wie?

Relaties en samenwerking

4. Als we het hebben over de meest belangrijke actoren vanuit uw perspectief, kunt u wat zeggen over wederzijdse afstemming van de manier van werken of de resources (e.g., technologie, personeel, kennis of informatie)?
5. Kunt u wat zeggen over de relatie met de meest belangrijke actoren in uw netwerk in termen van:
   - Krachtsverhoudingen (wie is afhankelijk van wie)
   - Commitment (bereid om opofferingen te maken voor de andere partijen)
   - Vertrouwen (e.g., delen van gevoelige informatie)
   - Wederzijds begrip (bijvoorbeeld het spreken van dezelfde (vak)taal)
   - Historie van de samenwerking
   - Toekomstige verwachtingen
6. Zijn er nog actoren waar geen actieve (langdurige) samenwerking mee is terwijl dit wel gewenst is. Indien ja, waarom is dit niet?

Building-as-a-service

7. Als een gebouw als geïntegreerde offering wordt aangeboden (een partij of consortium voor alle facetten van een gebouw), welke implicaties zou dat hebben voor uw rol binnen het netwerk?
8. Wat voor implicaties zou dit hebben voor het netwerk en de samenwerking in het bouwproces?
9. Wat voor implicaties zou dit hebben voor de rol van de klant in het bouwproces?

<u>Uitnodigen workshop</u>

Appendix IV: Mail focus group session

Email deelnemers workshop

Beste respondent,

Via deze mail willen wij jullie graag meer informatie geven over de workshop van dinsdag 14 april a.s.

Zoals aangegeven in de vorige mail zal de workshop digitaal worden georganiseerd en hebben we bewust gekozen om de groep op te delen in twee groepen. Omdat deze workshop deel uitmaakt van een groter onderzoeksproject m.b.t. servitization in de bouw, zal Xander Stegehuis ook deelnemen aan de workshops. De rol van Xander en mijzelf zal faciliterend zijn wat betekent dat wij niet inhoudelijk deelnemen aan de discussies.

Het doel van de workshop luidt als volgt: het identificeren van verbeterpunten om technisch -en service gerelateerde gebouwprestaties te borgen t.b.v. Building-as-a-Service. Om dit doel te behalen staan tijdens de workshop twee vragen centraal:

1. Waar is ruimte voor verbetering m.b.t. het borgen van gebouwprestaties?
2. Hoe kunnen deze verbeterpunten gerealiseerd worden?

Om er voor te zorgen dat workshop effectief verloopt en we ons volledig kunnen focussen op het identificeren van verbeterpunten en het creëren van oplossingen, verzoeken wij jullie om een kleine voorbereiding te doen. We vragen jullie na te denken over de **drie** meest urgente verbeterpunten die betrekking hebben op een of meer van het onderstaande:

- Restwaarde/levensduur van het gebouw
- Beschikbaarheid
- Comfort
- Energie
- Contract

De interpretatie van deze onderwerpen/prestaties zal voor elke deelnemer anders zijn, dit is geen probleem. Iedere workshop deelnemer krijgt de tijd om zijn of haar verbeterpunten te delen en toe te lichten. Vervolgens selecteren we gezamenlijk de meest urgente verbeterpunten, waarna de meest belangrijke verbeterpunten gedetailleerd worden besproken. Hierbij ligt de focus op wat er in het netwerk moet veranderen zodat de geselecteerde punten verbeterd kunnen worden.

Verder verzoeken wij jullie een blik te werpen op bijgevoegde afbeelding die de structuur van het huidige netwerk weergeeft. Deze afbeelding is gemaakt op basis van de interviewdata en willen we graag bij jullie valideren. Als de tijd het toelaat kunnen we deze afbeelding bespreken, maar de focus ligt op het bespreken van verbeterpunten en oplossingen. Vandaar mijn verzoek om je op- of aanmerkingen over de netwerk structuur via de mail (of telefonisch) met Merle te delen.

Tot slot willen wij jullie vragen om dinsdag 14 april om 09.55 uur op onderstaande link te klikken zodat we om 10.00 uur direct kunnen beginnen. De link zal je leiden naar de workshop die wordt georganiseerd met behulp van Microsoft Teams.

Mocht je nog vragen of opmerkingen hebben dan hoor ik het graag en anders tot 14 april!

Met vriendelijke groet,

Xander Stegehuis en Merle Lansink

Appendix V: Set-up focus group session

Inhoudsopgave

Verbeterpunten m.b.t. exploitatiefase

Legenda
- Meest belangrijk
- Belangrijk
- Valt af

1) Voorstellen (naam, bedrijf en functie) en verbeterpunten benoemen en toelichten
2) In VoxVote (zie chat) mag je de **6** meest belangrijke verbeterpunten selecteren (**5 minuten**)

Let op: 1 = meest belangrijk en 6 = minst belangrijk

Respondent X	Respondent X	Respondent X	Respondent X	Respondent X
1:	4:	7:	10:	13:
2:	5:	8:	11:	14:
3:	6:	9:	10:	15:

Instructies

- Microfoon uit, wij coördineren wie spreekt
- Reageren via de chat
- Inloggen VoxVote (zie chat)
- Tijdmanagement

Verbeterpunt #1: ..

