Service-Based Business Model Innovation in Product-Based Firms – A Comparative Study

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List of Abbreviations

AI	Artificial Intelligence
B2C	Business-to-Customer
B2B	Business-to-Business
BM	Business Model
BMI	Business Model Innovation
CAP	Common Agricultural Policy
CCP	Context, Content, Process
CVP	Customer Value Proposition
CO^2	Carbon Dioxide
DevOp	Development and Operation
DSI	Digital Service Innovation
ERP	Enterprise Resource Planning
GDPR	General Data Protection Regulation
GSM	Global System for Mobile Communication
IoE	Internet of Everything
IoT	Internet of Things
IT	Information Technology
KPIs	Key Performance Indicators
M2M	Machine-to-Machine
MNO	Mobile Network Operator

OEM	Original Equipment Manufacturer
PSS	Product-Service System
R&D	Research and Development
RBV	Resource-based View
SAP	Systemanalyse Programmentwicklung
SDL	Service-Dominant Logic
SIM	Subscriber Identity Module
SLA	Service-Level Agreement
UX/UI	User Experience/User Interface

Abstract

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(Holger Benad)

Traditional strategy in existing markets or product classes typically involves reducing costs, improving quality, or incremental innovation, which leads to increasingly dense competition with little room for maneuver. In order to compete in a digital era, traditional companies have to reinvent themselves by reallocating their resources and business processes to offer a new service value proposition in parallel to the legacy one. This thesis investigates the business model restructuring of companies in terms of service-oriented value innovation as a new business model woven in an established product-oriented company. Johnson's business model framework, with its four interlocking building blocks, provides the basis for qualitative research exploring how companies reinvent themselves to foster radical service innovations. The research approach includes three case study companies in the business-to-business sector, each of them representing the key actors in their industry. Research was conducted through 31 semi-structured interviews over more than a four-year period. The research helps unpack the evolutionary process of the new service business model, illustrating how companies manage the steps from a single project base to a service value proposition suitable for the mass market. While existing theory already provides an understanding of what a business model is and which single elements might be involved in an innovation process, the research extends this to explore how the elements of a service-based business model innovation affect each other in an activity system and how they become relevant in the course of the evolutionary process. The core findings also expand the business model approach in terms of an ecosystem perspective, which plays a decisive role in the innovation process in terms of newly established partnerships for the new service value proposition but has remained hitherto underexplored.

CHAPTER 1: OVERVIEW OF THE RESEARCH

1.1 Introduction

It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change. (Leon Megginson)

Today industries are changing at a rapid pace, meaning that established companies are more likely than ever to lose out to more innovative and dynamic competitors, including emerging start-ups. These developments have been spurred on by globalization and the rapid advances in information and communications technologies, especially over the last 10 to 15 years. One possible response is for firms to try to compete more effectively with the help of traditional marketing concepts and strategies (Porter, 1996; Palmer and Kaplan, 2007; Porter and Siggelkow, 2008). A second option is to try to pre-empt the competition through developing compelling new customer value propositions (CVPs) based on new technological possibilities (Raddats et al., 2019; Baines et al., 2020; Hoch and Brad, 2021; Paiola et al., 2022). This second option is value innovation, more widely recognized today under terms such as "blue ocean strategy" (Kim and Mauborgne, 2005), "radical innovation" (O'Connor and DeMartino, 2006), "disruptive innovation" (Christensen, 1997), or a number of other such variants (see Leavy, 2010). This suggests that companies may benefit from exploring innovation beyond their comfort zone, rather than focusing solely on incremental updates to the existing value proposition based on well-established processes and resources (Ibarra et al., 2018). Rather, the perspective of the company must leave this comfort zone and develop new value propositions for its

existing customer groups and attract new customer groups that were not in focus before even if they have to be created away from established processes and experience to calculate a detailed business case (Grubic and Peppard, 2016).

Industry examples indicates that while game-changing breakthroughs in value may or may not involve a breakthrough technology, they nearly always involve an innovative business model. A frequently cited example is Apple's introduction of the iPod/iTunes value proposition in 2003. This innovation departed significantly from Apple's traditional product-oriented approach by offering a new customer value proposition combining their physical product (iPod) with an online music downloading service (iTunes). Not only was the customer value proposition changed, but other elements of the traditional Apple business model had to be adapted to serve the new market. In particular, great consideration had to be given to the shaping of the surrounding ecosystem, e.g. the enabling technology, digital management rights to the content, and accessibility of the online store. In contrast, Amazon found a new value proposition in extending beyond its purely service-based business model to one that also embraced a product-based service offer, similar to that of the iPod, coming at it from the opposite direction. One interesting contrast between the Apple and Amazon approaches to product-based services is the contrasting profit models. The Apple model is aimed at making money on the devices, whereas the focus with the Amazon model is on making most of its profits through the associated services.

These two examples are representative of many other companies, or even entire industries, that have sought to combine products and services to better realize customer

requirements. Keywords associated with this transition include “Industry 4.0” and “servitization”, which are some of the key trends in industry (Frank et al., 2019) involving data-driven services as part of the overall value proposition. According to Statista.com (2022), almost 30 billion devices will be connected by 2030 (2021=11 billion devices) and the big data market size will grow up to 655 billion US dollars by 2029 (2021=240 billion US dollars). This drastic increase in networking shows that a radical change is occurring. Just offering a simple product is no longer sufficient, as through new technologies data for unmet customer needs is available. Similarly, the trend and the demand for data-based value is not only present in hi-tech companies but has also arrived in traditional ones. Companies like Rolls-Royce, Caterpillar, and Hilti (Kohtamäki et al., 2020; Favoretto et al., 2022) have undergone a radical business model transformation (Paiola et al., 2022) to add services to their portfolio as a serious source of income. However, for long-established companies, the new field of data-based services is difficult to grasp and integrate into their product-based corporate culture. But it is vital for them to distance themselves from direct competitors who enter the market with disruptive product innovations, on the one hand, or with cheap copies of products, on the other. The question for practitioners and researchers is whether firms transform successfully or not, and if so, why and how. A common approach to describe this form of transformation in a tangible way is the business model approach.

1.2 Relevance of Research

Since the turn of the millennium the scientific world has started to intensively research business model innovation (Wirtz et al., 2016). Researchers like Budler et al. (2021) highlight the need for further research, including with respect to insights from different

perspectives, e.g. in the new frontier of Industry 4.0 and business model innovation capabilities (critical business model elements) or business model management in networks. Likewise, practitioners are still trying to grapple with the nature and challenges of business model innovation business (see, for example, the Boston Consulting Group's ongoing series of publications in the category of "Sustainable Business Model Innovation", e.g. Young and Reeves, 2020).

According to Snihur and Eisenhardt (2022), the business model is becoming a more significant source of competitive advantage than strategy for firms, as well as for organizations such as government agencies and non-profits. Particularly where digital technologies matter, the business model concept captures the sources of competitive advantage better than the simpler, more static, firm-centric perspectives of traditional strategy. A recent summary of the business model evolution by Budler et al. (2021) draws on a bibliometric review to highlight new frontiers in networks and Industry 4.0 (Internet of Things "IoT" is a subset), amongst others, and shows a clear development of research from a basic understanding of the concept around the turn of the millennium to a new trend of researching highly networked and platform-based corporations with the help of the business model perspective. A closely linked research area is concerned with the innovation of business models, which became popular a few years after the hype about business models (Ramdani et al., 2019). After Industry 4.0 has found its way into all kinds of industries, the research in business models and related fields of research also requires a new perspective to explain what inspires the successful innovation process. The current stage of research provides a general understanding, including the specifics of what constitutes innovation – for example, by changing one or more elements – why innovation

could make sense, or what enables such innovation. Recently published systematic reviews deal with open or disruptive innovation research as well as experimentation to develop new business models (revolutionary approach) (Ramdani et al., 2019), drivers (Kraus et al., 2020), and triggers (Bashir, 2020) for business model innovation or a process view (Loon and Quan, 2020). These summaries show the development of business model research and location of this research with its contribution to the business model innovation in the Industry 4.0 context. In this context, this investigation takes a closer look at servitization, which describes the increasing service orientation of established manufacturing companies (Khanra et al., 2021). While the above-mentioned summaries go into detail and discuss individual aspects, the literature currently lacks a review that brings together these areas of research into a more holistic understanding to describe what triggers radical innovations and to capture critical elements via a process view. This more holistic perspective is becoming increasingly relevant as technology for data collection and processing is advancing rapidly, making it easier and more cost-effective to gather and process data from various sources to generate customer value. Organizations are increasingly leveraging the likes of IoT, which enables deep integration of their physical products as well as those of competitors. This study, therefore, focuses on the servitization of traditional organizations, which capitalize on new technologies to connect physical products and create value within a network involving their own organization, customers, suppliers, and even competitors.

1.3 Purpose

Part of the issue hampering progress is that the term “business model” and the accompanying question of its innovation still lacks a common and unanimous consensus

related to definition and key components (see Zott et al., 2011; Spieth et al., 2014). The merits of introducing a business model perspective have also been critically questioned (Porter, 2001, p. 73; Magretta, 2002;), while the approach is frequently misused by practitioners and scholars alike (DaSilva and Trkman, 2014). This limited progress formed part of the motivation to undertake research that would shed light on the business model innovation phenomenon and its development. Further motivation came from my own practical experience as a management consultant dealing with clients in traditional businesses who often struggled to include data-based value propositions in the structures of the established business model that have evolved over many years.

The following sections are aimed at providing an understanding of the foundations of the research, including carefully justifying the considered dimensions of the business model and business model ecosystem, as well as why the correlation of these two dimensions in the context of servitization requires further research. As outlined, the study is not a fully grounded theory research but rather builds on existing insights and frameworks to hone the knowledge and capture the current state of innovation in the industrial environment.

1.4 The Research Question

The topic of business model innovation and its incubation in established organizations is still under-researched. While the research is informed by existing literature, how the theoretical constructs of the business model and innovation ecosystem work together in the innovation scenario that is the focus of this study is not well understood (Edmondson and McManus, 2007). Consequently, a comparative case-based research approach that remains primarily descriptive and somewhat inductive is considered appropriate,

particularly in this first phase of the empirical inquiry (Eisenhardt and Graebner 2007). A further advantage of the case approach is that it lends itself particularly well to the study of change over time, not just the "what" of the change (content) but also the "how" (process) and the "why" (context). The case-based approach has proven to be a very effective research tool in studies with this kind of contextual-processual orientation (Leavy, 1994; Pettigrew, 2012; Yin, 1994).

In the empirical study, a multiple-case approach will therefore be used for generating emerging insights and understanding into the phenomenon of radical value innovation. While studies based on a single case study have been found to address significant research gaps and to generate descriptive and explanatory theory to address them very effectively (Siggelkow, 2007), the choice of a comparative method using two or more cases helps to increase the likelihood of key categories and relationships revealing themselves in the empirical analysis, while also helping to increase confidence in the transferability of the main findings and insights (Yin, 1994; Eisenhardt and Graebner, 2007; Baker and Edwards, 2012). Confidence in the reliability of the findings is also enhanced through the use of multiple data sources in this kind of qualitative study, so that the main empirical data used for this study will be drawn from personal interviewing of multiple respondents and from archival material, both external and internal (Leavy, 1994; Yin, 1994; Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Gioia et al., 2012).

The research context is the construction, conveyor, and agricultural industries, characterized by a long tradition of selling physical machines and now faced with increased competition due to factors like globalization. These industries are currently

undergoing major upheaval, with many of the main incumbents looking to protect and enhance their positions through value innovation strategies that involve the introduction of new service-oriented value propositions and new business models needed to give them effect. Existing theory provides little predictive insight into either the content of these changes – along what dimensions the new business models will differ most significantly from the existing business model – or into the process (how the change will come about, how long it will take, what organizational and commercial challenges the change leaders will face, and how they will be overcome).

Data collection for this preliminary investigation into three cases of radical value innovation in the construction, conveyor, and agricultural industries focused on exploring the following research question:

How do traditional product-centric companies reinvent themselves to foster radical service innovations?

By focusing on the business model transition for traditional product-based organizations, this research investigates what elements are involved in data-based servitization and explores how the innovation of the business model takes place in this context, thereby addressing calls by Kindström and Kowalkowski (2014) and Budler et al. (2021). The applied method of gathering data from 31 semi-structured interviews across three main cases was preceded by another three case studies to provide a better understanding of how organizations can process the servitization based on their legacy product-based business. The findings move beyond current understanding of the general business model

innovation process (e.g. Rachinger et al., 2019; Bashir et al., 2020), providing insights into a specific, but now very much in demand, innovation type of connectivity-based servitization. Research insights point to less explored patterns in the literature of affected key business model components (e.g. components that are relevant for license-based services and their booking or addressing legal specific aspects) as well as capturing how the innovation process evolves over time, thereby shaping the resisting focal structure of the company, but also significantly the network in the whole ecosystem. While previous research adopted a static or conceptual approach to exploring servitization (Markfort et al., 2022) and had a broader view on fundamental services (Frank et al., 2019), the current research unpacks the processes and dynamics of business model innovation via radical services, which lead from a physical product business combined with services to a platform provider (termed “hybrid”). As the processes and dynamics are basically not new, they are constantly exposed to new developments like Industry 4.0. This gives rise to new value propositions; the strategic orientation of companies is changing, and legal requirements or partners have a major influence on how a business model innovation takes place. Illuminating this reality, the case companies indicate that service orientation and the accompanying business model innovation is no longer implemented by a small team, nor is it managed in a single department in the focal company, but rather it requires a change across the entire organization (Johnson et al., 2008). As a growing practical challenge, servitization does not respect disciplinary or departmental boundaries. Even more apparent from the case study companies is that the required change also stretches beyond the organization to encompass the value chain and even across different ecosystems. It is therefore a flawed starting point to consider a department or organization in isolation (Clauß et al., 2014). The comparatively long data collection period spanning

from 2014 to 2019 had the unexpected consequence of enabling insights into the evolution of the case studies' business model. Notably, respondents reported that fundamental decisions changed, networks and partnerships altered or expanded, new roles and processes newly emerged, and on occasion, company strategies were reconsidered. From the data, four innovation dimensions were deemed critical, namely organizational and cultural management, customer management, legal management, and ecosystem management with specific elements within each of these dimensions requiring adoption. As a second insight, the analyses reveal four phases (i.e. technological enablement, monetization and strategy alignment, service growth, and platform strategy) of an evolutionary servitization process, which represents an increasingly distinctive service business model of the companies. This highlights the merits of contextual case studies to open understanding (Eisenhardt, 1989).

1.5 Thesis Structure

The thesis is written as a monograph and sets out the entire scientific work. **Chapter 2** presents the current state of research in the relevant topics of business model, business model innovation, the business model ecosystem, and servitization literature pathways. The key aspects and main observations of the relevant literature are discussed and key research gaps revealed. Based on the existing body of literature and the identified research gaps, **Chapter 3** shows in detail the methodological approach chosen for the research question and its justification. The case-based research includes three main cases, and the gathered data illustrates in detail how the respective innovation from a business model perspective proceeded. Inspired by Pettigrew's (1988) context, content, and process framework as well as the identified patterns in the data guide, **Chapters 4**, **5**, and **6** discuss

each case in detail. **Chapter 7** concludes with a comparison of the cases and the key points learned. **Chapter 8** reflects on the literature and contributes with new insights into the business model approach in terms of what elements are affected and in particular in which evolutionary servitization phase they are of significance. In so doing, this chapter is separated into the discussion of what elements are involved, how the hybrid business models are connected, and how the content, context, and process influence each other in the servitization. The chapter ends with the managerial implications. Finally, **Chapter 9** concludes and summarizes the research, as well as providing suggestions for further research.

CHAPTER 2: THE EXISTING BODY OF LITERATURE

2.1 Introduction

The chapter summarizes the existing body of literature addressing the research question of how established companies incorporate services as part of their business model. The research question highlights the main focus of the research project, which addresses the challenges faced by manufacturing companies seeking to evolve through the implementation of radical services. Since this question can be approached from different perspectives, sub-questions help to further narrow down the project, address specific aspects of the research question, and guide both the data collection process and the analysis. Therefore, three sub-questions were formulated and explored as part of this qualitative investigation.

- Why do firms come to undertake such initiatives (context)?
- What business model elements are most likely to be involved (content)?
- How is the business model innovation successfully incubated and scaled (process)?

This research question and its sub-questions comprise the literature streams of business models, the innovation of business models, the ecosystem perspective, and servitization respectively. The starting point is the insights gained from the Xerox business model, which was considered a pioneer in business model innovation in the context of developing new

services at the time. Xerox developed a pay-per-copy or pay-per-use model, which demonstrated early on how a manufacturing company could successfully achieve a combination of manufacturing and servitization within a spin-off (Chesbrough and Rosenbloom, 2002). At that time, the company was subject to technological limitations in the area of servitization compared to today, as there were neither suitable sensors nor technologies for data collection and transmission. The Xerox service-based business model therefore focused on customer value and the profit formula, while the rest of the business model was less impacted by the servitization process. Developments in Industry 4.0 and IoT are paving the way for more advanced data-driven services, driving innovation across various areas of the business model, expanding the ecosystem through partnerships, and involving customers not just as end-users but also as active participants in the value creation process. Nevertheless, the company, recognized as a pioneer in servitization, integrates advancements from the research fields of business models and servitization. Recent developments in Industry 4.0 and the Internet of Things (IoT) have made studies on the business model ecosystem a crucial aspect of contemporary research. To address this development and explore the research question in the context of the three propositions, the literature analysis focused on the areas of business models, ecosystems, and servitization.

This chapter highlights that a certain saturation has been reached in pure business model research (Budler et al., 2021). Instead, the focus is shifting towards business model innovation and the business ecosystem, which are increasingly interconnected with the topic of servitization. After reviewing the current literature on the three research areas central to this study, the research gaps and calls for further investigation identified in the latest literature are highlighted.

2.2 Business Model

2.2.1 History of the Business Model Construct and the Link to the Strategy

The business model concept is widely used throughout the literature and also by practitioners (Wirtz et al., 2016). Although the term attracts much attention, there is no exact definition of it (Zott et al., 2011; Bashir et al., 2020) and there is still an ongoing demand for further basic research into the concept (Budler et al., 2021). Business models gained in importance during the development and commercial use of the Internet, but it is also used in other contexts. Ghaziani and Ventresca (2005) found several meanings and highlighted the change in the use of the phrase from information systems and computer modelling to a more general understanding of doing business. However, it is now becoming apparent that even without a clear definition, researchers mostly agree that the business model has the value proposition, value creation, and delivery and profit equation at its core (Foss and Saebi, 2017; Markfort et al., 2022).

Arguably, business models have been a part of the economy (Teece, 2010) since society started to barter goods in exchange (Zott et al., 2011). Osterwalder et al. (2005) investigated the historical origins of the term and found it used in an academic article by Bellman and Clark in 1957. Casadesus-Masanell and Ricart (2007, p. 1) attributed the naming of a business model a little earlier, noting that it *"[…] can be traced back to the writings of Peter Drucker (1954) […]"*. Certainly, the concept of business models increased in popularity during the rise of the Internet in the mid-1990s and has evolved from an original background linked to information technology (Wirtz et al., 2016). Baatz (1996) picked up the notion as one of the first researchers and describes it in the broadest fashion as a way *"[…] how to make money […]"* (Scheer et al., 2003, p. 8), something

echoed in current research that focuses on a carefully designed business model to generate positive financial performance (Leppänen et al., 2023). With the beginning of the new economy and the rising importance of e-business, the business model concept developed steadily and became a buzzword. With the evolution of the Internet and new technologies, businesses and especially start-up companies had the opportunity to challenge traditional ways of doing business. This led to the creation of several new business models and thus increased competition with existing businesses. Consequently, it was argued that new business models that cater specifically to customer needs fulfil these more efficiently and effectively than traditional models, will be more successful in the long run, and ultimately will erase existing business models (Zott et al., 2011).

In general, three subareas receive particular attention from research and are associated with business models (Bieger and Reinhold, 2011). The first can be associated with the commercial use of the Internet. The origin is in the process and data modelling of companies and reproduces the processes, tasks, etc. with the help of an IT system (Bieger and Reinhold, 2011). Second, a more common association nowadays with the business model is the revenue model, which focuses on the generation of turnover and income and reflects profitability (Teece, 2010). This context is now receiving particular attention in connection with new technologies, and Industry 4.0 in particular. As far back as 2010, Wirtz et al. (2016) mentioned Web 2.0 as an increasing factor in generating revenue and supporting the interaction between customers and companies. More recent research has picked up on other concepts in the digital context – for example, with business models in the area of smart solution providers (e.g. Huikkola et al., 2022), digitalization (e.g. Rachinger et al., 2019), and servitization in general (Kohtamäki et al., 2022). Finally, the

third association concerns value creation, something commonly associated with business models nowadays. Bieger and Reinhold (2011) define value creation as the process of achieving value for customers and determining how external and internal resources should be utilized to generate this value. These developments were also confirmed by Budler et al. (2021) in a comprehensive analysis of business model development, categorized into three distinct phases. While the beginning of the business model research can be summarized under the umbrella term of "formation", the second development phase involves consolidation with research conducted around the conceptionalization of business models, especially their component elements. The third phase confirms a certain maturity of the basic business model approach, which is seen to have established itself to such an extent that it is expanding into other areas of investigation, for example ecosystem management (see Tian et al., 2022) or servitization (see Kohtamäki et al., 2019), both of which are of immediate relevance to the current resaerch.

During its recent development, the business model concept transformed into a more universal term, which can hardly be distinguished from strategy. There is a wide range of literature that deals with the two disciplines (Casadesus-Masanell and Ricart, 2010; Lanzolla and Markides, 2021; Bigelow and Barney, 2021; Snihur and Markman, 2023). According to Osterwalder et al. (2005), there are two different ways the term is used. It can be used to describe how a company understands its overall business, while it is equally referred to as a concept to show relevant elements and relationships that occur in the process. This means it conceptualizes the whole process by using models in order to properly describe the way a company does business on an understandable and generic level (Osterwalder, 2004). Furthermore, according to Zott and Amit (2008), business

model and product-market strategy complement each other. Traditional strategy focuses on competition, whereas the business model is about achieving and creating sustainable value creation. Additionally, business model researchers tend to emphasize the value proposition for the customers, which is less frequently mentioned in business strategy (Zott et al., 2011). Hence, strategy can be seen as the formulation of the future approach of the company, whereas the business model concept is the subsequent step of how these details are going to be realized (Shafer et al., 2005). Additionally, Osterwalder (2004) considers the business model to be at the organization's core, and thus it has to be addressed by the business strategy, business organization, and information communication technologies. The business model as a formal conceptual representation (Massa et al., 2017) is seen as a blueprint (Osterwalder, 2005; Demil and Lecocq, 2010) of the company's operations in offering a service or product (customer value proposition), how it is offered (profit formula), and what steps are necessary in order to provide the desired output (key resources and processes). Hence, the (business) model can be regarded as a simplified reflection of the real business and describes repeatable processes in a defined framework by reducing complexity (Rüegg-Stürm, 2002, p. 15). In this approach, the strategy is neglected and needs to be considered as an external variable, which influences the processes and resources of a business model and creates a new blueprint of such a model. According to this argument, strategy can be understood as a link between two snapshots of business models and is consequently orientated toward DaSilva and Trkman's (2014) work in revealing the secret of business models and what they are. Given their understanding of the puzzle, business models reflect the short-term perspective and how the company operates today, whereas the strategy depicts what the company aims to do from a longer-term perspective (DaSilva and Trkman, 2014).

But not all researchers agree on this. The term "strategy" originates from the ancient Greek *strategia*, which means "command" or "lead" and has its roots in warfare (Scheuss, 2008). In the 1940s, game theory was developed, and with it, the term "strategy" was introduced to the field of business administration. Meanwhile, "strategy" has become widely popular for both practitioners and academics, who use the term very broadly. Due to the fact that the term is widely used, Chaharbaghi and Willis (1998, p. 1) refer to strategy as *"everything, but ultimately nothing"*. Although there is no commonly agreed definition for the term, a general broad meaning would be that strategy can be seen as *"[…] top management's plans to attain outcomes consistent with the organization's mission and goals"* (Mintzberg et al., 1998, p. 9). Several management thinkers have defined this term with their own characteristics and distinctions.

An influential theorist in strategy is Harvard strategy professor Michael E. Porter. Porter's definition of strategy as the company's position in the marketplace is still today's dominant strategic logic (Mintzberg et al., 1998). In addition, the researcher refers to strategy as an analytical process and has therefore created several tools for strategy formation. According to Porter's theories, key premises include the idea that strategies are generic, and that the business environment is competitive. Therefore, companies may benefit from analyzing which of these generic strategies is most suitable for their specific situation. These generic strategies consist of cost leadership and differentiation (Mintzberg et al., 1998). Additionally, the central objective of strategy is to create a competitive advantage, which is basically the company's ability to outperform the competition in existing markets (Burke et al., 2009). Consequently, the task of strategic management can be derived from this logic, which is essentially making long-term

decisions to ensure the company's prosperity and growth. In addition, measures must be taken to achieve the sustainable growth and development of the company and the associated business model with the strategy. In order to achieve these goals, all elements that affect or could affect the company need to be brought together to form the "big picture". Additional and more recent insights are derived from Bigelow and Barney (2021, p. 10) based on a profound literature review arguing that the business model concept is still *"[...] significantly similar to strategy [...]"*. More research on the business model concept could have a positive impact on the strategy stream (Bigelow and Barney, 2021; Lanzolla and Markides, 2021). As both the business models and strategy refer to competitive advantage, Snihur and Eisenhardt (2022) argues that there is a difference between them, and that the business model concept is given a higher priority than the classic and static view of strategy, especially when new technologies are applied. Snihur and Markman (2023) have provided an up-to-date overview of the subject areas in a comprehensive analysis and highlight the strategy as a key intersection with innovation management and entrepreneurship. Bigelow and Barney (2021) and Lanzolla and Markides (2021) stand out in particular from this overview. It follows that depending on the perspective and definition of the business model, it can be more or less differentiated from the concept of strategy (Bigelow and Barney, 2021). Bigelow and Barney (2021) describe different perspectives of the business model approach and mention the construct as a theory of value creation as presented by Johnson et al. (2008) and emphasize the strategic elements of the approach that lead to results that a classical strategy research would not have achieved. Lanzolla and Markides (2021) researched the business model construct as a source for gaining new insights into strategy research, especially considering the activity system whose origin goes back to Porter (1996) and is repeatedly

taken up by various researchers (e.g. Zott and Amit, 2010; Massa et al., 2017; Bigelow and Barney, 2021; Lanzolla and Markides, 2021). A major contribution in this research is work by Porter (1996), who argued that aligning processes in a unique way offers the company a competitive advantage and increases protection against imitation. The topic was further researched by Siggelkow (2002) in explaining companies' configuration of elements and also shows great insights in the development process of a company. Porter and Siggelkow (2008) continue the research on activity systems and have expanded the approach to include generic and strategy-specific activities, as well as further research in the activity system's construct through design elements and design themes to create a unique business model (Zott and Amit, 2010), which is also mentioned by Lanzolla and Markides (2021). Here it is highlighted that the business model and the interplay of activities can have an impact on firms' performance and thus is relevant for strategy. Lanzolla and Markides (2021) conclude their analysis with questions for further research, including *"What activities should be connected? How can we develop interdependencies among activities that cannot be imitated?"* (2021, p. 551).

This section indicates that the term "business model" was already in use a long time ago but only gained intensive attention at the turn of the millennium and has still not lost its significance. Despite this attention in the scientific community, the debate on its definition has not yet reached a consensus. The differences and similarities with other research domains, including the concept of strategy, are still open or are increasingly merging into one another. In the same way, the business model approaches are not yet uniformly defined, so a large number of variants exist and these are discussed in the following section.

2.2.2 Business Model Approaches and Elements

The previous section highlights the still open discussion on the definition of the business model. Despite this disagreement, it is increasingly clear that there is broad consensus on the core principles of the construct (Markfort et al., 2022). But the literature is not only vague about the definition but also about the business model construct and the elements (Teece, 2017). It is now becoming apparent that the fundamental elements of the model focus on *"[…] the firm's value proposition and market segments, the structure of the value chain required for realizing the value proposition, the mechanisms of value capture that the firm deploys, and how these elements are linked together in an architecture"* (Saebi et al., 2017, p. 567).

At the turn of the millennium, research made an intensive effort to describe the business model with elements, resulting in a large number of different approaches being discussed within a few years. The research and summary of Morris et al. (2005) resulted in a categorization of three hierarchic layers based on the appraisal of 30 business model definitions. The lowest and therefore most rudimentary approach with a focus on profit generation is coined the "economic level", which is followed by the operational (internal processes and infrastructure) level and finally the strategic level, with its focus on sustainability and competitive advantage, which is still at the heart of the discussion about business models (Snihur and Eisenhardt, 2022). As the results show, the evaluation of the different components seems to be based on entries between single business model definitions. The firms' value offering, economic model, and customer interface/relationship revealed the highest number of mentions.

This classification into categories and their definition of a business model that is a *"[…] concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets […]"* leads to a component-based framework (Morris et al., 2005, p. 727). This framework is built up by the six elements or factors related to offering, market factors, internal capability factors, competitive strategy factors, economic factors, and investor factors. Likewise, Shafer et al. (2005, p. 200) identified 42 different business model components and refer to them as *"[…] unique building blocks or elements"*. Aziz et al. (2008) analyze various business model definitions to identify their key components, ultimately distilling them into 54 distinct elements.

In addition to the many business model approaches, the four-box business model is often used to conduct further research on the topic. The model, developed by Mark W. Johnson, offers great flexibility and thus can be readily applied for further analysis. Johnson (2010) defines the business model as *"[…] a representation of how a business creates and delivers value, both for the customer and the company"* (Johnson, 2010, p. 22). Building from this, Johnson (2010) created a four-box business model framework to describe and identify the crucial elements of value creation. The first element of this model is the CVP, which essentially has to identify an unsolved customer problem that competitors have not addressed yet. Hence, it has to create a solution at a given price for the job to be done for the company's customers. It is fundamental for a company to understand the job to be done for the customers to create a suitable offering. The second element of the four-box business model framework is the profit formula. This element concerns the way in which the company intends to create value and thus generate profits. The definition of the sales

model is particularly important here, as is the target margin per unit in order to subsequently understand the cash inflows. Hence, the company has to consider its cost structure in order to understand how the revenue model has to be defined and vice versa (Johnson et al., 2008). Furthermore, to achieve the CVP, the company must identify the key resources and key processes that give them the ability to meet these demands and finally deliver to the prospective customers. The key resources are the company's people, information, channels, technologies, products, and the brand, which are needed in order to be able to deliver the CVP in a profitable way. Also important are partnerships with other companies, which are part of the key resources, since they can have a serious impact on the company's performance (Johnson, 2010). The key processes refer to tasks that need to be carried out iteratively and consistently over time. Additionally, it is relevant to connect all the elements with each other in order to enable the company to perform their operations (Johnson, 2010). The key processes can be divided into three sub elements, namely processes, business rules and success metrics, and behavioral norms. Basic processes refer to tasks that need to be performed in order to generate output, like manufacturing, sales, R&D, training, and development (Johnson, 2010). Business rules and success metrics deal with planning and monitoring tasks of the company, including the elaboration of credit and supplier terms. Furthermore, the company's behavioral norms need to be considered when assessing potential sales, communicating with customers, and defining distribution channels. Finally, the key resources and processes generate synergies that contribute to the overall success of the business model (Johnson, 2010).

The review of the existing body of literature shows an even more heterogeneous picture than the various definitions and approaches discussed above might suggest. The following points summarize the key insights:

- The meaning of the "business model" has changed over the years. The earlier meaning or association was with software modelling evolving to the revenue model and value creation.
- The definitions of the "business model" diverge. Several authors are not in agreement on the framework of (innovative) business models and the elements/components therein, especially their relations to each other.
- Business models are often used for single industries and are not researched theoretically with an extensive definition of parameters, limitations, and elements (framework of the business model).
- The literature shows that business models are mostly developed for single industries. This results in a lack of empirical research that shows the theoretical continuity in other industries and therefore a development of a unitary construct of the business model framework.
- Since about 2005 the term "business model" has increasingly appeared in the literature in connection with the term "innovation" and Industry 4.0. At the same time, disruptive changes in business environments and technologies are considered more and more.

2.2.3 Business Model Innovation

Firms are continuously exposed to both internal and external pressures. They must navigate new technologies, government policies and regulations, globalization, market volatility, and dynamic competition, to name just a few. Additionally, the development of new products or services internally often necessitates changes in processes and resources. Thus, it is crucial for a firm to control its business model, to be proactive, and to adapt it to new environments and internal developments. Research on business model innovation does not go back as far as research on business models themselves (Foss and Saebi, 2017), and thus it is not surprising that there is still no standardized definition (Bashir and Verma, 2019). One possible definition of the term is that *"[a] business model innovation is a novel architecture by which a firm creates, delivers, and captures value"* (Snihur and Markman, 2023, p. 3) and is seen as an instrument for the transformation of a business (Budler et al., 2021). Business model innovation contributes to gaining and sustaining a competitive advantage (Giesen et al., 2010; Bieger and Krys, 2011) and enables the company to stay competitive and prevents it from being unable to hold its own against the competition and disappearing from the market (Ramdani et al., 2019). In today's business world, it is no longer sufficient to only introduce new products or lean processes. Business model innovation and product innovation are not interchangeable, but they interact and complement each other (Amit and Zott, 2010). It is remarkable that a business model innovation does not discover a new product or service; usually existing products and services are redefined and delivered differently to customers (Markides, 2008). As companies are forced to continuously develop further, the perspective of business model innovation as a viable or even necessary approach is increasingly becoming the focus of research in this area and is of great importance for both

practitioners and academics alike (Zott et al., 2011; Spieth et al., 2014; Foss and Saebi, 2017; Bashir et al., 2020).

Markides (2006, p. 20) defines business model innovation as *"[…] the discovery of a fundamentally different business model in an existing business"*. Business model innovation occurs when two or more components of a business model are innovated (Lindgardt et al., 2009), whereas another definition emphasized that either certain components or only the architecture of the business model can be changed, and thus the relationship between its elements, and how they are compatible and complementary (Bieger and Reinhold, 2011). The approaches refer to all components of a business model and the use of innovation, and the change of one component influences the others as all components are connected (Porter, 1996; Stähler, 2002). Furthermore, either a business model can be completely newly developed or an existing one can be adapted (PricewaterhouseCoopers, 2010).

Business model innovation is still exceptional (Johnson et al., 2008), as many enterprises only hesitantly go beyond product or service development to profoundly innovate their business model. It is a challenge for managers to create a new business model if they lack experience in how to innovate the business model and it is difficult to estimate when the right time for innovation has come (Kim and Min, 2015). As an additional challenge, the conviction of all stakeholders is emphasized in the literature (Johnson et al., 2008). However, there are various situations in which a new business model could make sense or is even essential (Johnson, 2010):

- Reaching a high number of customers that are not part of the market because existing answers are too expensive or too complicated.
- Benefiting from a new technology.
- Getting a “job done” where customer needs are unmet.
- Resisting competition.

However, organizations must recognize that a new business model is a complement, rather than a substitute, to their current business model and that implementing it requires patience (Johnson et al., 2008).

An invention is basically the first time that the idea of this new product, process, or model appears. Inventions can be achieved by almost everyone, but mostly by the likes of universities or research facilities. On the other hand, an innovation is the first actual use of the invention in a commercial or economic context. Thus, this objective is mostly undertaken by companies because there is a strong need for specific resources in order to bring it efficiently to the market. Hence, a company that is able to bring an invention successfully to the market is called an “innovator”. This enables the innovator to generate profit and to gain a competitive advantage against the competition. Furthermore, there has to be a time lag between the initial invention and the first market appearance of the innovation. These lags occur mostly because some of the elements that are needed to successfully launch the product on the market are not yet developed or ready. Thus, reasons can be a current lack of demand, production capabilities, and co-innovations (Fagerberg, 2003). Furthermore, Joseph Schumpeter stated in his work about creative destruction that change is normal, not stability (Morris, 2009). Creative destruction is an

explanation about the ongoing processes of the marketplace that in order to achieve progress, something established has to be erased and an innovation must take over that place. This is especially the case for companies that are strongly influenced by external (macroenvironment) and internal (microenvironment) factors, which they need to consider when planning their economic activities. Innovation in the business context can be defined as follows: *"[…] the result [of the innovation] must be increased value in the form of new or improved functionality, reduced cost, price increase (good for the seller), price decrease (good for the buyer), better margin for the seller, or some combination of these"* (Morris, 2009, p. 194). Thus, innovation is about improving the current situation by achieving the above-mentioned elements.

Innovation drives the economy forward and allows companies to compete on the market. Morris (2009) also states *"[…] that innovation itself is the only defence against innovation"* (p. 194). Hence, companies have an intrinsic motivation to innovate in order to withstand market pressure or the push for technology (Winterhalter et al., 2017). Further reasons can be new technologies or digitalization (Emprechtinger, 2018), price pressure (Stampfl, 2014), or external stakeholders (Andreini and Bettinelli, 2017), to name just a few triggers for innovation. But companies need to identify processes that require a focus on innovation efforts. Additionally, focusing the innovation processes only on technology is a dead end, since competition can copy or even evade the technology. Thus, competitors can erase one's competitive advantage (Geissdoerfer et al., 2018), which makes the company a follower or even irrelevant. Technology is fast-moving, and it is hard to maintain that pace for a longer period of time; thus, focusing on several innovation processes enables one to increase the competitive advantage. Morris

(2009) defined several innovation targets split into different clusters (e.g. business structure, customer experience, organization) that must be taken into consideration when identifying innovation processes, and this coincides with a summary of innovation areas by Ramdani et al. (2019) or the innovation dimensions of Bashir et al. (2020), who also criticize the lack of clarity of the dimensions.

The types of innovation, or the outcomes of business model innovation explored, primarily focus on the subsequent performance of the firm (Zott et al., 2011; Foss and Saebi, 2017; Bashir and Verma, 2019), competitive advantage (Teece, 2010), and innovation (Foss and Saebi, 2017). The literature offers various innovation designations that refer to the degree of innovation and how they relate to the competition. One well-known and far-reaching innovation is disruptive innovation. Christensen (1997) coined the term "disruptive innovation", which evolved from the notion of disruptive technology and is now mainly used for disruptive business models. A disruptive innovation creates a totally new market and attracts a different, initially small, customer group. This group is an underserved segment with different requirements and is not regarded as attractive by established firms. Disruptive innovations usually do not offer the extensive value propositions that established customers expect (Christensen, 1997). These innovations are simpler, cheaper, and often more convenient to use. The business model is improved in a way that a market does not expect. Initially, performance metrics such as growth rate, profit margin, or return are lower. They increase when the mass market is reached due to refinements of the business model and quick technological developments (Stähler, 2002). Here, the rate of progress of innovations is steeper than the advancement of customer needs, thus it covers at point in time the customer needs. Then, disruptors disrupt an

existing market and replace an existing business model, as these firms benefit from cost advantages. Companies outside of a particular industry often initiate this (Zollenkop, 2006). Later, Christensen and Raynor (2003) differentiated between low-end disruptions, where customers do not have the need for full performance, and new market disruptions, where customer needs have not yet been satisfied. A prominent example for low-end disruption is the low-cost airline industry. Usually, disruptive innovations are labelled "competence-destroying" because the firm cannot build on existing skills and knowledge (Markides, 2008). A sustaining innovation attracts the existing customer group with new (incremental) developments, with attributes they already value. They usually have a higher growth rate than disruptive innovations, support the company's skills, and are competence-enhancing (Christensen, 1997; Markides, 2008). Mostly, companies engage in new product and service development and stay close to their recent customers. Thus, firms who miss opportunities are in a critical situation. It is worth mentioning that even if a business model innovation is subtle rather than disruptive, the innovator can have enormous benefits. In the context of disruptive innovation, it is also important to address radical innovations and distinguish them from disruptive innovations. O'Connor and DeMartino (2006, p. 1) characterize radical innovations as technologies or products which create *"[…] whole new lines of business that bring new to the world performance features to the market and may result in the creation of entirely new markets".* The literature often uses radical and disruptive interchangeably. However, it becomes evident that radical innovation typically refers to innovations in existing products, technologies, or service offerings, often involving significant improvements or entirely new approaches within an established framework. In contrast, disruptive innovation is more concerned with the impact and transformation of entire markets (Christensen, 1997). Therefore, the

present work focuses primarily on radical innovation, as up to the point of data collection, no clearly disruptive characteristics according to Christensen's (1997) definition were observable.

2.2.4 Characteristics and Process of Business Model Innovation

The characteristics and process of business model innovation refers to the diffusion of how a product or service is introduced on the market as well as the stages of introducing a new business model. Rogers (1995) identified a set of common characteristics of product innovations, which define the adoption rate and thus the success of innovations. These can also be applied to business model innovations and were taken up again by Urbinati et al. (2019). Firstly, successful innovators offer a value proposition with a relative advantage. Secondly, these businesses offer a value proposition that is compatible with values, norms, and behaviors. Thirdly, a low degree of complexity positively influences the adoption rate. A fourth characteristic is trialability. It is advantageous if customers can try the product and service before buying. Lastly, observability, the simplicity with which the benefits can be communicated to customers, plays a major role (Rogers, 1995).

In contrast to Rogers (1995), who considers the perception of customers, Giesen et al. (2010) illustrate common characteristics of strong innovators, which are critical for internal execution. The first characteristic is alignment, as enterprises must internally align the different elements of the business model to achieve consistency. It is essential to understand how the elements are related to, and interdependent on, each other. Moreover, the business model must be consistent with suppliers' and partners' models.