Waarom is dit een verbeterpunt?	Wat zijn de benodigde veranderingen?
• ..	• ..
	Hoe kunnen deze veranderingen gerealiseerd worden?
	• ..

Verbeterpunt #2: ..

Waarom is dit een verbeterpunt?	Wat zijn de benodigde veranderingen?
• ..	• ..
	Hoe kunnen deze veranderingen gerealiseerd worden?
	• ..

Appendix VI: Visual representation focus group session

Results focus group session 1:

Verbeterpunten m.b.t. exploitatiefase

Legenda
- Meest belangrijk
- Belangrijk
- Valt af

1) Voorstellen (naam, bedrijf en functie) en verbeterpunten benoemen en toelichten
2) In VoxVote (zie chat) mag je de **6** meest belangrijke verbeterpunten selecteren (**5 minuten**)

Let op: 1 = meest belangrijk en 6 = minst belangrijk

Marcel (BINX)	Heleen (BINX)	Stefanie (BINX)	Sytze (INGY)	Martijn (ABT Wassenaar)	Wouter (Asito)
1: Verhogen restwaarde van een gebouw	4: klanten moeten bewuster worden in keuzes m.b.t. materialisatie die ze maken en hier beter in begeleid worden.	7: Weet een klant exact wat hij/zij van ons (BINX?) kan en mag verwachten? (heeft de klant de juiste kennis zodat kan BINX daar haar product/dienst beter op afstemmen)	10: Multifunctioneel en flexibel gebouw realiseren.	13: Realistischere energie berekeningen maken om zo beter en specifieker in te kunnen spelen op klantvraag.	16: Versnellen en verbeteren verstoringsproces. Informatiedeling moet beter en handelingen sneller t.b.v. beschikbaarheid. Eenheid in systemen.
2: Op voorhand vastleggen van gezamenlijke verantwoordelijkheden	5: meer integrale aanpak tussen partijen onderling. Hierdoor afstemming versoepelen, TCO kunt verlagen en restwaarde verhogen.	8: Vastleggen van SMART afspraken tussen opdrachtgever en BINX, zodat je ook beter kunt monitoren en borgen	11: inhoud contract aanpassen en niet alleen op afdekken van risico's maar ook op samenwerking.	14: Integraal denken en werken. Werkzaamheden van leveranciers/adviseurs combineren om meer direct contact (korte lijnen) te krijgen. Communicatielijnen verminderen en efficienter maken.	17: Bij keuzes omtrent inrichting van het pand beter nadenken of het positief/negatief bijdraagt aan onderhoud of verlening levensduur gebouw.
3:	6:	9:	12: Inventarisatie maken met klant van hun wensen en daar aanbieding op afstemmen. Functionaliteit optimaal matchen met klantprocessen.	15: Modulair bouwen t.b.v. verhogen flexibiliteit en restwaarde gebouw. geautomatiseerd bouwen om de efficientie en doorlooptijd van het bouwproces te verkorten (voorbeeld Broad Sustainable Building)	18: Inrichting van contracten moeten op elkaar worden afgestemd (geen silo's). Een bepaalde keuze voor onderhoud kan namelijk leiden tot meer werk m.b.t. het behalen van prestatie voor schoonmaak.

Verbeterpunt #1: Het gebouw en haar functionaliteit perfect aansluiten op objectieve klantwensen

Waarom is dit een verbeterpunt?	Wat zijn de benodigde veranderingen?
• Omdat de klant niet de juiste kennis heeft om de klantwens objectief te formuleren en daardoor vaak een hiaat ontstaat tussen vraag en aanbod. • Bouwmanagementbureau moet dit aansturen maar heeft hier zelf ook niet altijd de juiste kennis van.	• Dialoog met de opdrachtgever • Klantbegeleider, wie is dit? • Zorg dat de juiste expertise wordt ingezet op de juiste momenten, dit kan afwijken van het huidige proces • We leggen nu vaak aan de voorkant de "klantwens" al heel erg vast in een uitvraag en daaropvolgende offertes/contracten. Ik vond het idee meer ruimte te houden in de uitvraag daar een mooie oplossing voor. (moet opdrachtgever in aanpassen) • Moet bij een BAAS niet al op de tekentafel de samenwerking tussen Binx en Opdrachtgever beginnen? • Of een fase voor de daadwerkelijke uitvraag waarin in dialoog gesproken wordt over wat de uitvraag moet zijn. • En idd in engineering ook gelijk het BAAS aspect tegelijk oppakken • De uitvraag moet opener zijn, zodat in een soort tenderfase werkelijke gekeken kan worden naar de wensen van de klant en hoe deze ingevuld kan worden. Dialoog is hierbij heel belangrijk. (Dialoog zijn wij altijd voorstander van, ook in tender, maar niet elke OG wil dat.... OG is vaak bank voor het ontstaan van ongelijkheid in info verstrekking aan inschrijvers (aanbestedingsrecht) • Mogelijkheid om na gunning klantwens verder uit te werken? • Stoppen met smart formulering van klant wensen.
	Hoe kunnen deze veranderingen gerealiseerd worden?
	• Zou je dan niet die gesprekken los moeten trekken van het gunningstraject? • Vertrouwen is wel heel erg belangrijk hierin (hoe?) • Stoppen met smart formulering van klant wensen. • Mogelijkheid om na gunning klantwens verder uit te werken? • Bouwmanagement moet aansturen: welk gebouw heb je nodig, welk contract hoort hier bij. • Groot issue is ook de voorschriften en procedure van het tender proces zelf. Die gaan wij nu niet oplossen veranderen.