Successful companies use their core competencies or assets in a different way to carry out business model innovation (Giesen et al., 2010). The second characteristic is analytics, which firstly refers to strategic foresight, meaning that firms can better evaluate the impact of new technologies, products, markets, etc. by using analytical tools. For instance, the online video rental company Netflix uses analytic algorithms to foresee which other movies customers might like. Secondly, financial business modelling helps to predict the financial impact of different scenarios. Thirdly, continuous performance measurement is essential in order to adapt quickly to a changing environment (Giesen et al., 2010; Markides, 2008). Finally, another important characteristic is adaptability. This includes the ability to experiment with new business models while retaining established ones. A dynamic and flexible operating model can enhance responsiveness to changes and thereby support business model innovation (Giesen et al., 2010). To conclude, the so-called "three As" (aligned, analytical, adaptable) have to be executed to achieve successful business model innovation.

More recently the literature has also offered insights related to organizational and business model change addressing gaps in understanding and calls for further research (Massa and Tucci, 2014). Berends et al. (2016) identified learning modes and mechanisms within the innovation process. Cognitive search as a learning mode is characterized by conceptualization and creation, whereas experiential learning focuses on adaption and experimentation. The transition from cognitive search to experiential learning is referred to as "leaping", whereas the change in the other direction is called "drifting". Berends et al. (2016) also found that the business model innovation process and changed business model elements often have an impact on other business model

elements, aligning with Zott and Amit's (2010) perspective of an activity system. At the intersection of new trends like Industry 4.0, the business model innovation process finds resonance with researchers to explain servitization based on different stages. The explanation of change based on a staged approach has been used many times in early literature and has proven its worth (Khanagha et al., 2014; Baines et al., 2020).

In sum, research on business model innovation has already gone through several phases, so a certain stability of the construct has been achieved in terms of definition, elements, and interfaces. It is also clear that business models have a strategic character or even go beyond the pure concept of a business, especially when they are viewed in terms of innovation. Nevertheless, the business model innovation shows new trends in the context of ecosystem and servitization that offer the opportunity for further research in this area and are considered relevant by scientists. For this reason, the literature on ecosystems and servicing will be reviewed.

2.3 Business Ecosystem

The ecosystem perspective is an area of research that is closely associated with the business model in the literature and its innovation is becoming increasingly important, especially when it comes to digitalization (Sjödin et al., 2022) and servitization (Kohtamäki et al., 2022). The term is an often-used concept in management studies (Kohtamäki et al., 2022) to describe an overview of related partners (Adner, 2017) and was initially coined by Moore (1996), who believed that the term "industry" was too narrow and difficult to define for many companies. In its place, he favored viewing business ecosystems as consisting of a variety of industries and individual firms all

focusing on their key capabilities (Moore, 1996) but also depending for their success on the success of others in a more loosely connected network (Iansiti and Levien, 2004). This ecosystem perspective highlights the importance of considering the broader network of complementary contributions from other players in the successful creation and delivery of new value propositions to customers, which may be relevant for firm-level strategists and innovators. Strategy in the ecosystem is increasingly understood as the skill of managing assets that do not belong to oneself (Iansiti and Levien, 2004). A classic example is the Windows ecosystem created and orchestrated by Microsoft, but dependent for its ultimate success and competitiveness on the contributions of a wide and loosely connected network of third-party application developers and other strategic partners. So increasingly, company strategists and innovators have to concern themselves with how to influence the complementary strategies of other players in their business networks, both upstream and downstream (Power and Jerjian, 2001), including the adoption strategies of downstream players key to delivering the full value proposition to the customer at the point of purchase or consumption, and the upstream players whose complementary skills and assets are essential to co-innovating it in the first place (Adner and Kapoor, 2010).

The design and implementation of a business model should not only focus on the analysis of internal factors, but should also take external factors like customers, suppliers, and the whole business environment in which the company acts into consideration. By understanding the business ecosystem, one is not only decreasing the risks of the company but also increasing the possibility of identifying new opportunities and growth perspectives in order to achieve sustainable development of the innovation

(Leavy, 2012). This section summarizes the current knowledge of the ecosystem perspective as an interface discipline of the business model.

2.3.1 Basic Understanding of the Business Ecosystem

The business ecosystem concept is an approach that takes a broader range of risks and possibilities related to the environment of the business into consideration. It was basically developed during the 1990s and derived from the biological ecosystem (Adner, 2017). Thus, in order to define a business ecosystem, theorists commonly use the biological ecosystem as a starting point (Fukuda and Watanabe, 2012). Analogously to the business model and business model innovation literature, there are also different definitions of the business ecosystem, and depending on the perspective drawn upon, definitions vary (see Moore, 1996; Iansiti and Levien, 2004; Adner, 2017). Furthermore, the term "ecosystem" has been used in several different fields of study (Tafti et al., 2015). The conceptual term "ecosystem" is now widely applied in many areas, including those related to business and management, and it is now common to talk about business ecosystems (Peltoniemi and Vuori, 2004), industrial ecosystems (Frosch and Gallopoulus, 1989), the economy ecosystem (Rothschild, 1990), the digital business ecosystem (DBE) (Nachira, 2002), and the social ecosystem (Mitleton-Kelly, 2003).

The term "ecosystem" harks back to its origins in ecology and explains complex networks in business (Moore, 1996; Iansiti and Levien, 2004). Chapin et al. (2011, p. 3) define the organism ecosystem as *"[…] the interactions between organisms and their environment as an integrated system"*. Theorists adopt this general definition and project it on the field of business. James F. Moore (1993) conducted the first conceptual approach to the field

of business ecosystems and shaped the term for further research (see, for example, Gomes et al., 2018; Kohtamäki et al., 2022). He suggested replacing the term "industry" with "business ecosystem" and defines it as *"[...] an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world"* (Tafti et al., 2015, p. 200). This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organism also includes suppliers, lead producers, competitors, and other stakeholders. Over time, they coevolve their capabilities and roles and tend to align themselves with the direction set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments, and to find mutually supportive roles (Moore, 1996, p. 26).

For Moore (1996), the term "industry" is too narrow and hard to define for many companies. Thus, a business ecosystem consists of a variety of industries and the members of this ecosystem focus on their key capabilities. Subsequently, these members improve their capabilities and cooperate in order to properly satisfy customers' needs. This is not only accomplished by offering the product itself, but also by creating complementary offerings to the initial product (Moore, 1996). Thus, this community produces goods and services that will be bought by consumers of the ecosystem. The ecosystem consists of suppliers, lead producers, competitors, and other stakeholders. Additionally, the company that possesses the leadership role determines the direction of the ecosystem. This is essential, as it allows the members of the ecosystem to evolve and develop their capabilities toward a common goal, where they can identify the roles that

best suit them. According to Moore's (1996) definition of an ecosystem, it extends far beyond the core business, its direct suppliers, distribution channels, and primary contributions. Other relevant parties within the community may also play a role, leading to the identification of two additional layers – the extended enterprise and the business ecosystem – derived from Moore (1993) and further illustrated by Heikkilä and Kuivaniemi (2012). For example, universities, suppliers of the suppliers, etc., are assigned to the layers according to their direct proximity to the company. The ecosystem thus results in a rich mix of community members who make a valuable direct or indirect contribution to the company's core business. However, the large number of ecosystem members must be coordinated (Jacobides et al., 2018), and without a certain coordination a useful ecosystem lacking in efficiency and innovation will not be successful (see also Adner and Kapoor, 2010; Adner, 2012; Kapoor and Lee, 2013). The coordination of the ecosystem requires the knowledge of how the ecosystem develops and evolves in order to derive actions and maintain or improve the status quo. Moore (1996) therefore presented an approach involving four development stages: pioneering, expansion, authority, and renewal of an ecosystem. Pioneering refers to the definition of a new customer value with both customers and suppliers in order to exploit the advantage of the first mover, as also addressed by Markides and Sosa (2013). The second stage summarizes the efforts to expand the ecosystem and achieve a critical mass in the desired market (Moore, 1996). One example is in the data-driven platfrom ecosystem in the context of its expansion, which is *"[…] facilitated by opening up the platform interfaces, promoting interoperability between different platform services as well as creating an open marketplace for new partners to deploy their value-added services"* (Jovanovic et al., 2022, p. 9). In the third authority stage, the ecosystem increases its stability and

profitability, as well as its complexity. Hence, the positions of the members within the ecosystem are fixed and the relations between the companies become stable. Nevertheless, new entrants try to get into the ecosystem and incumbents must defend their positions. This shows that even these positions of the incumbents are not permanent and can be replaced by new entrants. Additionally, to remain competitive, the focus should be on leading the innovation and co-evolution of the business system (Moore, 1996). Current research addressing this stage of ecosystem development has identified ecosystem leadership (e.g. Gawer and Cusumano, 2002; Foss et al., 2023) and orchestrating of the different actors' business model in an ecosystem (e.g. Kohtamäki et al., 2019) as relevant in addressing this stage of the ecosystem. The final stage of the ecosystem concerns the renewal or death of the business ecosystem. This becomes increasingly important because new ecosystems are trying to attack the established one (Moore, 1996). Lock-in effects or high switching costs often protect the companie's own ecosystem and protect against new entrants and rival companies (Fehrer et al., 2018). The objective may be to facilitate continuous improvement in the company's performance. Otherwise, the ecosystem loses its competitiveness and subsequently becomes obsolete (Moore, 1996). Iansiti and Levien (2004) also use the analogy "ecosystem" but their understanding of the term is more related to the biological term "community". Hence, according to them, parallels between biological ecosystems and business networks can be identified. These are mutual dependencies of the ecosystem members and their position in the system itself.

Many of the features of the ecosystem are not part of the traditional value chain concept. The business ecosystem, for example, includes institutions that provide financing, companies that provide the technology that is needed to perform the business tasks, or

complementary products that are linked to each other (Iansiti and Levien, 2004; Jacobides et al., 2018). Furthermore, Iansiti and Levien (2004) have defined three measures to detemine the healthiness of the ecosystem. The productivity factor is essential for the success of a business ecosystem since this reflects the ability of the network to transform raw material into the desired output. The robustness of the business ecosystem is about surviving external or internal shocks like disruptive technologies. Thus, this also includes the business ecosystem's ability to adapt and change to new market conditions. And lastly, the ecosystem needs the ability to create a niche and to identify new opportunities.

Regardless of which perspective on the ecosystem is chosen, the literature argues that an ecosystem is highly dependent on selecting the right partners to ensure success and competitive advantage. Companies need to carefully select ecosystem partners based on criteria such as compatibility, reliability, expertise, and complementarity (Tsou et al., 2015). This is adressed by Adner (2012), who developed the value blueprint, which is basically a mapping instrument that helps a company to increase its knowledge about the partners involved and translates the value proposition into action. This instrument resembles value chains and supply chains, but it differs due to the focus on the exact location of the partners providing critical complementary products (Adner, 2012). Without this instrument a company might know who the partners are but not whether they are positioned upstream or downstream or how they contribute to the innovation. Thus, the value blueprint enables the company to visualize and to create a map that shows the dependencies of the innovation on partners in the business ecosystem in order to deliver the value proposition. The definition and creation of the value blueprint is a team task that has to be performed in an iterative and incremental way so that everyone involved

agrees with the assumptions – hence, starting with the end customers and then going backwards to identify all the directly and indirectly involved partners needed to deliver the value proposition.

Within each ecosystem, the literature recommends that one company takes the leadership role (Gulati et al., 2012), which is *"[…] understood as the exercise of effort towards others with the purpose of establishing and maintaining an ecosystem around a focal systemic innovation"* (Foss et al., 2023, p. 1). The characteristics of the ecosystem leader should include the three capabilities of sensing, seizing, and transforming; while sensing refers to the capability to create a unified vision, seizing refers to encouraging the members to contribute to the common goal and ecosystem, and transforming refers to maintaining stability through appropriate measures (Foss et al., 2023). The relevant task of the business ecosystem leader is to define the direction and the timing for the innovation blueprint and take all the upfront risks. Thus, the leader is responsible for establishing the structures of a functioning business ecosystem and must persuade other companies to join as followers (Leavy, 2012). Moreover, the company obtaining the leader role has to have an expected surplus large enough to invest in deficits of the ecosystem that might occur (Adner, 2012). Furthermore, a follower must decide to participate in the specific ecosystem by assessing the leader's value blueprint and the opportunities by participating in it. Subsequently, potential risks related to co-innovations and long-term sustainability must be assessed (Leavy, 2012). After deciding on the role in the business ecosystem, the company has to decide about the timing. Compared to Moore (1996), the focus was only on leading the business ecosystem, but Adner (2012) added a new perspective with the smart follower approach. Thus, the company decides

whether it wants to focus on the first mover or the smart/right mover advantage. This distinction must be made in order to understand occurring execution challenges. Subsequently, the company's task is to identify whether the innovation challenge is about being the first to bring the product on the market and achieve the first mover advantage, or if there are complementary or co-innovation challenges. In the latter case, necessarily the most effective solution, as supplementary innovations are still needed to enable the customer to fully utilize the innovation. Hence, it would be smarter of the company to wait with the introduction of their innovation until the related innovations are ready for commercialization. This is referred to as the smart or right mover advantage and is an important factor to consider in strategic decision-making (Leavy, 2012).

The overall innovation performance of the ecosystem depends on the performance of each individual company and the interaction between them. To understand the dependencies in the ecosystem, Adner and Kapoor (2010) researched the effects of components and complements in a business environment context. Internal challenges contribute significantly to the success or failure of innovating companies (Christensen, 1997) but are only a part of the whole. Furthermore, the focus is to identify the location and dimension of the technological interdependencies of all involved partners to eliminate possible occurring challenges. Hence, the core objective is to enable companies and the related ecosystem to ensure the understanding of value creation and capturing in the value chain (Chesbrough, 2007; Adner and Kapoor, 2010; Fehrer et al., 2018).

Activities along the upstream and downstream must be taken into consideration when identifying the business ecosystem (Adner and Kapoor, 2010; Adner, 2017). First, the

upstream suppliers generate the inputs that are needed by the focal company to produce their offering. These inputs are referred to as “components”. Occurring challenges in this stream limit the company’s ability to create value because they disturb the company’s objective to produce their innovation. Second, the downstream complementors offer additional value to the core product. These complements are needed by the customers to fully utilize the potential of the innovation. Thus, limitations in this stream will decrease the customers’ perceived utilization and the opportunity to create further value (Adner and Kapoor, 2010). Finally, these inputs generated by several partners deliver the value for the whole business ecosystem and the combination of these enables the involved companies to capture a tremendously higher value than they would be able to capture alone (Leavy, 2012).

The existing body of literature also mentions the risk assessment and management in ecosystems as being highly relevant (Gomes et al., 2018). Adner (2012) identified three risks that have to be assessed when evaluating the value proposition of a new innovation. The success of new innovations is closely related to identifying and addressing all potential risks. Adner (2012) offers with his concept a structured approach to enable companies to assess these risks and defines them as follows. First, companies traditionally focus their strategies on the execution risks, which are about generating and delivering the right innovation with the right specifications at the right time. Thus, this kind of risk is only a small fraction of the overall risks that can arise. Furthermore, in these traditional strategy approaches new kinds of risks are not taken into consideration, which Adner (2012) refers to as the “ecosystem blind spot”. Therefore, co-innovation and adoption chain risks also have to be considered. Co-innovation, collaboration, and cooperation all

offer good opportunities to leverage the capabilities of the involved companies, but they do at a high cost. Thus, to assess co-innovation risks that might occur, a company must identify what else must be innovated or developed and by whom, in order to be able to realize the company's own innovation. Without identifying this risk in the business ecosystem, one might develop a highly effective product but fail to commercialize it. This is due to the lack of co-innovation that is needed as a complementary technology, as without it, the value proposition cannot be realized (Adner, 2012). Additionally, when assessing this risk, one has to bear in mind that the more co-innovations are needed, the higher the probability of problems. These collaboration dependencies can be determined with a probability calculation (Adner, 2012). Furthermore, the adoption chain risks must be identified. These are the risks that arise because of not taking all the partners that have to adopt the innovation into consideration. There are several intermediaries between the company and the end consumer that decide whether the innovation becomes a success or failure. These intermediaries include distributors, retailers, and salespersons that have to be convinced and incentivized to adopt the innovation (Leavy, 2012). The end customer is not the only important element of the adoption chain, as one has to equally focus on all and satisfy their demands in order to be successful (Adner, 2012). Finally, by identifying these risks in advance, a company can react and manage a feasible solution proactively in order to deliver the innovation with a supportive and well-functioning business ecosystem. The risk assessment concerning co-innovations and the adoption chain must also be applied already in the value blueprint (Leavy, 2012) mentioned above.

2.3.2 The Digital Ecosystem Perspective

Research is increasingly focusing on ecosystems in connection with Industry 4.0 and products or services that arise from it. This research focus, which has only been emerging for a few years, can be classified in the area of servitization, which is a transformation from a pure product-focused value proposition and adds service to the portfolio (Raddats et al., 2019). Services in general, in the given context of data-based service as an essence of the Industry 4.0 trend, require a rethinking of the ecosystem and are viewed from different perspectives in the literature. The scientific world has developed various terms for this in a short time, which has led to a confusion and mixing of these ecosystem concepts (Brozović and Tregua, 2022). The literature mainly uses the terms "service ecosystem" (e.g. Letaifa and Reynoso, 2015; Sklyar et al., 2019a, 2019b), "platform ecosystem" (e.g. Kapoor et al., 2021), and "service networks" (e.g. Gebauer et al., 2013), while other terminologies have been developed alongside them, e.g. "IoT ecosystem" defined by Mazhelis et al. (2012). By definition, a service ecosystem is a *"[…] relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange"* (Lusch and Vargo, 2014, p. 161). In contrast to this definition, the platform ecosystem does not focus only on services. According to Kapoor et al. (2021, p. 1), a *"[…] platform ecosystem (PE) is an assemblage of a platform, the actors and the offerings developed on that platform"* and *"…platforms are products, services, or technologies that are similar in some ways, but provide the foundation upon which outside firms (organized as a "business ecosystem") can develop their own complementary products, technologies, or services"* (cited in Gawer and Cusumano, 2014, p. 418).

The complexity of services, and especially data-based service in the servitization context, transforms the focal company from a vertical to a horizontal integration to offer value propositions to customers (Gebauer et al., 2013). This means that one company is rarely in a position to deliver the entire value creation to the end customer on its own. Rather, it requires the involvement of an entire network as early as the development process, so that, viewed in terms of the entire ecosystem, it is a service provided by many partners and customers, both upstream and downstream, as well as OEMs who work in parallel with their respective value chains on a joint solution. This perspective, rooted in the service-dominant logic (SDL) (Vargo and Lusch, 2004; Lusch and Vargo, 2014), was analyzed by Gebauer et al. (2013), who identified the four different network constellations of horizontal integration service networks, horizontal outsourcing, vertical after-sales, and vertical life cycle and the relevant capabilities for each. They concluded that the identified constellations represent how complex the services are and thus have an impact on the required transformation of the whole network. As service networks consist of multiple actors like suppliers, customers, distribution networks, and partners that provide the end customer value as a joint service (Parida et al., 2015), the perspective should not only consider the OEM as a central point and responsible part for the whole network. This is addressed by Reim et al. (2019), who went on to take up and examine the idea of service networks and researched the approach of different actors in servitization and under different conditions (e.g. geography). The four approaches of digitalization, service benchmarking, service extension, and customer co-creation were identified by the researchers as servitization strategies for actors in networks. Also, challenges for the actors are addressed by the researchers and their results provide information about capability-related challenges, which can be influenced by each

individual actor, and market-related challenges, which often exert influence outside the network and are therefore hardly under the influence of the authors. In contrast to this research and the actors' strategy to approach the service network (Reim et al., 2019), it is also found that actors and their co-creation in a network can take dynamic roles and change from active to inactive and vice versa in value creation for the entire network (Erkman et al., 2016). Furthermore, the authors also come to the conclusion that co-creation within a network is multidimensional, and actors may perceive the values of economy, sustainability, and brand.

In contrast to the service network perspective, the platform ecosystem not only considers services but also products and technologies. Researchers in this area have been working, for example, on the emergence of platform ecosystems. The platform ecosystem is the most developed ecosystem in the servitization process. This is preceded by the traditional manufacturing supply chain and, as the next maturity step, the innovation network (Kohtamäki et al., 2022). When entering this advanced phase of the platform ecosystem, a key challenge is the complementor selection in the initial phase (McIntyre and Srinivasan, 2017), and further research was conducted by Murthy and Madhok (2021) who investigated how ecosystems initially evolve and how previously unknown partners or platform sponsors come together to create value. They found that platform sponsors must signal opportunities for value co-creation to acquire both further consumers and complementors. A more holistic approach is detailed by Jovanovic et al. (2022), who emphasize that the platform ecosystem is the most advanced and profound archetype along with the product platform and supply chain platform for a transformation of a company and the entire ecosystem. Based on their research, they emphasize that

production companies should take over the platform sponsor role and drive innovation in a collaborative model with customers and partners. The sponsor, also referred to as the "orchestrator" (Dhanaraj and Parkhe, 2006) or "platform leader" (Gawer and Cusumano, 2002), is defined in this context as the one that develops their own technological platform and connects selected partners who contribute to value generation to it (Rietveld et al., 2019). Based on these insights, the three dimensions of platform architecture, platform governance, and platform services occur and must be managed by the platform sponsors. It is demonstrated that all three dimensions correlate, and platform governance grows with the more open platform architecture as well as the number of connected partners. The complexity of the services also has an impact on both dimensions.

The literature provides a variety of insights from the perspective of the service ecosystem, using the definition of Lusch and Vargo (2014) in the context of SDL as a basic description and starting point for their research. The ties between actors are not equally strong across the service ecosystem and change with increasing digitalization and resource integration. Ties play a vital role in ecosystems and are defined as the social relationship between the actors and can be classified as weak ties, strong ties, or no ties (Sklyar et al., 2019a). Sklyar et al. (2019a) researched ecosystems in terms of digitalization and identified fundamentally different interplay among actors before and after the introduction of digitalization, which has a positive impact on the effectiveness within the interaction. Furthermore, in contrast to Rifkin (2014), digital services alone are not enough to increase the effectiveness of resource integration via scalability and require a digital infrastructure. Surprisingly, the higher the number of weak ties, the more positive the effect and the more efficient the resource integration, as servitization and

digitalization go hand in hand and have a significant interaction (Lerch and Gotsch, 2015). Sklyar et al. (2019b) researched the inter-firm and intra-firm change processes and collaboration of actors in the context of the introduction of digital servitization. The findings demonstrate that digitalization can be an enabler for improving coordination in the ecosystem between the various actors. The unified vision across all members in the ecosystem plays a decisive role and is a success factor (Sklyar et al., 2019b; Foss et al., 2023). Sklyar et al. (2019b) also consider the decision-making (for further information see, for example, Joseph and Gaba, 2020), which should, according to some previous research, be decentralized in the servitization process and lower management should gain more authority for this (Eggert et al., 2014). However, Sklyar et al. (2019b) found out that centralized decision-making tends to have a positive influence, which supports the findings of Davies et al. (2006) and Kowalkowski et al. (2011).

Finally, the term "IoT", with its three enabling components of hardware (e.g. sensors), middleware (e.g. data storage), and user tools (Gubbi et al., 2013), is often mentioned in the literature in connection with the ecosystem. An IoT ecosystem is a "*[…] special type of business ecosystem which comprises a community of interacting companies and individuals along with their socio-economic environment, where the companies are competing and collaborating by utilising a common set of core assets related to the interconnection of the physical world of things with the virtual world of Internet"* (Mazhelis et al., 2012, p. 5).

Through using the IoT technology, companies can take on the role of an enabler to equip others with the technology to also become part of the ecosystem (Weinberger et al., 2016).

The IoT ecosystem perspective can also support the business model design. Westerlund et al. (2014) and Osterwalder and Pigneur (2010) take the view that an ecosystem business model consists of value pillars that are in turn anchored in the ecosystem. When developing a business model in the IoT ecosystem, companies may benefit from considering key pillars such as value drivers, value nodes, value exchanges, and value extraction. With these four values the authors show the need to rethink business model research away from the focus on the individual organization towards the holistic and ecosystem-wide view that is necessary in an IoT ecosystem (Westerlund et al., 2014).

The two upper sections, which examine the origins of the ecosystem as well as new trends, demonstrate that the trend is increasingly moving towards digital business models and that manufacturing companies are forced to deal with digital value propositions and find their place in the ecosystem. The following section therefore provides a closer review of the literature that deals with servitization.

2.4 Servitization

2.4.1 Origin and Diversity of Servitization

Manufacturing companies are increasingly following the trend of digitalization and expanding their product portfolio with service value propositions. This evolution of manufacturing companies is called “servitization” in the literature (Baines and Lightfoot, 2014) and was previously mentioned in 1988 in connection with B2B (Vandermerwe and Rada, 1988). The motivation for companies to undertake this far-reaching business model and mission change (Raddats et al., 2019) is to generate a competitive advantage and increase profitability (Dörner et al., 2011). Since the concept emerged, it has already been

examined from numerous perspectives, and insights are provided into, for example, service transition (Oliva and Kallenberg, 2003; Kowalkowski et al., 2017) and service orientation (Löfberg, 2014), to name just two examples. In a bibliometric analysis, Khanra et al. (2021) note a sharp increase in published studies from 2014 onwards and 80% of the identified papers were published between 2014 and 2019. This proves the relevance of the topic today and that servitization is no longer just a marginal phenomenon in both industry and literature. The four clusters of firm capabilities, customer involvement, business models, and transformational challenges emerge from these identified papers (Khanra et al., 2021), whereas another study identified the five main themes of service offerings; strategy and structure; service development, delivery, and sales; resources and capabilities; and motivations and performance (Raddats et al., 2019). These two papers alone show that servitization is of great interest and has already been considered from different perspectives. Due to the fact that the topic of services in manufacturing companies is very recent, the two other terms “product-service system” (PSS) (Goedkoop et al., 1999) and the already mentioned “service-dominant logic” (Vargo and Lusch, 2004) exist in parallel and so are either used synonymously or at least have a large overlap. They are fundamentally based on the same idea that manufacturing companies develop further into solution providers and into selling both products and services (Barquet et al., 2013). There is currently no uniformly recognized definition for PSS, but one could be that PSS combines products and intangible services in a way that generates added value for the customer (Tukker and Tischner, 2006, p. 1552). This approach is therefore embedded in servitization and focuses on the value proposition, which encompasses much more than the mere combination of product and service. Kuijken et al. (2017), for example, place their research of PSS between a company and

customer and examine various combinations of products and services in terms of customer value. Hence, they see the PSS as an outcome of the servitization strategy, which is also categorized and further developed by other scientists (e.g. Kohtamäki et al., 2021). Zheng et at. (2018) build on the idea of PSS and expand this approach to include smart technologies in the context of digitalization. In contrast to PSS, SDL addresses the concept of the traditional supply chain and replaces it with the network concept or service ecosystem as discussed in Section 2.3.2. In this context, the literature discusses various perspectives and considers the network in terms of configuration, roles of actors, necessary resources, or even responsibilities within the chain for value creation (e.g. Erkman et al., 2016).

While "servitization" as a generic term was previously associated with the combination of products and services, digitalization is also making inroads here, as already mentioned by Zheng et al. (2018) in the context of PSS. Digital servitization has its focus on smart solutions and extends the traditional definition of servitization to include the software as a third pillar beside product and service (Kohtamäki et al., 2019, 2022). The smart solutions approach in this context is based on Porter and Heppelmann's (2014) definition of smart products, which states that the three elements of physical components, smart components (e.g. sensor), and connectivity components (e.g. antenna) make up a smart product. As this technology and its development is advancing rapidly in the industry and has now found wide application in both industry and private use, the literature has also recently begun to deal with digital servitization as servitization offers companies new opportunities to create a competitive advantage (Kowalkowski et al., 2021). The service design process is identified as a critical component in digital servitization and requires a

holistic approach for value propositions, which was researched by Iriarte et al. (2023) and addresses how servitization can benefit from design tools and practices. Within digital servitization the subarea of digital service innovation (DSI) finds its way into the literature. In the course of the research, the innovation patterns platform skimming, platform revenue generation, and platform orchestration were identified based on the business model approach (Markfort et al., 2022). From a multidimensional phenomenon perspective, DSI is key for the performance of a company and requires the simultaneous consideration of digital servitization and technological innovation as they are strongly interlinked (Opazo-Basáez et al., 2022). The new service development process is also addressed in this context and Huikkola et al. (2022) contribute to the research stream via identifying rules for managerial heuristics in the innovation process phases.

It turns out that servitization as a relatively recent research area and development direction of manufacturing companies is only really picking up momentum and attracting great attention in the scientific community. As shown here, there are other terms that overlap with, or are subordinate to, servitization. Furthermore, the literature has undertaken contextual analyses relating to specific areas of servitization. However, servitization is also very well received in connection with the business model perspective as well as the interaction with the ecosystem. For this reason, the next section examines existing research in these areas in more detail.

2.4.2 Servitization in the Context of Business Model Innovation and Ecosystem

The servitization and smart solutions are considered significant factors influencing the business model (Kohtamäki et al., 2022). The business model itself is also a suitable

approach in this context, for example, to analyze PSS (Tan, 2010), which, in turn can lead to the creation of new business models (Tischner et al., 2002). Likewise, the ecosystem perspective is often used in the servitization literature to examine the interaction between the players beyond the boundaries of their own company (e.g Sjödin et al., 2022).

Literature that combines the two areas of business model and servitization has gained momentum, particularly since 2013. However, even before the term "servitization" became part of everyday language, there were already a few forerunners examining the development of service-based business models. Some authors have identified the main reasons for leaving the treadmills of the product-based model as the growing competitive environment and the cost pressure to which companies are increasingly exposed (Kindström, 2010; Barnett et al., 2013). Analysis has shown that individual areas of a business model alone are not enough to ensure successful service orientation. Kindström (2010) states that growing literature on the service innovation of manufacturing companies lacks the integral consideration that the perspective of a business model approach can offer. Furthermore Kindström (2010) found out that several business model elements are affected when a company decides to introduce services. Drawing on the business model approach of Chesbrough (2007), they identified several key issues in terms of value proposition, revenue mechanisms, value chain, value network, competitive strategy, and target market. Based on these findings, Kindström and Kowalkowski (2014) continued the research on 10 business model elements, which were relevant in their previous studies of manufacturing companies. These elements are also elementary for services and analyzed strategy, revenue mechanism, offering structure, development process, sales process, customer relationships, delivery process, and culture and value

network to identify key resources and capabilities for service innovation. Barquet et al. (2013) applied Osterwalder and Pigneur's (2010) business model canvas to provide guidelines for the introduction of PSS. Within each of the nine canvas building blocks the researchers identified PSS characteristics for the existing business model to decide whether it makes sense to adapt the existing one or create a new specially adapted business model. This change also requires a paradigm shift for the business model and managers already identified by Neely (2008). Barnett et al. (2013) addressed the need for further investigation in the context of servitization and criticized the fact that incremental changes do not lead to success, and profound paradigm shifts in operations and management are required. The interview-based analysis revealed that when transforming into a service-based business model, major challenges in contracting, culture and organization, performance, design and related equipment failures, and customer behavior occurred. To overcome most of the challenges it must be realized that a holistic business model change must be initiated that transforms the company into a service enterprise rather than a manufacturing company that provides additional resources for the services (Barnett et al., 2013), which is also advocated by other researchers (e.g. Raddats et al., 2019).

The literature discussed so far shows that the business model is changing and that various elements are affected when manufacturing companies add services to their portfolio. In contrast to the general strategic literature, service infusion is not a unidirectional transition and rather incremental (Matthyssens and Vandenbempt, 2008). Kowalkowski et al. (2012) and Forkmann et al. (2017) also investigated this finding and identified elements of incrementalism as well as phases of the business model reconfiguration. Cultural and

social challenge factors, cognitive boundaries, and the organizational design prevent the service infusion (Kowalkowski et al., 2012). Another significant insight is that service infusion does not happen over a short period of time and simultaneously across the entire business model. Rather, service infusion is a gradual process and evolves over time (Kowalkowski et al., 2012) and is also recognized by other researchers (e.g. Baines et al., 2020). Finally, responsiveness strategic decision-making or agile incrementalism, as the authors have summarized these findings, will help to react flexibly to the challenges. This contrasts with the traditional behavior of managers, which is that decisions are planned completely and holistically (Lindblom, 1979). Moreover, this method of strategic planning is conducive to service infusion, and managers must accept a certain degree of uncertainty in planning and continuous adjustment. This agile and responsive philosophy is also used in more recent literature on smart solution development in the context of decision-making (Huikkola et al., 2022), and also more holistically in an agile co-creation model of a micro-service innovation approach (Sjödin et al., 2020). An explicit extension of Kowalkowski et al.'s (2012) approach was done by Forkmann et al. (2017) in a study on business model reconfiguration. Reconfiguration of a business model addresses maintaining competitiveness, which must be ensured via an ongoing reacting and counteracting on external influences (Teece et al., 1997; Casadesus-Masanell and Ricart, 2010). For this reason, the three levels of transaction content, transaction structure, and transaction governance and the structural levels (business networks) help to understand how service infusion can be managed.

Due to the emergence of new technologies and reference to digital servitization, the business model approach is repeatedly considered in this area. In this process, the IoT

opens up new possibilities and companies are able to develop fundamental new business models (Laudien and Daxböck, 2016). But digital servitization cannot be carried out by a single company. Rather, it involves the entire ecosystem of complementors, suppliers, and other stakeholders (Kohtamäki et al., 2019). For this reason, research in recent years on business models and digital servitization has inevitably included the entire ecosystem in its considerations. As manufacturing companies struggle to implement these business models with the facets that the IoT offers, Paiola and Gebauer (2020) analyzed, as one of the first researchers, the impacts of this technology on the sales model, which can be direct or indirect. Using Osterwalder and Pigneur's (2010) canvas model, they researched different business model configurations of 25 companies and summarized that a direct sales model, and thus direct contact with the customer, is essential in the context of the IoT. Second, they identified the three levels of servitization product-, process-, and outcome-oriented. The levels represent the complexity of servitization and the nature of the link and connection across partners in the ecosystem, and especially with the customer and its value creation. At the product orientation level, the IoT plays an exclusively functional role and focuses on product life cycle services (Ulaga and Reinartz, 2011), while the most complex outcome-oriented level of servitization has a direct impact on the customer's value creation. The investigation shows that, at the most complex level, the IoT is essential and facilitates the complex linking of the two business models using technology. The authors viewed servitization as an extension of the existing business model, while others see servitization as a separate emerging service business model in parallel to the legacy one. Some authors have already shown that service divisions need to be outsourced and separated from product-oriented business (Christensen and Raynor, 2003) that a service culture can unfold (Gebauer et al., 2005). Gebauer et al. (2005)

describes this service culture as corporate values that, in contrast to purely production-oriented values such as efficiency improvement, focus more on flexible service delivery and the ability to respond individually to customer needs. It is therefore appropriate to separate this service culture from the existing physical business model, aligning with the approach of Palo et al. (2019), who pursued this spin-off strategy and found that servitization rather entails the parallel existence of two business models. This insight conflicts with Kowalkowski et al. (2017), who see servitization more as a transition from one business model to another. Furthermore, Palo et al.'s (2019) research proves that successful servitization is defined by the actors throughout the company and requires a change in business practices. Therefore, it's not a change of business model elements (Kindström, 2010; Kindström and Kowalkowski, 2014) top-down, but rather the bottom-up starting from each individual actor is crucial for servitization. They also emphasize that this change must take place not only in the focal company but in the entire ecosystem.

This ecosystem perspective was addressed by Kapoor et al. (2022) and the impact of a platform ecosystem on advanced services was also addressed. Several studies have already addressed the technical aspects of the platform ecosystem, but little is known about the dynamic of the actors' roles (Cenamor et al., 2017). Investigations revealed that there is a major deficit in the necessary capabilities of the actors (e.g. convincing other employees of the relevance of the services and getting them on board for the change), which act as the pivotal point in servitization and platform management. In conclusion, a company must first examine the supply chain with regard to the lack of capabilities before the servitization process. As platform ecosystem implies the use of the IoT, customers and their (machine) data are a decisive part of the value creation and proposition, and

their commitment is also of the highest relevance in servitization. Finally, the existing body of literature examines the ecosystem, servitization, and business models through four firm boundary theories: the power-dependency approach and organizational identity, as well as two theories commonly used in service literature – the resource-based view (RBV) and the transaction cost approach (Kohtamäki et al., 2019). The authors established a three-dimensional matrix comprising the dimensions of solution customization, solution pricing, and solution digitalization, each exhibiting different levels of complexity. Based on this, five distinct business models were developed: Product Provider, Industrializer, Integrated Solutions Provider, Outcome Provider, and Platform Provider. Companies can now decide which business model to pursue and how extensively their organizational structures must be adapted, as the models differ in complexity based on the user value proposition. To illustrate this complexity, the authors examined the five business models from the perspective of the four firm boundary theories. For this study, the resource-based view is particularly relevant, as it is frequently referenced in the service literature. From the RBV perspective, it becomes evident that the product provider model primarily focuses on product-related capabilities, as only add-on services are offered in this area. In contrast, the most complex model – the Platform Provider – focuses, for example, on interfaces, IoT, or a large number of providers.

The literature has also dealt with the evolution of servitization through digital technologies, business models, and the ecosystem. As already mentioned, because the technologies (e.g. the IoT) and their use are still very recent, the literature is still limited. Initial research and findings were presented by Kohtamäki et al. (2022), whose focus is on the development from less demanding to very demanding digital services and builds

on the findings of Kohtamäki et al. (2019). For each of the three identified levels, they explain the interplay between ecosystem, business model, and technology. From a business model perspective, the evolutionary process extends over solution provider business model, outcome business model, and platform orchestrator. As increasing digital servitization is constantly changing the ecosystem and the players involved in it, the change in the business model is also accompanied by an adaptation of the ecosystem and develops from the supply chain to the innovation network to the platform ecosystem. In contrast to Kohtamäki et al. (2022), Baines et al. (2020) refer to the actual servitization process of a manufacturing company and examine this taking into considering the contextual forces. The contextual forces that a manufacturing company is exposed to are key in the servitization process and lead to a continuous adaption (Finne et al., 2013). It is known from the traditional literature that forces can be external or internal (Pye and Pettigrew, 2005), and this was borne in mind in Baines et al.'s (2020) framework to investigate how these forces shape servitization. The four conceptual categories of exploration, engagement, expansion, and exploitation were identified and represent certain evolutionary stages. As these stages determine the maturity level of servitization, the five identified forces of technology push, customer pull, value network positioning, organizational commitment, and organizational readiness have an impact on progress. A similar study on the evolutionary process and business model innovation was conducted by Paiola et al. (2022), specifically addressing servitization through IoT and the simultaneous emergence of a second business model. They show in the three evolutionary phases of inception, experimentation, and replication how different business model elements of the old and new business have adapted. The data from the two cases demonstrate that the main differences in the evolutionary process can be seen at the

organizational level, and one company retains the service business in the existing structures while the other company spins it off in the final evolutionary step. Finally, Paiola et al. (2022) also emphasize the customer as a central component in servitization. While Kohtamäki et al. (2019) see the relevance in the fundamental provision of the service through customer data, Paiola et al. (2022) emphasize the necessity of customer interaction as early as the business model development and experimentation stage.

2.5 Conclusion and Research Gaps

The literature analysis shows the various contributions of the three areas of business model, ecosystem, and servitization, respectively. Although there is still no clear definition for the business model, the concept itself has reached a high degree of saturation and has already gone through several stages of development since it gained importance at the turn of the millennium. The same applies to the ecosystem, with many different concepts emerging, which are mainly based on the work of Moore (1993), following an analogy to the biological ecosystem. Both research streams prove highly relevant in the context of servitization and the transition of manufacturing companies to offer a service value provision. In particular, the literature on servitization frequently seeks to explain the challenges of servitization with the help of the business model, while also recognizing the importance of the ecosystem as the creation and provision of services, and digital services in particular, that extend far beyond the boundaries of the company's own business model. This area of research, which is still in its infancy, has already produced some findings and uses traditionally developed approaches from the business model and ecosystem literature. Yet there are still a number of gaps in the research, which scientists are also addressing for further investigation.

There remains an ongoing criticism that insufficient attention is paid to understanding manufacturing business models that are evolving towards services (Reim et al., 2019). The influence of business models and digitally enabled ecosystems is also seen as relevant for further research in the literature (Snihur and Markman, 2023). Specific questions for further research directions are mentioned in Budler's et al. (2021) summary of the business model research. They cluster the findings to date into the five themes of business management in networks, predictive value of the business model concept, business model innovation capabilities, business model ontology richness, and interconnectedness. This gives rise to research questions, one of which is specifically *"Which building blocks (elements) and success factors are critical in the development of new and network-based BMs?"* (Budler et al., 2021, p. 490). Although the involved business model elements in servitization are explored by Kindström and Kowalkowski (2014), the call from Budler et al. (2021) for further research is driven by the changing conditions created by digital servitization. As described in the previous sections, digitalization and the IoT have only recently made their way into organizations and organizational research. They provide rich research opportunities, enabling, as they do, fundamentally new value propositions while also requiring adoptions in the business model and ecosystem. As a result, further research is needed to investigate the implications of the IoT for business model innovation (Kohtamäki et al., 2019).