Verbeterpunt #2: Inrichting van contracten moeten op elkaar worden afgestemd (geen silo's).

Waarom is dit een verbeterpunt?	Wat zijn de benodigde veranderingen?
• ..	• ..
	Hoe kunnen deze veranderingen gerealiseerd worden?
	• ..

Results focus group session 2:

Verbeterpunten m.b.t. exploitatiefase

Legenda
- Meest belangrijk
- Belangrijk
- Valt af

1) Voorstellen (naam, bedrijf en functie) en verbeterpunten benoemen en toelichten
2) In VoxVote (zie chat) mag je de **6** meest belangrijke verbeterpunten selecteren (**5 minuten**)

Let op: 1 = meest belangrijk en 6 = minst belangrijk

Bram (BINX)	Remco (BINX)	Maarten (M3V)	Chris (Wiggers)	Martijn (Alkondor)
1: Samenwerking in consortia	4: Restwaarde gebouw verhogen	6: Omgaan met verschillende exploitatie / exploitatie kasstromen t.b.v. TCO incentivering OG	9: Anticiperen op toekomstige klantwensen of gebouw Eisen.	10: Aanbesteden voor TCO i.p.v. stichtingskosten
2: Levensduur verlenging TCO (circulair)	5: Energie prestaties borgen	7: Waarborgen gebouw flexibiliteit		11: Gestandaardiseerd bouwen van unieke gebouwen
3: Decentrale prestatie verantwoordelijkheid		8: Omgaan met heterogene klantbeleving in prestatie contracten		

Verbeterpunt #1: Levensduur verlenging TCO (circulair)

Waarom is dit een verbeterpunt?	Wat zijn de benodigde veranderingen?
• Er zit nu een GAP tussen de ontwerp- en realisatiefase en de exploitatiefase. Deze GAP moet worden verkleind middels een integrale aanpak zodat de TCO wordt verlaagd en de levensduur van het gebouw wordt verlengd.	• Bekijk het vanuit het perspectief van de klant • Leveren van een prestatie comfort/ energie, schoon • Verplichten dat iets een x aantal jaar mee zal gaan • Prestaties bij ketenpartners weerleggen (verantwoordelijk maken) • Real time monitoren middels informatie uit gebouw • dat we beter nadenken over de losmaakbaarheid van de gebouwproducten, Het gebouw niet als een uniek object/kunstwerk moeten zien, maar als een samenstelling van gestandaardiseerde producten. • op constructief gebied: bijvoorbeeld hogere (vloer)lasten rekenen dan strikt volgens norm noodzakelijk. Dit zorgt voor grotere vrije indeelbaarheid en andere toekomstige gebruiksfuncties. • Definitie vastleggen van circulair • TCO van onderdelen icm langdurig onderhoud • Loskoppelen projectcyclus en productcyclus • Esthetica vs levensduur vs circulair • Flexibel gebouw/circulair/vrije indeling • Contractduur vs levesnduurkosen vs gebruikswaarde van de klant, het patchen van dakbedekking vs nieuw • Demontabel bouwen • Nadenken hoe we eenvoudig upgrades kunnen dien in de producten (tbv anticiperen op gebruikersprocessen, en functies) • Niet meer opleveren maar prestatie is onderdeel van de levering • SLA contract op basis van de prestaties • Real time monitoren van gebouw en KPI's definieren • Gebouw upgrades **Hoe kunnen deze veranderingen gerealiseerd worden?** • ..

Verbeterpunt #2: Samenwerking in consortia

Waarom is dit een verbeterpunt?	Wat zijn de benodigde veranderingen?
• ..	• .. **Hoe kunnen deze veranderingen gerealiseerd worden?** • ..

Appendix VII: Coding tree

Network	Construction process general	Integration of activities			
		Risk and responsibilities			
		Degree of cooperation			
		History			
	Actors	Customer-side	End-customer	Director educational institution/foundation, user	
			Municipality		
			Building management agency		
		Contractor-side	Internal	Director, tender manager, project leader (incl. supervisor construction), supervisor installation, financial specialist, BIM-coordinator	
			External	Subcontractors	
				Advisors	Architect, advisor building physics, fire safety and acoustics, structural engineer
				Product supplier	
				Raw material supplier	
	Resources	Financial resources, knowledge/expertise, human resources, digital information systems, goods			
	Activities	Advising, decision-making, engineering, calculating, coordinating, Q&A session, purchasing, submission of (tender)documents, assessing, granting of permits, designing, maintaining, building, facilitating, using			