There is a clear research gap and need for further investigation is seen in the evolutionary servitization process. In this context, research has not yet provided any insights into the role of the ecosystem and how the partners in it might interact and need to be orchestrated (Paiola and Gebauer, 2020). In the context of ecosystems and the increasing number of

partners in servitization, the closely related and well-established stakeholder theory is relevant to consider. The stakeholder theory, particularly popularized by Freeman (e.g. Freeman et al., 2010), has been extensively explored in the field of organizational research (Barney, 2018) but has received little attention in the business model and servitization literature (e.g. Bigelow and Barney, 2021). In contrast to the dominant shareholder value approach, which focuses on maximizing financial returns, stakeholder theory considers the interests of a broad spectrum of relevant stakeholders, including social and ethical considerations (Parmar et al., 2010). However, this is only partially observed in the companies examined in this study, as they have primarily focused on profit maximization and the innovation of internal processes. For this reason, stakeholder theory is not considered in this study but might serves as a foundation for further research in this field, similar to the perspective of Bigelow and Barney (2021), who regard further exploration of the theory in this context as relevant.

Finally, there are very few evolutionary approaches in the current literature that have taken a holistic approach to the development from a product-based to a service-based business model. Initial studies were carried out by Baines et al. (2020), for example, who applied the context and process (based on Pettigrew's (1988) context, content, process approach) to servitization and the business model in their analysis. However, there is no approach in literature that considers both the content and how the content evolves in consideration of this dynamic context. This provides the research opportunity for the current research.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter builds from the literature review to detail the methodology and philosophical viewpoint of this thesis, including which work steps are needed to appropriately address the research question in order to successfully develop insights for scientists and practitioners Specifically, the chapter outlines the approach chosen as the most suitable for investigating how product-oriented companies reorganize in order to add radical services to their portfolio. In this regard, the methodology, research design, and the associated general research process are key decisions for this research and directly link the research gaps of the business model innovation and associated research stream discussed in the previous chapter with the research question and objectives as formulated in Section 3.2. In this context, the chapter provides an overview of the philosophy and key assumptions underpinning the research before detailing the methodology and research design appropriate to the formulated research question. The single sections deal exhaustively with why these approaches were applied, and which process accompanied these decisions. The chapter also answers questions about how the data were gathered and how this information was evaluated, concluding with a reflection on the limitation of the applied methodology.

3.2 The Research Question and Research Objectives

The research question is the mission statement of a research project, with all activities aligned to answer the question. The formulation of the question also informs the

methodology used to answer the identified research gap and how the information should be gathered. Edmondson and McManus (2007, p. 1156) categorize the research question as one of four key elements in a research project, which helps to focus a study, narrows the topic area to a meaningful, manageable size, addresses issues of theoretical and practical significance, and points toward a viable research project – that is, the question can be answered.

Following the literature review of the different literature streams related to business model innovation and identification of the research gaps, the central research question was formulated:

How do traditional product-centric companies reinvent themselves and foster radical service innovations?

Business model innovation and related topics, especially in the context of new trends like Industry 4.0, are still not comprehensively studied, and theories or frameworks, if they even exist, not generally accepted. The literature review revealed manifold future research topics indicating the complexity of the research area.

The sub-questions are carefully formulated based on the research gaps and determine the sections and single elements of the semi-structured interviews for an effective and efficient collection of the data, as well as helping to answer the central research question. The research question and its three sub-questions pursue three objectives to contribute to the business model innovation literature and related streams, as well as practitioners who

are facing the option or necessity for servitization. Guided by the research question, its sub-questions, as well as the focusing on data-based service innovation, the contribution focuses on three different research dimensions, specifically servitization and ecosystem with the business model construct as an anchor point as well as their interaction between each other (see Figure 1).

Despite substantial usage in both academic research and practice, evidence from recent reviews continues to highlight that the precise nature of what constitutes a business model and business model innovation remains unclear (Rachinger et al., 2019). However, a tendency is emerging and business models consist at least of a *"[…] value proposition,*

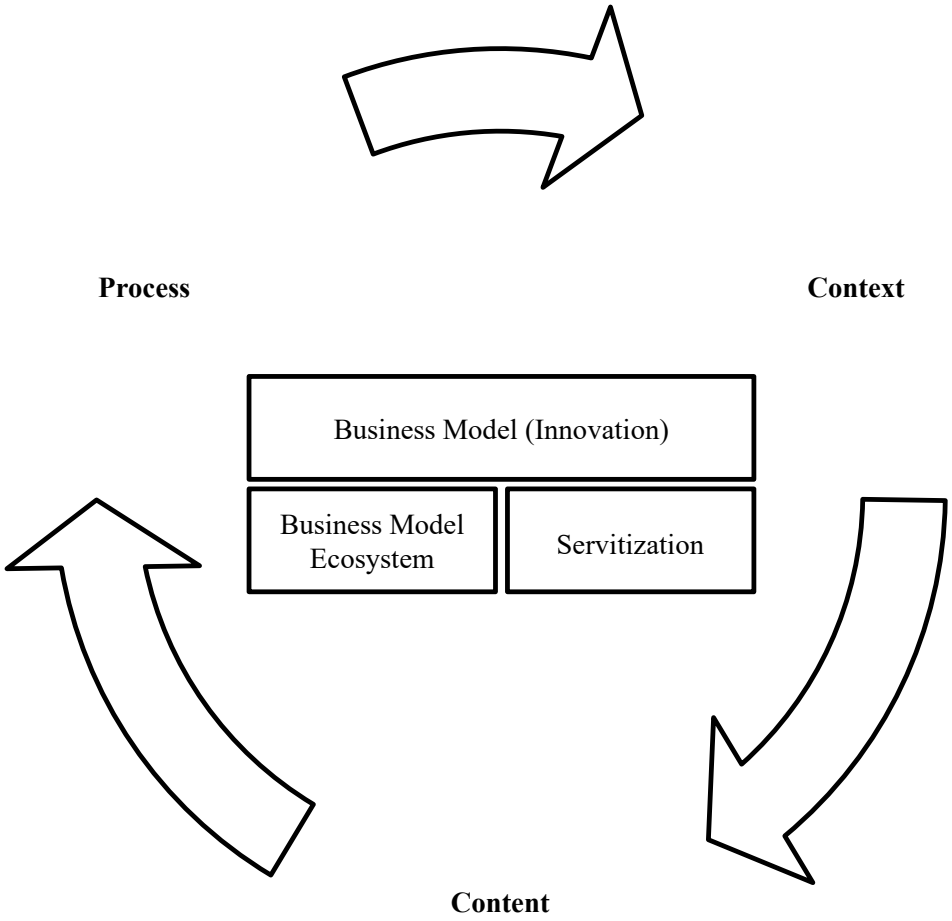

Figure 1: Research Approach and Dimensions of Contribution

value creation and/or delivery and profit equation (or value capture)" (Markfort et al., 2022, p. 78), as discussed in detail in CHAPTER 2: In the same vein, service innovation, and especially digital servitization, is insufficiently researched (Kohtamäki et al., 2019), as is also true of the business ecosystem (Gomes et al., 2018). But equally, in these research domains, recognized approaches have been established, e.g. Moore's (1993) definition of, and approach to, an ecosystem or the definition of servitization as *"[...] where manufacturers develop business models based on the capabilities enabled from product usage, instead of the sale of their product alone"* (cited in Kapoor et al., 2021, p. 5). These approaches and definitions are the basic framework for the present research. The literature review provides an overview of existing knowledge in the broad field of business model research and highlights areas where further understanding is needed. Equally, the need for additional insights for practitioners, who occupy leading functions in the corporate strategy and servitization, was clearly demonstrated.

The existing literature and gathered primary data point to the complexity of servitization. Service orientation no longer occurs or is managed by a single department in the focal company; instead, it requires a change across different departments. Moreover, the required change stretches beyond the organization to companies in the value chain and even across different ecosystems. The patterns identified in the interview program can be allocated to the three aforementioned pillars of ecosystem, business model, and servitization, which also influence one another. Consequently, their interaction must also be considered. Contribution is made to the business model innovation literature based on Johnson et al.'s (2010) four-box business model and its different elements. Recent insights into business models summarized by Budler et al. (2021) and Zott et al. (2011)

focus on the network perspective, which is a main pillar of digital innovation in the present context. Zott et al. (2011, p. 42) highlight the *"[…] increasing complexity and intricacy of inter-firm relationships"*. Budler et al. (2021, p. 490) summarized and clustered the existing body of literature on business models and highlight the work of Bankvall et al. (2017), and Chandna and Salimath (2018) as a key business model reference in networks with the potential for further research, e.g. *"What are the core elements of network-based models?"* The ecosystem perspective introduced by Moore (1993) and taken up again by Adner's (2012) work on co-innovation and adaption chain guides the contribution in this stream. More recent research by Adner (2017) on ecosystems and their structure as well as interplay with strategy is used for the contribution as the primary data show how alliances in the innovation process are used for strategic positioning in the market (e.g. is the construction machinery company now in a position to develop into a platform provider and bind other manufacturers to it in order to reach customers). Additionally, the insights draw on recent findings in ecosystem research from Sklyar et al. (2019a, 2019b). These authors focus on inter-firm and intra-firm change processes in the ecosystem with a focus on digital servitization. Their insights are particularly valuable as the ecosystem in the case companies fundamentally changed and new foreign ecosystems like the telecommunications industry have become a key enabler for their service business. Paiola and Gebauer (2020), in particular, give valuable insights into the servitization process and how the IoT shapes the business model, and Kohtamäki et al. (2019) discuss the alignment of business models within the ecosystems in the servitization context. On a micro level, Kindström and Kowalkowski (2014) investigate what elements of a business model are involved in a servitization process and separated them into resources and capabilities. The results are used for refinement in the

given context and to comply with their request for *"[…] evolutionary patterns by which these service innovation-driven changes unfold over time […]"* (Kindström and Kowalkowski, 2014, p. 106).

With respect to innovation, the course of this plays a decisive role as innovation is not a one-off change to the business model within a short period of time. Companies typically progress through multiple stages of servitization, starting with basic machine data and advancing toward becoming platform providers that integrate physical products and data. A prominent framework of organizational change is the CCP approach applied by Pettigrew (1988), Whipp et al. (1989), and Pye and Pettigrew (2005). Contribution is made to show how the different dimensions influence each other in the course of the innovation process. Contribution in this area is mainly to the research of Bigdeli et al. (2017) and the organizational change, especially how the dimensions of content, context, and process influence each other.

3.3 The Philosophical Approach

This section briefly discusses the philosophical approach, as a basic understanding is considered essential in the context of scientific work. This research is based on a qualitative approach and semi-structured interviews (see Section 3.4.1). It should be noted and accepted that the qualitative research approach is fundamentally not free from personal influences on the study and can only be minimized and not completely excluded (Mays and Pope, 1995; Malterud, 2001). It is also essential to take professional experience into account. As already mentioned in Section 1.3, I have experience as a management consultant in the field of servitization and was involved in customer projects

that dealt with transformation from a purely product-oriented to a solution-oriented provider. As such, the ontological position on which this research is based has clearly emerged. Positivism is based on the ontological view that reality is objective and therefore not subject to personal and individual beliefs (Spencer et al., 2014). Since objectivity is difficult, if not unrealistic to achieve, the research has a subjective leaning towards interpretivism, privileging context and understanding.

The view of an interpretivist is that reality is relative (Hudson and Ozanne, 1988). Rigid structures are therefore avoided, and a more flexible structure can facilitate a better interpretation of perceived reality (Carson et al., 2001). Johnson (1987) argues that interpretation is key to understanding the social world. This argument is the underlying idea of an interpretivist approach (Leitch et al., 2010). The qualitative method, based on this view, *"[…] aims to explore and to discover issues about the problem at hand, because very little is known about the problem. There is usually uncertainty about dimensions and characteristics of problems. It uses "soft" data and gets "rich" data"* (Domegan and Fleming, 2007, p. 24). This explanation also indicates that only the interpretation of the data leads to a valuable result. Similarly, the mutual influence of researcher and participant cannot be ruled out. Rather, allowing and accepting this dynamic interaction can be valuable, as it is central to capturing the inherently contextualized narratives of the respondent's experience (Spencer et al., 2014). The chosen research method, grounded in a subjectivist ontology and an interpretivist epistemology, enables the discovery of unforeseen behaviors through interaction with individuals, assigning significance to these findings within the under-researched domain of servitization. This approach has also been supported and widely accepted by other researchers in the field (e.g., Huikkola et al., 2022).

3.4 The Methodology and Research Design

3.4.1 A Qualitative Methodology and Research Design

In light of the limited research exploring business model transition and how companies establish a service model, a qualitative approach was considered the most suitable for analyzing the research question (see Section 1.4). The research methodology indicates how to solve the problem (Kothari, 2004) and also includes the choice of methods (Guba and Lincoln, 1994) formulated in a research design. Basically, the research question is closely connected to the research methodology and must be harmonized (Leavy, 1994).

So, given the lack of current theoretical insight into service business model innovation, a largely inductive qualitative approach was seen the most suitable for researching this still nascent topic of how product-oriented companies manage the innovation process from a business model perspective (Eisenhardt, 1989; Edmondson and McManus, 2007; Eisenhardt and Graebner, 2007) and explore patterns via learning from observations in the practical world. Exploring existing theories of business models and ecosystems shows an insufficient explanation of radical service innovations of traditional companies, especially with respect to “why” and “how” companies start to innovate themselves in the given context and break out of their comfort zone. These questions remain largely unanswered or are answered insufficiently in the literature, as the current literature chapter and justification for further research highlight. Aligning with Edmondson and McManus (2007) as well as Miles and Huberman (1994) and Yin (2009), these types of questions perfectly match theory building research and more precisely draw upon pre-existing theory to add additional insights in a given context (Lee et al., 1999). In contrast to quantitative methods, which are very expedient in terms of generalization, the

qualitative approach answers research questions in a complex real-life scenario often driven by human activities (Guba and Lincoln, 1994) and is highly dependent on the context, as well as considering dynamic effects (Eisenhardt, 1989). Since the research question relates to an area that has not yet been sufficiently researched and defined by a generally accepted definition, the qualitative approach empowers *"[…] richness and holism, with strong potential for revealing complexity"* (Miles and Huberman, 1994, p. 10). Quantitative research on business model innovation has been useful in revealing key components of the business model and validation of constructs (Wirtz et al., 2016; Wirtz and Daiser, 2017), but offers less insight into the rationale, causal relations, approaches, and impact of transitions (Carayannis et al., 2014). By contrast, a qualitative approach also allows a closer and deeper look at the phenomena in real life and allows richer data in this context (Graebner et al., 2012). An impressive overview of peer-reviewed publications in the business model innovation context was undertaken by Wirtz et al. (2016), analyzing in detail what types of research were conducted in the past and what content was examined. The vast majority of approaches were qualitative studies (74) in contrast to quantitative empirical ones (30). Among these empirical approaches, the case study method is the most commonly employed (Wirtz et al., 2016). Appendix A provides a brief overview of papers and theses with a similar research focus. Leveraging the advantages of the qualitative approach outlined earlier and drawing on methodologies from key authors in related fields (e.g., Sklyar et al., 2019a, 2019b; Baines et al., 2020; Sjödin et al., 2020), this study adopts a qualitative, case study-based approach to identify patterns in the complex domain of business model innovation.

The research question is addressed through case studies and in-depth interviews, following the predominant approach used in existing studies within this field (see e.g., Gebauer et al., 2020b; Tronvoll et al., 2020). The case study method, widely regarded as one of the most commonly used qualitative approaches in management research (Welch et al., 2013), is considered the ideal approach in combination with in-depth interview due to the limited understanding of how manufacturing companies undergo the servitization process and analyse patterns in a specific context. Additionally, this approach serves to *"[…] contextualize the processual nature of organizational transformation"* (Tronvoll et al., 2020).

In contrast, several other qualitative methods were considered but found unsuitable for addressing the research question. The most common among them include ethnography, action research, and focus groups. Ethnography is rarely used in management research (Tsang, 2014). This method involves researchers either passively observing people's behaviors and statements or actively participating in their activities to gain deeper insights (Lee et al., 1999). Action research, by comparison, focuses on solving a practical problem, requiring the researcher to actively engage in a real-world context to implement and evaluate solutions (Heikkilä & Kuivaniemi, 2012). Similarly, the focus group approach gathers collective insights and opinions by facilitating discussions among small groups of participants, often based on previous findings (Kindström & Kowalkowski, 2009). The advantage of the chosen methods – a case study approach combined with interviews – lies in their ability to provide a deep contextual understanding while offering broad

applicability, independent of group dynamics. This ensures efficient and direct access to individual perspectives.

3.4.2 The Research Process

The research process gives a chronological and thematic overview of the whole research with a focus on the core activities experienced in this research project (see Figure 2). In contrast to several researchers who focus on the data collection process as the research process, Kothari (2004) includes the whole research in the definition. Following this point of view and theoretical approach, the processes were used and slightly adapted to the requirements of the actual project. The individual character of this project results in a process comprising seven core activities as highlighted in Figure 2. The problem definition (1) and interpretation and formulation (7) form the cornerstones of the research project. The activities in between are subdivided into the five core activities of literature analysis (2), research question and sub-questions (3), framework and semi-structured list

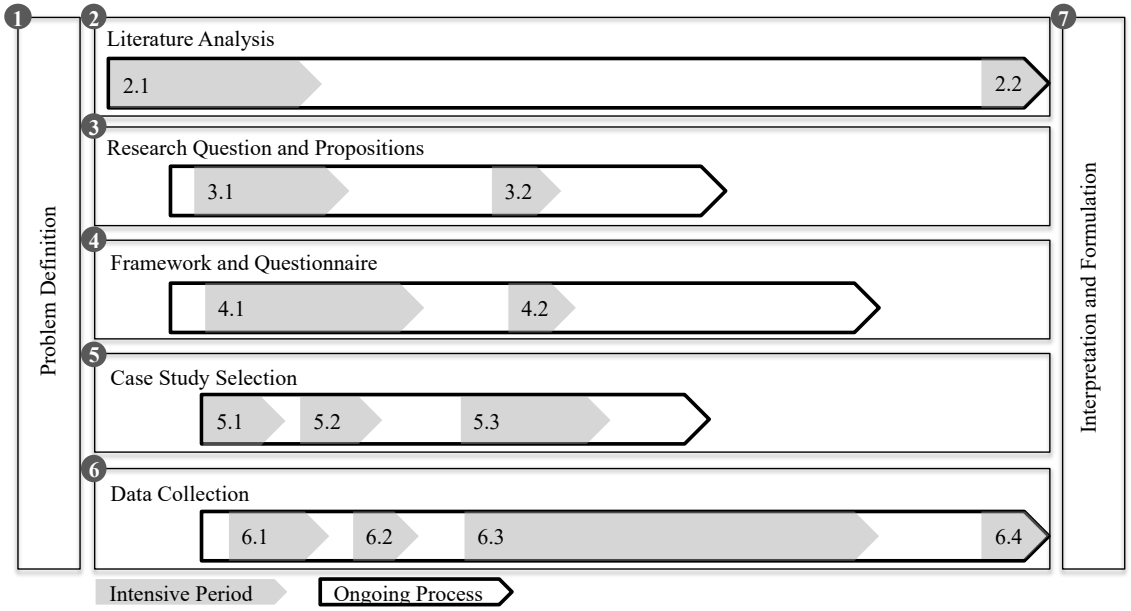

Figure 2: Phases of the Overall Research Process

of questions (4), case study selection (5), and finally the data collection (6). Although the activities are basically based on each other, it is not a straightforward process, but rather an iterative one, which ends up in many parallel processes to hone the outcome of each activity. The individual character of a research project based on factors including different data collection approaches or number of case studies, unforeseen circumstances in different activities, especially in the interview phase, as well as the researcher's learning process will likely result in backward-forward procedures in each activity to refine the research question. Similarly, the volatility of access to the case study companies is high, which is due to the still new and unknown field of activity of the service area and the fact that the roles change frequently, resulting in a loss of access to the contact persons and ultimately to the case study company. The reasons for these fast-changing roles are many and varied: for example, the service units are subject to extreme growth as servitization is becoming more and more important as part of the overall corporate strategy, something highlighted by respondents. Beside frequently changing roles, it may also happen that unfortunate staffing decisions are made due to the lack of experience of the human resource department in this new area concerning job requirements. Expectations are not always met on the employee side either, which leads to the contact person leaving for another company and thus losing contact with the company for further interviews.

The intensive periods of each step are highlighted as grey arrows and give a qualitative indication of intensive activity phases. Following the problem definition (1), the literature analysis starts and continues until the end of the research project. Two intensive phases (2.1 and 2.2) characterize this activity, starting with the initial analysis and the final analysis in the writing phase. The core phase of the further research is the research

question and proposition phase, which facilitates effective and targeted preparation of the interview program. Two intensive periods can be highlighted in this phase. The first one (3.1) is manly driven by the literature analyses, whereas the second one (3.2) is also influenced and honed by experiences from the pilot case study work and the feedback from IAM and BAM conferences. The same process also applies for the research framework with its two pillars of the business model itself and the business model ecosystem, as well as the list of questions for the interview period (4.1. and 4.2), which were honed iteratively and dependently on the phase before. The fifth phase encompasses the pilot case study phase (5.1) and the interview program with the main cases (5.2 and 5.3). The companies for the pilot case study were chosen based on the identified gaps in the literature and original research question. Within this phase the different topics for the analyses and questions could be explored and refined. The refinement of the framework and research question and the lessons learned from the first interviews (e.g. challenges in the evolutionary process) resulted in a much more streamlined list of questions focused on the problem definition. The case study selection, as well as the interview phase itself, was a much longer and iterative process. This was because of the already mentioned volatility of access to the case study contact persons. Also, the period between the initial contact with an interviewee and the actual interview could be quite long with several months going by, explained in part by the reality that capacity and resources for the new service business are very tightly measured, and the interview calendar is often booked a long time in advance. The loss of contact with one company also necessitated the acquisition of a new case study company. Finally, additional questions were asked based on gaps that were understood as significant as part of the case study write-up.

3.4.3 Pilot Case Study Phase

An interview-based approach is highly dependent on the availability of its interviewees and their willingness to give enough time to the interviews in their tight schedule. This is only one reason for a carefully selected and phrased list of questions to leverage insights from every conversation as much as possible. This approach can also be tested and refined through a pilot case study program. Saunders et al. (2015) define and justify the piloting [of questionnaires] as a *"[…] small-scale study to test a questionnaire [...] to minimise the likelihood of respondents having problems in answering the questions and of data recording problems as well as to allow some assessment of the questions' validity and the reliability of the data that will be collected"*. Yin (2009) explicitly recommends and highlights pilot case studies in the case study preparation phase. Researchers tend to follow the recommendations of these authors, embedding a pilot case study phase in their qualitative analysis. For example, Ulaga and Reinartz (2011) designed their research process for investigating how companies combine goods and services based on Yin's (1994) approach, utilizing the pilot phase to become familiar with the circumstances of the study and enhancing preparation for the in-depth phase with an efficient structure of the research questions (see Appendix E).

Following the recommendations of Yin (1994) and also the described advantages of a pilot phase (Ulaga and Reinartz, 2011), a small number of pilot interviews were conducted (see Table 1). This phase was directly prepared and processed after the first literature analyses and initial research question formulation with the goal of:

- getting familiar with the research context in the practical world

- developing a consistent and well-phrased list of questions
- testing and honing the thoughts of the research problem and the research framework
- learning if the approach helps to answer the research question and its single sub-questions.

Within this phase, four different companies were chosen for exploring the framework and list of questions. As all companies were originally in the product-based industry and have already spent resources on the service strategy or are at least service spin-offs and are highly dependent on physical products, these companies provided an excellent foundation for the main case study research. Table 1 provides a summary of the pilot case studies, the industries the companies act in, and the respective positions of those interviewed. All interviews were conducted on an informal basis and based on the initial developed research framework and list of question.

Table 1: Overview of Pilot Case Study Companies

Company	**Industry**	**Interviewed positions**
Vaisala (Finland)	Environmental and Industrial Measurement	Head of Services
Hilti (Lichtenstein)	Power Tools	Product Manager
Kemppi (Finland)	Welding	Head of Development and Business Area Manager
Better Place (Denmark)	Automotive	Director, Product and Business Development

The preliminary findings of two of the pilot case study companies, Hilti and Kemppi, were subsequently presented at the Irish Academy of Management as a competitive paper as well as the British Academy of Management at the doctoral colloquium. Both conferences gave additional thought-provoking impulses for a more efficient and effective in-depth case study phase.

3.4.4 A Multiple Case Study Research

In the more advanced empirical study, a multiple-case approach was used for generating and exploring the emerging insights into the phenomenon of radical value innovation to be gleaned from this project. While studies based on a single case study have been found to address significant research gaps and to generate descriptive and explanatory theory to address them very effectively (Siggelkow, 2007), the choice of a comparative method using two or more cases helps to increase the likelihood of key categories and relationships revealing themselves in the empirical analysis, while also helping to increase confidence in the transferability of the main findings and insights (Yin, 1994; Eisenhardt and Graebner, 2007; Baker and Edwards, 2012). Confidence in the reliability of the findings is also enhanced through the use of multiple data sources in this kind of qualitative study, so the main empirical data used for this study will be drawn from both the interviewing of multiple respondents per firm and from archival material, both external and internal (Eisenhardt, 1989; Leavy, 1994; Yin, 1994; Eisenhardt and Graebner, 2007; Gioia et al., 2012).

The rationale for the decision to include more than just one case study is to offset the possibility of mere coincidence in just one company (Baker and Edwards, 2012) and in

order to allow the development of more robust conceptual insights that can also be better articulated in a multi-case environment (Yin, 1994; Eisenhardt and Graebner, 2007).

As the literature review shows, the topic of business model innovation and its incubation in established organizations is still under-researched, so the first phase of the research study being reported on here is very much exploratory. The approach to the generation of fresh empirical and conceptual insight was somewhat inductive, though not as "zero-based" as would be the case if using a full grounded theory approach (Glaser and Strauss, 1967). The research framework is clearly drawn together from existing literature, but how these theoretical constructs of business model, innovation ecosystem, and innovation diffusion work together in the innovation scenario that is the focus of this study is not well understood. Consequently, a comparative case-based research approach was felt to be most appropriate (Eisenhardt and Graebner, 2007). A further advantage of the case approach is that it lends itself particularly well to the study of change over time, not just the "what" of the change (content) but also the "how" (process) and the "why" (context). Indeed, the case-based approach has proven to be a very effective research tool in studies with this kind of contextual-processual orientation (Pettigrew, 2012; Leavy, 1994; Yin, 1994). The research context is the agriculture, conveyor, and construction machinery industries, characterized by a long tradition of selling machines and now faced with increased competition due to factors like globalization. These industries are currently undergoing major upheaval, with many of the major incumbents looking to protect and enhance their positions through value innovation strategies that involve the introduction of new service-oriented value propositions and the new business models needed to give them effect. Existing theory provides little predictive insight into either the content of

these changes – in what dimensions the new business models will differ significantly from the existing business models – or into the process (how the change will come about, how long it will take, what organizational and commercial challenges the change leaders will face, and how they will be overcome).

Although the duration of semi-structured interviews is difficult to define – given the recommendation to keep them open-ended to maximize their value and fully leverage the interviewee's knowledge (Creswell, 2009) – the official timeframe is set at one hour for individual interviews.

3.4.5 Primary Data and Secondary Data

The qualitative case study approach mainly consists of gathered data from the interviews themselves. Nevertheless, secondary data are of great importance in different phases of the research project. In the preparation of the interview program and its single interviews, secondary data serve as information about the company itself and also to aid in understanding the context of the examined topic. Secondly, secondary data can help to avoid unnecessary questions in the interview, as these can be looked up in advance and guarantee a purposeful course of conversation with experiences and views from the individual interviewee. Thirdly, this kind of data helps in the follow-up work and in making connections between significant factors such as the company's history, development over time, and strategy clearer. Notably, most of the information in the case study introduction came from secondary data, which serves to embed the primary data and story in the overall context of the company's business, development and strategy. The combination of secondary and primary data is used in other, different researchers in

this area. For example, Kindström et al. (2015, p. 378) use secondary data beside interviews and focus groups *"[…] to minimize biased interpretations on the part of respondents"* in their paper to research the service sales function in product-oriented companies.

3.4.6 Case Study Selection

From the outset, it was evident that established industries with traditional structures are in the process of reinventing themselves in a way that goes far beyond simple add-on services like warranty extensions or maintenance contracts. Driven by the research question, the search started for established industries and their players with traditional structures developed over a long period of time in their original product business. As the radical innovations are based on data mainly generated by machines, sensors and the Internet are two crucial technologies, which need to be ready for successful business models. Due to the nature of the project and the methodology of researching an organizational shift of companies in their early stages, the options are limited due to the novelty of the enabling technologies. A good example of a probably not *"ready to market"* industry is the automotive one and its drive for sustainable concepts, including electric mobility. Based on my own experiences in the profession as a management consultant, there are very few established business models with a positive revenue model. This means in turn that it is hard to learn from these companies in their current phases of servitization. However, there are other traditional industries, especially in the B2B context in advanced stages and already with profitable services in place, although they are still far from being the main income of the single company. One of these industries, which is also the key industry for the analysis, is the construction machinery industry and one of its leading

innovative companies. But also, other industries and companies like the conveyor technology and agricultural cases are in this stage of reinventing themselves and offer different radical services.

The case study evaluation process followed Kowalkowski's (2008) three-key-factor evaluation approach. The first factor refers to the success of the company, which must be an industry leader in the sense of a targeted business with service offerings. The second factor refers to the general strategy of the company, in this instance targeted growth with the help of the services. The third part in an interview-based research design is the access to interviewees. In addition to the above-mentioned three criteria, comparability was added in the course of the project in order to be more focused on the service innovation typology and guarantee a better comparison between the cases in the cross-case and cross-industry investigation (see Figure 3) described as purposeful sampling. This approach is also used by various other authors in the business model context (Velu and Stiles, 2013; Rabetino et al., 2017).

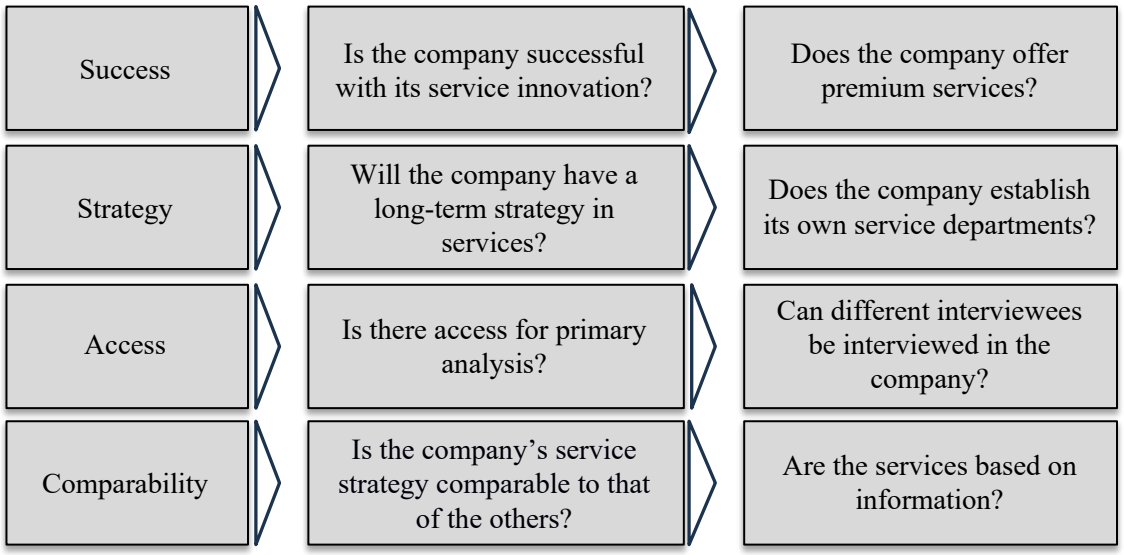

Figure 3: Criteria of Case Study Selection based on Kowalkowski (2008)

The focus was placed on the B2B context, as the initial literature review revealed that companies in this domain face significant challenges driven by efficiency factors (cost, time, resources). In contrast, these factors in the B2C context are often overshadowed by the brand itself (e.g., symbolic value). Additionally, B2B companies represent the largest contributors to GDP growth and play a pivotal role in an economy's value creation (Kowalkowski et al. 2024). Consequently, the B2B sector is under greater pressure and has gained momentum, particularly through IT-based Industry 4.0 technologies, which have opened up new opportunities for data collection, processing, and the development of new business models. The industries and their companies were selected based on the choices outlined in existing research, a market analysis, as well as the aforementioned criteria (see Kowalkowsi, 2008), particularly access to these entities. In the end, four companies in three different industries were chosen for the primary case study analyses. The construction machinery case study is a company with a wide spectrum of products in different industries. The focus of the analysis is the crane industry, which was the first mover in radical service innovations within the company. The second company is a global player acting in the agricultural technology industry. Similarly to the first case, the company introduced radical services years ago and the development of this sector is gaining speed. The third company acts in the conveyor industry and also started its efforts in the service business several years ago. Finally, another case in the crane industry acts as a supporting case study (see Appendix B) and represents insights into this industry as the first one does. The company has a long-term history in maintenance services and expands the business also into the radical service context, going beyond the incremental ones. Previous research has examined these or similar industries and their companies in the context of business model innovation and servitization. Eggert et al. (2014) for

example mentioned the agricultural company Claas as well as the mechanical engineering company Caterpillar in their research of service innovation. The power-tool maker Hilti was mentioned by Johnson et al. (2008) or Gebauer (2008) and highlighted as a successful company for the introduction of radical services. Similarly, Weinberger et al. (2016) have used the construction and mechanical engineering company Konecranes as a case study to examine how IoT services are transforming the industry.

3.4.7 Case Study Procedure and Analysis

The in-depth case study analysis includes a construction machinery, conveyor technology and an agricultural technology case. The access to companies and employees in middle management positions is not an easy initiative and many attempts failed. Ultimately, the identification of suitable employees from the selected companies was successfully achieved through the business platform LinkedIn. On this platform, service and product managers from the two companies in the construction machinery and conveyor case were identified and contacted via handwritten letters sent to the business offices. However, in both cases, the individuals addressed were no longer responsible for this area but requested their respective successors to get in touch with me. The idea to add an agricultural technology company as a case study came up by chance during a business conversation and was established with the help of a colleague in the professional field. From then on, the process was almost identical for every case study company. The topic was presented to the contact persons, who were interviewees on the one hand and also sponsors on the other, helping to identify other relevant roles and persons within their respective companies. In order to meet the legal requirements of the participation companies and the university, a summary of the research as well as the “Informed Consent

Form" (Appendix D: Informed Consent Form) were sent to the contact persons who reviewed the details internally in order to get permission from the respective legal department. In addition, a list of topic themes and questions was also provided at this stage. In the semi-structured approach, interviews are not rigidly oriented to the questions, but it is guaranteed that *"[...] basically the same information is obtained from each person, there are no predetermined responses, and in semi-structured interviews the interviewer is free to probe and explore within these predetermined inquiry areas"* (Hoepfl, 1997, p. 52). The list of questions (Appendix E) for the main interview phase evolved from the literature review and the identified research gaps, as well as the well-defined research question. The theory has shown that business model innovation in the context of servitization is still in its early stages and that the influence of the ecosystem, particularly through IoT, affects companies. Therefore, the questions were designed to capture a developmental narrative, including drivers and changes in the business model. Existing insights from the literature were incorporated to achieve a deeper understanding and integration with other elements. For example, Kindström and Kowalkowski (2014) provided initial insights into the affected business model elements, which were used to develop the storyline for the questions. Care was taken to ensure that the questions were not formulated too specifically, allowing the interviewees the opportunity to provide broader answers that could reveal unforeseen connections or perspectives. The initial versions of the questionnaire were tested during the pilot case study. However, it became evident that both the initial construct and the questions needed to be adjusted. For example, the area of business model diffusion was excluded from the study. Furthermore, the initial construct idea was presented and discussed at the BAM and IAM conferences during the doctoral colloquium. The critical discussion of the research areas and questions led to a

further refinement of the questionnaire, including rephrasing questions, removing unsuitable ones, and adding new questions to narrow the focus of the topic.

The interviews with subsequent respondents followed the same approach in all three case studies, i.e. the research topic was presented followed by the presentation and discussion of the Informed Consent Form. The "*indispensable*" audio recording (Patton, 1990) initially provoked reluctance among the participants of the pilot study. Hence, interviewees in the main interview program were once again explicitly informed that the interviews would be recorded, and that consent would be obtained from each person. In total, 31 interviews across the cases were conducted, lasting from 28 to 137 min. Table 2, Table 3, Table 4, and Table 5 present an overview of the interviewed companies, the position of the interviewees, and the length of the interviews. The typical respondents were Product Managers, Heads of Department (product and service), or Directors. The term "Product Manager" or "Head of Product Management" could be misleading as it might imply the management of physical products. It is important to note that the job title is also used for pure service value propositions, at least in the case study companies, and has been changed or updated thus far. Evidently there is variability in the interview range and responses from Rasmussens (2018) (81 interviews) and Kowalkowski (2008) (80 interviews), Halecker (2016) (18 interviews but additional workshop recordings and evaluation forms), and Sandstrom (2010) (23 interviews). It is important to note that the case studies were purposefully selected and relatively rare in terms of the transition they were experiencing. A further benefit was a prolonged access period, which enabled tracking of the journey. In addition, the professional experience of the researcher, coupled with the extensive pilot case study, made for informed and contextually sensitive

questioning and overall comprehension. Following each interview, the recorded conversation was transcribed verbatim for coding. Furthermore, the detailed analysis of each interview serves as preparation for subsequent interviews. In addition, further open topics can be identified that can be addressed in subsequent interviews. The coding followed the frequently used three-step approach of first-order, second-order, and aggregated dimensions (Bazeley, 2007; Sorensen, 2008), which is also used by researchers in the business model, ecosystem, and servitization context (e.g. Sklyar et al., 2019a; Raja et al., 2020; Kohtamäki et al., 2021). The analysis of the data using NVivo was a process involving multiple rounds of coding. Initially, the transcribed texts were read several times, followed by marking relevant text passages and creating initial nodes and resulted initially in a broad and scattered construct of 22 categories. The subsequent steps involved in inductively developing a theoretical scaffolding included, beyond the previously described familiarization with the data, the marking of text passages, and the creation of initial codes, the abstraction and development of preliminary theoretical ideas. These ideas were then compared with the existing literature. In particular, the findings of researchers such as Kindström and Kowalkowski (2014) served as a key reference point., who had already identified similar business model elements and categories. While their findings are fundamentally similar to the results of this research, the changed context and advancements in technologies within the industry have expanded upon their conclusions, adding a multitude of additional insights. Similarly, the aggerated dimensions (e.g., quality management was a main category) also underwent changes. The reasons for these adjustments included insufficient data or a more meaningful reclassification under a different aggregated dimension. Additional interviews, new insights, and changes in contextual relationships. These led to a refinement of the initial ideas and theoretical

scaffolding, ultimately synthesizing the theoretical scaffolding into a clear and coherent narrative. This approach was applied both to identify the four dimensions and their subcategories, as well as to develop the four evolutionary phases. These phases did not emerge directly from the interview questions. Instead, they were derived from the context. The interviews revealed or recounted significant events in the companies' histories. For example, questions were asked about how the introduction of services came about or how they evolved over time. The data collection benefited from the fact that the interview programs were conducted over an extended period, allowing certain questions to be asked multiple times. This made it possible to observe developments, such as changes in cooperation, standards, or strategic orientations over time. This data was enriched and supported by publicly available reports (secondary data) or company reports, which highlight major changes, e.g. acquisitions or strategy adaptations. The same process was applied here to inductively develop a theoretical scaffolding. Initial rounds of analysis and ideas resulted in seven phases, which were then compared with the literature. Further refinement led to the identification of four evolutionary phases, aligning with current findings while being enriched by the detailed insights from this analysis (see Appendix C, Figure 8, Figure 23).

Table 2: Interview Overview of Construction Machinery Technology Case

Company	Respondent	Role	Date	Duration
Construction Machinery Technology	Interview 1L	Head of Product Management	02.10.2014	1:07
	Interview 2L	Chief Technology Director	24.09.2015	2:17
	Interview 3L	Head of Global Customer Service	24.09.2015	2:24
	Interview 4L	Service Engineering Manager	04.03.2016	1:14
	Interview 5L	Sales Manager	04.03.2016	1:12
	Interview 6L	Product Manager	15.06.2016	0:50
	Interview 7L	Service Engineering Manager	08.06.2016	0:39
	Interview 8L	Head of Product Management	15.07.2016	1:53
	Interview 9L	Service Engineering Manager	11.01.2018	0:40
	Interview 10L	Product Manager	13.01.2017	0:28
	Interview 11L	Product Manager	31.01.2017	0:47
	Interview 12L	Head of Customer Services and Sales	23.02.2018	1:48
	Interview 13L	Product Manager	25.07.2018	1:08

Table 3: Interview Overview of Conveyor Technology Case

Company	Interview	Role	Date	Duration
Conveyor Technology	Interview 1S	Head of Service Eastern German States	26.09.2014	1:31
	Interview 2S	Product Manager Automation & Systems	14.11.2014	1:12
	Interview 3S	Product Manager Business Solutions	11.08.2015	0:59
	Interview 4S	Product Manager Business Solutions	22.06.2016	0:57
	Interview 5S	Product Manager Business Solutions	13.07.2016	1:34
	Interview 6S	Head of Product Management and Business Solutions	13.07.2016	0:22
	Interview 7S	Senior Director Digital Solutions and Support	15.10.2018	1:00
	Interview 8S	Engineer Business Solutions	07.11.2018	0:59
	Interview 9S	Senior Director Digital Solutions and Support	17.07.2019	1:02

Table 4: Interview Overview of Agricultural Technology Case

Company	Interview	Role	Date	Duration
Agricultural Technology	Interview 1C	Head of Service Products & Connectivity	30.11.2017	1:14
	Interview 2C	Head of Information Service Sales	11.12.2017	1:06
	Interview 3C	Senior Management Advisor	22.03.2018	1:01
	Interview 4C	Head of Marketing	24.11.2018	1:02
	Interview 5C	Head of Service Products & Connectivity	04.11.2019	1:12
	Interview 6C	Manager Digitalization and Processes	22.11.2019	0:51

Table 5: Interview Overview of Industrial Crane Technology Case

Company	Interview	Role	Date	Duration
Industrial Crane Technology	Interview 1K	Head of Service Business	19.12.2013	0:20
	Interview 2K	Service Director	29.01.2014	0:22
	Interview 3K	Key Account Manager	02.06.2014	0:59

3.5 General Context of Service Innovation

The focus of the investigation is the business-to-business (B2B) structure as an attractive market for researching servitization patterns due to its novelty in this development, at least in the broad market, compared to the business-to-consumer (B2C) companies. From a practitioner's perspective, observations of projects as a management consultant showed that more and more companies are recognizing the need for radical services in their portfolio based on customer demands or pressure due to competitors. Research follows

the trend reflected in increased publications analysing the industrial development in the B2C or general context. Some research has already been carried out in the B2C context and addresses, for example, value (Coutelle-Brillet et al., 2014; Kindström et al., 2014), modular strategies (Carlborg and Kindström, 2014), service quality (Pomirleanu et al., 2016), or value co-creation (Kohtamäki and Rajala, 2016), to name just a few research directions in a similar vein. Nevertheless, there are no in-depth analyses exploring service business model innovation and the involved key elements in the B2B context. An article by Kindström and Kowalkowski (2014) aligns most closely with the focus of service business model innovation but does not purely focus on the B2B market, investigating rather the elements in a generic way based on a larger number of different cases in an unspecified focus of market structures. In order to close the gap in increasingly popular research, the focus of the thesis is purely on B2B companies. Although the case study companies started with physical products and have a long tradition in their industry, incremental services belong to their portfolio as well and contribute to a very good reputation for each company. Excellent maintenance offers, different guarantee packages, and/or leasing models were honed over the last few decades and form the basis for the next generation of service strategies. While the first generation focuses directly on the physical product itself, the new services satisfy different customer needs via focusing on information that is made available to the customer directly – for example, in the case of location data or with the help of intelligent algorithms for decision-making support and optimization. An enabling technology for dealing with information is mobile technology, which helps to transmit data wirelessly from one point of the world to another. All of the case study companies set out the course for services in this direction and equipped their products with mobile phone cards and a large number of sensors. This is also an

increasing area of interest enabled by the availability of technology on both sides of the business. The investigation sheds light on how this mobile technology and unfamiliar ecosystem for the case study companies influence the business model. In this context, keywords like “Internet of Things” (IoT), “Machine to Machine” (M2M), and “Internet of Everything” (IoE) are used to describe this development in the practical and theoretical world. Figure 4 highlights the significance of the M2M development and shows an impressive increase in the number of devices until 2020. While M2M focuses on the communication between machines, the IoT involves the individual person. Similarly to the development of M2M communications, IoT connections significantly increased from 400 million devices with connectivity up to 1.5 billion in 2022 (Ericsson, 2018).

The figures show the relevance of these kinds of services and underline their efforts to further enhance business units. All the case study companies started to innovate many years ago even before the trend of connected devices in M2M or the IoT was identifiable to any extent. Yet, as the detailed case study analyses show in this and the next two

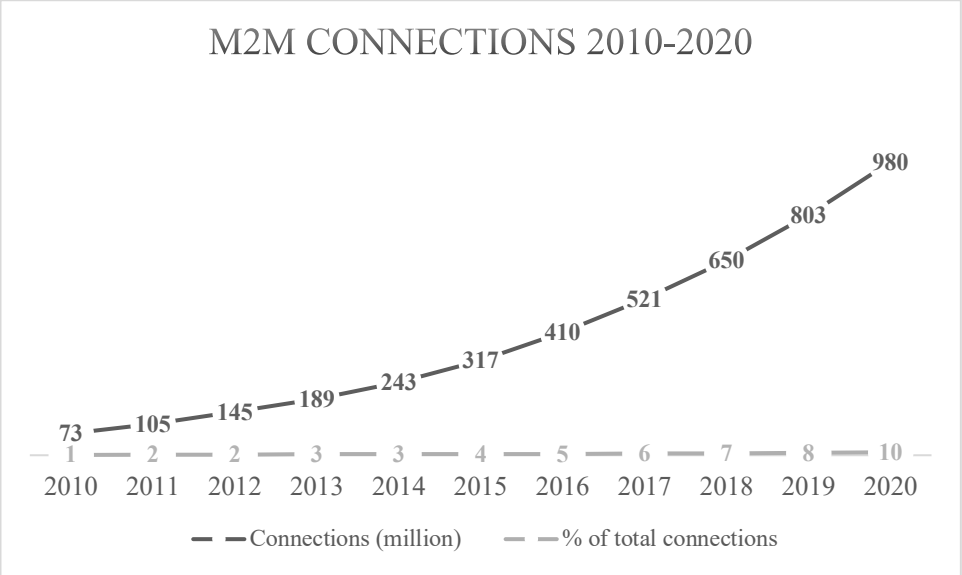

Figure 4: Development of M2M connections

chapters, service innovation is gaining momentum, with the companies now viewing services not as an additional benefit for the customer but as a new required industry standard. The implication is that each company will be measured by the customer, in contrast to the previous era where only the quality and abilities of the physical product were relevant. As the companies are well established and have been offering their high-quality products for several decades, the different facets that made the product unique in the past are now taken for granted. Conversations with interviewees from the construction machinery case clearly showcase the relevance for digital product-based services as customers explicitly include these capabilities in tenders when they are looking for a potential solution.

3.6 Limitations of the Chosen Methodology and Research Design

Although the research offers an excellent level of detail in the innovation process due to its intensive analyses based on semi-structured interviews, which often disclose unusual or unexpected patterns in the face-to-face discussion, the results are just a first step in a generally accepted approach. The focus is on a specific innovation process of market leaders in the B2B context. The restrictions were necessary to enable the detailed analyses of the case study companies on the one hand, and the nature of a dissertation on the other with limited resources. The data collected in case-based approaches are often dense and complex due to their semi-structured approach and the intended possibility of putting things into a causal relation. However, the analyses are much more complex and might simplify real life too excessively or in unsuitable ways. Eisenhardt (1989) argues that faced with vivid, voluminous data, researchers are tempted to build theory that tries to capture everything. Furthermore, a case-based approach allows room for interpretation

and depends to a certain extent on the researcher's way of telling the story (Miles, 1979) as he or she becomes a part of it and what conclusions are drawn from it. The reproducibility suffers as a result and in Yin's (2009) view, case-based approaches lack rigor. Soy (1997, p. 1) argues that *"[…] critics of the case study method believe that the study of a small number of cases can offer no grounds for establishing reliability or generality of findings an".* For example, case studies, according to Stake (1978, p. 5), are *"[…] not a suitable basis for generalization […]"*, but this approach is intended to create a required fundament for further research with suitable approaches to further develop the results from primary data gathered and derived from case-based data. However, some researchers also generally advocate the application of several approaches to theory development. Parkhe (1993, p. 255), for example, stated that *"[…] no single approach to theory development, including case studies, is self-sufficient and capable of producing a well-rounded theory that simultaneously maximizes the research quality criteria of construct validity, internal validity, external validity, and reliability"*.

Finally, the researcher is aware that unbiased behavior cannot be completely ruled out in a qualitative approach and can only be minimized (Mays and Pope, 1995). According to Malterud (2001), bias is unavoidable in qualitative inquiries and ignoring this fact leads to subjectivity. Consequently, Haraway (1991) suggests that the researcher's position should be explicitly stated and, according to Van Maanen (1988), referenced at appropriate points in the research process, followed by a discussion of both its positive impact on the study and its limitations. Although qualitative research has its limitations, Section 3.4.1 discusses why this approach, with its advantages, is the most suitable way to analyze the research question. Furthermore, Campbell (1975, p. 179) sums up the case-

based approach aptly: "*After all, man is, in his ordinary way, a very competent knower, and qualitative common-sense knowing is not replaced by quantitative knowing [...]. This is not to say that such common-sense naturalistic observation is objective, dependable, or unbiased. But it is all that we have. It is the only route to knowledge – noisy, fallible, and biased though it be.*

CHAPTER 4: CASE STUDY A – THE CONSTRUCTION MACHINERY COMPANY

The German company was founded in the 1940s and is known for the introduction of one of the first mobile tower cranes on the market. This was the starting signal for a small company and a success story, which led to a large corporation that today has some 40,000-plus employees, more than 130 companies, several lines of business, and a turnover of 9.009 million euro (2016). Several innovations and market-leading inventions have accompanied the brand's reputation. This contributes not only to strengthening the market position but also to increasing market power.

Although the company started its story with mobile cranes, it has since developed a wide variety of products in different product groups, resulting in an impressive turnover today (see Table 6; Construction Machinery Case Annual Report, 2016). As a result of this diverse product range and associated financial resources, Case A was able to commence innovation in fundamental new service directions as the detailed case study analysis in the following chapters illustrates.

Table 6: The Product Groups and Turnover

Product Group	Million €
Earthmoving	2.074
Mobile Cranes	2.072
Aerospace and Transportation System	1.280
Domestic Appliances	898
Maritime Cranes	816
Mining	638
Tower Cranes	410
Others (e.g. hotels)	396
Machine Tools and Automation System	219
Concrete Technology	206

Business model innovation in the context of servitization does not take place in every industry sector that the company serves. Today, the three business units of earthmoving, maritime cranes, and tower cranes (see Table 6, grey shaded) have started to consolidate radical service strategies based on mobile communications and related technologies in the company structures. Each segment is acting in the B2B context, and their customers are companies from small founder-managed companies up to large groups. The segments are of paramount importance for this investigation due to the demand and need for these radical services, which enable sustainable business models due to the willingness of customers to pay for such services. In addition, the company had the ability early on to satisfy customer needs from a technical, processual, and organizational perspective, even though it was, and still is, extremely challenging to create these services. As later sections and deeper analysis highlight, these kinds of innovation would not be possible, at least to this extent, without the support of some other business areas or segments in the group,

which only support the value proposition indirectly, e.g. via developing hardware components to enable services.

The company's tradition in incremental services certainly facilitated the organizational transformation enabled by cultural values purely focused on the customer. The construction machinery company has always been customer-focused, and not only on its physical products, with the sentence *"[…] we never abandon the customer"* highlighted several times in the interviews from different respondents. This sentiment was referred to with respect to any questions or issues encountered by customers, or even by customers in the second-hand market. In addition, the company values, which are detailed in the following paragraph, provide an excellent basis for innovation in services and were reflected by interview respondents.

4.1 Brand, Customers, and Competitors of the Construction Machinery Company

Developing services to this extent and on this scale requires a certain company size to manage and carefully design each component of the physical product to meet the local demands in every target market concerning cultural differences. These starting points were already in place for the case company as its products can be found all over the world, including distant regions. In order to be represented in all important markets, the company is located in all relevant continents, i.e. Europe (22 countries), America (7 countries), Africa (7 countries), Asia (14 countries), and Oceania (3 countries) (Construction Machinery Case Homepage, 2017). Due to versatility and its global presence, the company can be perceived by its customers, and also competitors, as a reliable brand for all products developed by the company.

The brand itself is also established and maintained by the company's values, which are clearly outlined on the homepage and in other company documents. The management defined six core values and hold them dear, which are described as the enabling factors for the success (Construction Machinery Case Homepage, 2018):

- Highest quality in everything we do
    - The company aims to always offer the highest quality to its customers. This value is also a driver for its service innovations as indicated across interviews. For example, the company took some time in the development process and pursued the aim, not necessarily to be the first one on the market with an innovation, but to be the one with the most mature solution. As regards the customer approach, the company sets high quality requirements and takes over parts of the service for its partners if they are not able to guarantee these high standards in front of the customer.
- We are innovative
    - This value could be highlighted as the company's key driver due to the courage of management and the investment in something different, including a likely uncertain business case based on new technologies for sensors, telematic systems, and IT developments.
- We are a trustworthy partner
    - One more value that is reflected and reinforced in the interviews is represented by the Head of Product Management, who emphasized that *"[…] even second market customers are maintained if they need support"*. Also, all of the solutions are developed based on an outside-in perspective,

focused on real customer needs, which is simplified at least for the focused company segment due to the direct customer approach and proximity to the user.

- We are independent
    - Based on the company's homepage, this value summarizes the flexibility and responsiveness of market demands. This is due to the financial independence of the family-owned business, which allows it to act not always in the most profitable way but in the most sustainable manner and taking multiple values into consideration. This probably gave the company the chance to create the telematic service, which was initially not developed based on a positive business case but on other values, as manifested in the mantra of "never abandon a customer", as stated by the respondents.
- We accept responsibility
    - This value was also mentioned several times in the interviews and hence reflected in the service business model. For example, the services process different data categories like machine data but also personal data of the customer, which are then treated and processed with higher standards than legally prescribed.
- Our employees are a key factor in our success
    - The OEM is known as being a good employer, providing secure jobs. The company is striving to create optimal working conditions to ensure that their workforce remains highly motivated. This value was also reflected in the interviews and in unofficial exchanges with the employees. The

headquarters, which deals with digital innovations, relies on the individual creativity and intrinsic motivation of each employee and imposes few rules on its employees, e.g. no clear responsibility or tasks, presence time (remote workplace if possible), and other different factors.

These values are reflected again and again and can also be found on multiple occasions in company documents. When it comes to the analyses of the overall business models and service innovations, the significance of such values will be emphasized and analyzed further (see Section 4.2). These values help to create a strong brand, which is perceived by the company's customers as representing a high-quality solution provider in the upper price segment, as indicated by coverage in several magazines (e.g. Portstrategy, 2018) and detailed by interview respondents. The company has always been, since it started 60 years ago, customer-focused and innovations were developed based on real customer needs and not based on mere technological possibilities. An

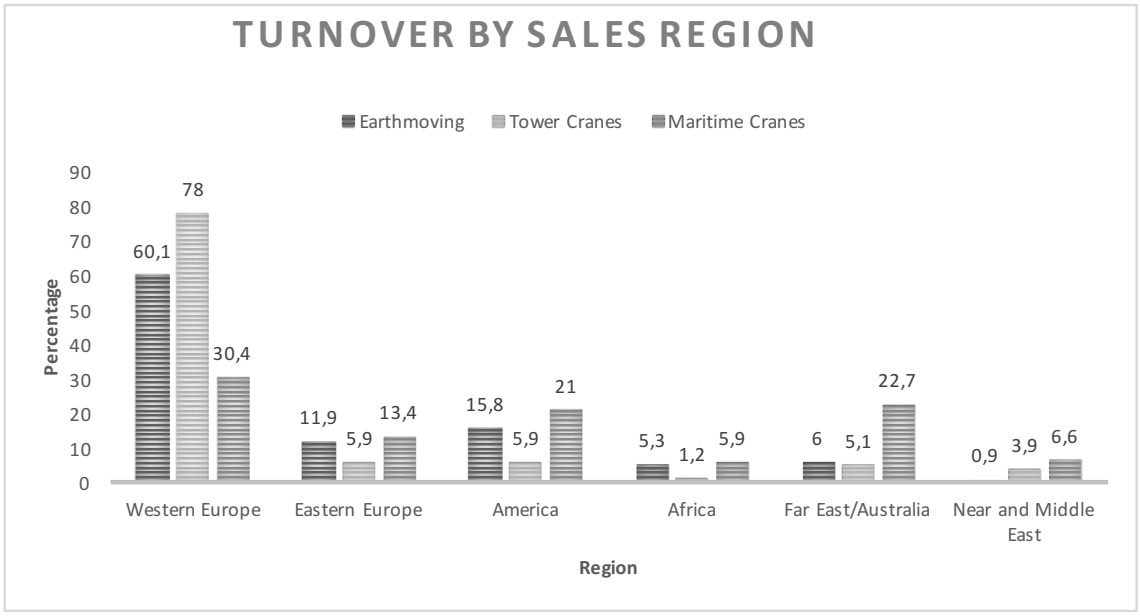

Figure 5: Construction Machinery Case's Turnover by Sales Region for the Sectors of Interest

indication of this approach is tailor-made products, which do not necessarily focus on a mass market but rather on single customer jobs-to-be-done and how customers can be supported by products and new offerings. This fact might also be a reason why some products, or product groups, are highly specialized for meeting the real customer requirements. On the other hand, the OEM also serves totally different markets like domestic appliances, which are highly competitive (e.g. refrigerators). Within this overall context, it is important to narrow down the varied offer of the company and focus only on the product categories that are affected by service innovations and hence are under consideration for this particular research. Radical service innovations can be found in the areas of earthmoving, shipping and tower cranes. These three sectors are responsible for 34% of the total company turnover and are represented in the markets worldwide (see Figure 5 (Construction Machinery Case Annual Report, 2016)). Having a closer look at the categories of interest and which markets are served by each group, the Western market is by far the most important for all three segments and is also the company's home region. Although the other markets are substantially behind this one, none of them can be neglected as this figure represents only the direct sales. Indirect sales (second sales) or leases in the other regions from the Western market to others are not uncommon and the company needs to be present in these markets. The strongest market in physical businesses was also the launch market for the new service solution. Launching services that are totally different to what the company is used to providing in its comfort zone means that unknown factors, which are especially likely in foreign markets, need to be reduced (Christensen, 1997). According to the Product Manager (Interview 6L), it is for that reason that the construction machinery company started in Germany with at least one of its latest services, as it is much easier to learn in the home

market. Typically, governmental or legal requirements in foreign markets are not familiar and might be harder to capture. Additionally, cultural differences and varying levels of service acceptance became evident in the interviews. Fully integrated, data-driven services in machines are highly valued in Western Europe, whereas customers in Eastern Europe tend to focus more on the physical product and only add external service solutions when necessary (Interview 4L).

Another relevant figure in this context is the number of employees working in the three segments of interest. In total, the company employs 40,000-plus people, with nearly 40% (15,000) working in the three segments (see Figure 6 (Construction Machinery Case Annual Report, 2016)), which is very similar to the distribution of turnover. Furthermore, the case and its connected business model plays an important role as, according to Christensen (1997) and other researchers (Markides and Oyon, 2010), an outsourcing approach (e.g. a subsidiary or spin-off) for radical services might be the preferred strategy. By contrast, the case illustrates how an alternative approach, which

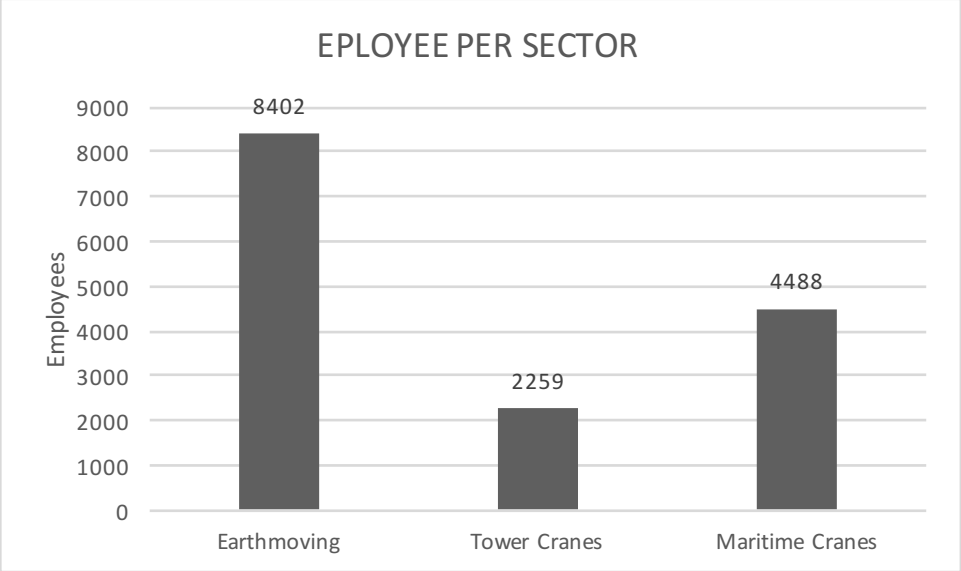

Figure 6: Construction Machinery Case's Employees in the Three Sectors

involves the internal development of a new business model utilizing the same employees from the legacy business model, can be effectively managed.

The significant representation of workforce and turnover indicates the strong position of the OEM in the world market and contributes to the company's ability to create radical services. This represents further justification for its selection as the focus for the current research. For example, the KHL Group compares and evaluates different companies in this sector on an annual basis and formulates the results in a document called "Yellow Table". Basically, the company provides information on the international construction market and is, according to its own statements, the leading supplier of different information in the industry edited in different formats like books, magazines, events, newsletters, exhibitions, and directories (KHL, 2017a). One of these formats and pieces of edited information is the aforementioned Yellow Table, which lists the elite of equipment manufacturers on a yearly basis. The comparison summarizes the world's top 50 companies in the sector and is based on the sales in the previous year (KHL, 2017b).[1] Although this might lead one to expect little variation from year to year, the Yellow Table shows that the top ten are very closely grouped together in their sales volume, and places vary. In this competitive review, the case company is in fifth place with a share of 5% of the total sales volume in 2016 (US$129 billion) (KHL, 2017b).[2] The case was the first to

[1] The methodology of KHL is using the sales of companies worldwide and transferring them based on average exchange rates against the US dollar. Data sources include audited financial statements, etc. (KHL, 2017b).

[2] Top 9 List: Caterpillar (16%), Komatsu (11%), Hitatchi Construction Machinery (5%), Liebherr (5%), Volvo Construction Equipment (4%), Doosan Infracore (4%), John Deere (4%), XCMG (4%), Terex (3%) (KHL, 2017b).

launch radical telematic-based services on the market, which further highlights the relevance of the case. In those days there was only an initial idea of prospective employees and customers, which needed to be further justified internally for a business case as stakeholders needed to be convinced of the strategy, especially so in the absence of a strong competitive rationale.

4.2 Empirical Service Innovation Analysis of the Construction Machinery Company

The case company adopted a new services direction and tapped into new sources of income to ensure long-term corporate success. The new services require a fundamentally different set of firm capabilities, which are described in this project with the help of a business model approach. Pettigrew's (1988) context, content, and process (CCP) dimensions help to frame the research and to understand why, what content, and how the company has changed its business model and respectively developed a service business model in parallel to its legacy one, in order to create and deliver a fundamental new customer value proposition. This approach gives a holistic overview of all relevant factors as *"[…] it is too narrow to see change just as a rational and linear problem-solving process [...] explanations of change have to be able to deal with continuity and change, actions and structures, endogenous and exogenous factors, as well as the role of chance and surprise"* (Pettigrew, 1987, p. 658). The framework was also used by Whipp et al. (1989) in the context of strategic change (Baines et al., 2020; Pye and Pettigrew, 2005).

4.2.1 Driver for the Construction Machinery Technology Company's Strategic Realignment

The case company's strategic vision changed over time and fundamental decisions were made in the divisions of interest with the objective of consistently assisting the customer effectively. However, these decisions were not only initiated and driven by customers, but a mixture of different factors led to the organization that the case is today, with a unique mix of different service value propositions and a strong team of service experts within the legacy organization. This contextual dimension highlights why the company had to innovate to this extent and why it chose not to rely on introducing simple well-known incremental innovations to the market but rather developed a fundamentally new information-based value proposition. The company's key decision was not to focus on what the competitors were doing but rather to rely on their strong company values and create something different in order to help their customers as the company's vision, including "highest quality in everything we do" and "we are innovative", dictates.

The OEM regularly develops and introduces new cranes, diggers, and other physical products to the markets across all its subsidiaries. Although the company was already a successful global player as one of the top five OEMs, it still decided to introduce a completely innovative kind of service going beyond the traditional incremental ones *"[…] with limited changes of service characteristics […]"* (Snyder et al., 2016) like guarantees or maintenance contracts. This section discusses the context dimension and gives a detailed overview of the internal and external environment (Pettigrew and Whipp, 1991) of the company in the radical service innovation to answer the question of why the company introduced radical service innovations beyond its comfort zone.

Internal and External Context

The cornerstone and initial birth of the service was more than 15 years ago and started in Austria where the company built the headquarters of the services under investigation and created a dedicated service unit. All initiatives were, and still are, coordinated from this location, and are spread across the different company branches, i.e. earthmoving, hydraulic crawler cranes, crawler cranes, tower cranes, and maritime cranes. Focusing on the internal context, the company experienced a significant development over the years. Although the success story of the company began with cranes, Table 6 also shows other industry segments that contribute significantly to the total turnover. This suggests that the companies within the group are often able to support each other in terms of the technologies and developments needed, which is also emphasized in the company reports (Construction Machinery Case Annual Report, 2016, p. 15). This is underlined by different statements from the respondents. For example, the Head of Product Management (Interview 1L) noted *"[…] that we are in the lucky position and are able to produce almost everything on our own starting from the diesel engine, IO module, sensors".* This indicates that the company was fundamentally able to introduce these data-based services very extensively and solidly in terms of functionality and reliability even in its early days, as it knows every part of its products in detail. This knowledge enables comprehensive access to every data source and sensor to create the most suitable value proposition for its customer segments and individual needs. This situation was used to offer the first solution in introducing the tele or remote service more than 15 years ago. The reason why the case developed this service was not the competition, rather their six corporate values were and are still the driver for the services. The previous section already

highlighted the company's values and especially the two values *"We are innovative"* and *"We are a trustworthy partner"* reflects their approach to step off the treadmill and dare to innovate in a new direction for in order to fulfuill unhidden customer needs (for details see Chapter 4.1.). As a Product Manager (Interview 12L) explained, that the service concept *"[...] has clearly grown, but by the fact that we always have the customer, and these are our core values, that the customer is always in focus and also that the support from us is always present. That we don't let him down and we try to convey this".* The company never abondons its customer even when the physical product has been sold to them many years previously. In light of these key values, the employes add a radio module to every product, which enables to company to perfom a diagnosis of the equipment remotely independently of its location as long as there is network coverage and reception. The remote service and diagnosis covers a basic need of different customer segments: for example, the breakdown and downtime of machines in the construction machinery industry cause enormous costs and every hour counts. Hence, a remote diagnosis can save time between the notification of malfunction, the travelling of technicians to the building site for the initial diagnosis, and eventually ordering the spare parts. Notably, the initial diagnosis can be done by a technician from the OEM remotely, e.g. from the factory in Austria, to save on travel time and surface knowledge of the issue to, for example, send a technician with the corresponding know-how and spare parts. This remote service was initially a free service for its customers. At this time, Case A was a pioneer at least in the crane sector in providing this service.

Some time later, the company considered new solutions and tried to determine which service value propositions would be most suitable. The criteria are, firstly, the customer's

job-to-be-done and an in-depth analysis of the needs that need to be addressed on the customer side, which may also involve further development of physical products. In contrast to the pure product business with a value proposition solely on the customer side, the service business model also generates a value proposition on the established product business for the company itself, as its engineers and managers can learn and get a much better sense of how the machines are used by the customers. New impulses came from other industries, which started to introduce services in this direction, ultimately convincing the company to start with the service disruption in their own industry. This was based on the realization that these kinds of services are adopted by customers in general and that their own markets might also call for these value propositions sooner or later. Internal financial needs arise and the company decided to change the strategy from services for free to services for a fee, in the context of connected value propositions. This was also a cultural turning point for both the OEM and its customers. While the previous remote and teleservice offering was always a free-of-charge service for the customers, the company had started to develop added value, which customers were willing to pay for. The understanding of new value propositions was therefore crucially driven by both the market situation and cultural aspects. A basic remote service has now also been introduced to the market by competitors and is a free service for customers. For this reason, no one would be willing to pay for it, as they were never forced to do so. The key for the team was now to create services byond me-too solutions and a value for the customer that they had never experienced before and, critically, were willing to pay for. This, in turn, would also satisfy financial demands and internal needs to justify the further development costs for new services and guarantee a reasonable return on investment (ROI). Internal key drivers supported the change to paid services. The services offered by

the company are currently based on yearly fees generating a regular income based on already sold machines. The Head of Product Management stated that these services *"[…] enable us to balance peaks in times of economic difficulty, because we have recurring revenues from licence revenue, revenue from usage because we are quite diversified, such as consulting, such as training, training that is not directly affected by the conjunct, such as direct device sales. And that of course makes us more resistant"* (Interview 1L). This results in another source of income and helps to compensate, or at least soften, for decreasing income orders of the product business model in recessions.

In the further course of the service history, additional forces or drivers came to light from government authorities. Once the first services had been launched at the turn of the millenium and the market had adopted them, different authorities took greater notice and rules were subsequently laid down with respect to documentation. It has never before been possible to document specific processes with this level of accuracy and now enables a traceable process of what was done and how by each connected machine at a micro level. From a more comprehensive perspective, construction companies are much faster, easier, and more precisely able to create mandatory CO^2 reports, as in some countries each building site is allocated only a certain amount of CO^2 emissions free of charge. But it is not only the documentation based on networked machines that is the focus of the authorities and requires resources for the company to coordinate its services with the requirements of the new regulations. Case A is also in discussions with the authorities to potentially create new standards regarding crane operator licences based on software solutions such as its simulator software. This in turn also generates new customer groups like crane driving schools, which were never a focus for their phyical product business

model. This was highlighted by the Head of Global Customer Services, who said: *"[…] there is a strong tendency for external institutes to do the crane driver training, for example, who then ask for such simulators"* (Interview 2L).

The very expensive machines in the phyiscal business model are normally advertised by the customers for bids. Every machine manufacturer (OEM=original equipment manufacturer) can submit a tender with a suitable machine and price based on the required specifications. Case A realized some time ago that customers explicitly request these kinds of services in their calls for tenders. According to the Head of Product Management, *"[…] we are now recognizing this trend in calls for tenders, which for example explicitly require very specific solutions that we offer, and there is no chance for competitors to offer them, because they can not fulfil this service or requirements at all. This is a very clear trend that has become apparent the last two or three years and is globally consistent"* (Interview 1L).

The development cycles in the Internet era are much faster than in the hardware market and even more so in the construction machinery business. Due to the OEM's strategy in terms of services, the company realized a new trend and needs not only to expand the single service portfolio but also to develop a service platform where different services can be integrated not only for the company's services but also services from other players in the ecosystem. This is the first attempt to create a marketplace model that offers customers fundamental new value propositions.

The follwing Figure 7 summarizes the forces in context, detailing why the company had to innovate and requirements to further expand their service business as services are increasingly gaining importance. The figure also shows the forces in two qualitiatve dimensions to illustrate, on the one axis, the time and when the forces came to surface in the service history, and on the other axis, the distance to the company's core. It is evident that the construction machinery company started early based on internal forces mainly driven by their values explained in Section 4.1, and especially their effort to never leave a customer alone. This is certainly still the company's driver for innovation, however the interviews showed that the whole industry has now arrived in the digital age and requires

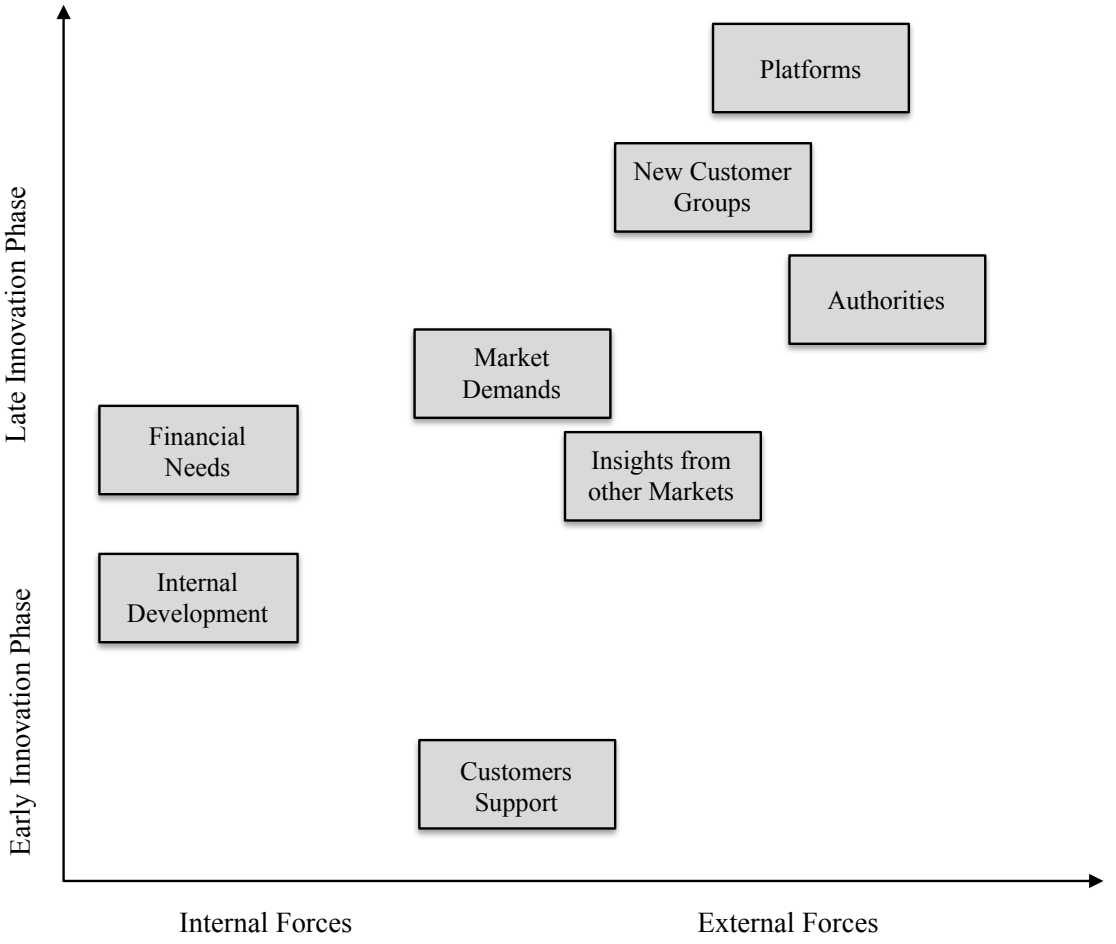

Figure 7: The Internal and External Forces of Innovation of the Construction Machinery Technology Case

these kinds of services. This opens up the opportunity to strengthen the position and fullfil customer needs in different sectors. It can be observed that the ensuing services are getting more and more detailed and complex as the external environment, such as competitors, follows suit in this direction, along with the resulting pressure to provide ever more in-depth services, but also to create new opportunities through increasing digitalization. But also, authorities demand these service value propositions and reporting options, which are made available by these innovations for several reasons. The services, in the meantime, are either enhancements based on their initial services or new ones summarizing different service packages to create a new value proposition. This leads to the conclusion that there was a relevant development in order to reach the current scope of performance, which could not be reached without this process of development and presents a certain barrier for new entrants without the required learning process.

4.2.2 Organizational and Cultural Management

In the past, the company focused on its high-quality machines and excellent customer care, including maintenance services in the case of any failure *"Our quality and our service in traditional maintenance are certainly factors for success"* (Interview 2L). Correspondingly, the business model around these product-based value propositions and their incremental services was ideally designed to fulfil customer needs. The strategic change and realignment towards a solution provider, which includes not only a physical-based but also a service-based business model, results in a hybrid business model, built from new resources and processes. The areas of the business model particularly affected in the evolution process are described in this section, providing insights into the content of a radical service innovation and what processes and resources need to be developed or adapted over time. The interview program and coding revealed four key dimensions of innovation, which are valid for all the case study companies (Figure 8). However, none

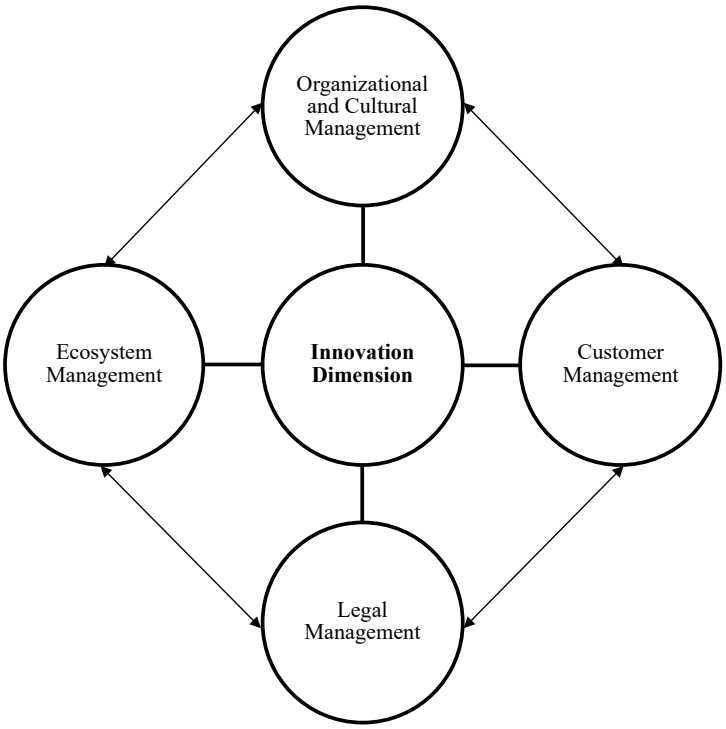

Figure 8: The Key Dimensions of Innovation

of these dimensions can be considered as a separate action field as it is only the interaction of each dimension, and its single resources and processes built up in the activity system (Porter and Siggelkow, 2008) that help to create a unique and hard-to-copy value proposition (Johnson, 2010).

The company's radical services required some fundamental changes in the company's organization and culture in order to develop a new service business model on the one hand, but also to generate a constant and sustainable value proposition of premium quality for the customer on the other. All offered services were previously based on the physical product value propositions, which are embedded in a well-established and mature business model with clear activities and responsibilities, including roles and company culture. This clear structure is relevant and needed for a premium quality and customer experience on the legacy side; however, it is a challenge to upset the structure and make it ready for services requiring some new processes between existing and new resources. The Head of Product Management stated that there is *"[…] no department in the company, that is not involved, that it does not concern and of course this makes it correspondingly time-consuming as already mentioned to coordinate this extreme complexity with all areas"* (Interview 1L). The company accepted the challenge to create a new service business model and partially ties it with the legacy physical one, not only to expand the value proposition but to start an era of a fundamentally different nature in how the company will generate money in the future, at least for the industries involved in the telematics-based service innovations. A Product Manager even goes so far as to designate the services not as a service product but as a specific process, e.g. digging holes on a digital building site (*"[…] if he has now bought the product of data transmission from us*

[...] that is a special process", Interview 13L), which is no longer dominated by pure physical products. This underlines the fundamentally different approach for the business model and its value proposition as well as the challenges to establish it in an already existing organization. Taking an organizational perspective, this short section highlights how the service business model is integrated in the case division and also discusses the required cultural approach to change focus from a purely product business to a solution provider.

The early emergence of the service business model was purely developed in the legacy business model as this was an inside-out-driven development to support internal interests while also saving resources for something for which success is uncertain. As the early services seem to be attractive and based on the forces, a top-down decision further supports the digital shift as *"[...] the management decided to establish it as a separate area in the company in order to be able to concede the freedom that a small plant needs in the beginning"* (Interview 1L) and established the aforementioned service division. This decision was made in 2009, but the restructuring process of both the organizational and cultural one is still in progress as the leadership team is still honing the approach of their digital processes.

The decision for a separate service division shows the great importance of service and top-down prioritization in the company by the leadership team. This is further emphasized by the announcement made a few years later by the leadership of the industry segments, stating they would shift their strategy from a purely physical OEM to a solution provider, placing significant value on the newly established digital unit. The new strategic direction

was also *"[...] anchored in our corporate strategy and operational vision [...]"*, as the Technical Director stated (Interview 2L). As the company is evolving more and more into a solution provider based on the announced strategy, the coexisting physical and service business model forms a hybrid value proposition and combines services and products in order to depict and take over different processes on the customer side (Product Manager). Hence, neither of the two business models can survive on its own or deliver the full value proposition; they need each other to combine and form one value proposition. This was highlighted when the Head of Product Management highlighted that tenders of customers include functions or processes of a physical machine, which can only be delivered by the OEM's service business model (Interview 1L). However, the physical product business is still very strong and the services are not yet comprehensively in place, as several interviewees reinforced, although services and the hybrid value proposition are gaining in importance. This is why exclusive service roles and departments are now established and equally connected to the phyisical ones in order to separate the service culture and processes as much as possible from the legacy ones. A showcase example for this separation is the development process of services, which, similarly to the legacy business, was carried out as a stage-gate process with different acceptance criteria for each gate. This process is characterized by very detailed development steps and late customer involvment for testing and fine-tuning. The optimization is now a more agile development process, involving early customer involvement for testing and rolling out in small update packages*:*

So far, we have followed a very traditional development approach, essentially a Stage-Gate Process, where acceptance criteria were defined for each phase. However, we have

now adopted a more agile approach. Previously, we would release a prototype to select customers who we knew could handle it, even though it was still far from the final product. But given the high pace of development and the rapid rate of change, we can no longer afford to wait until the entire Stage-Gate process is completed. (Interview 12L)

This example shows a fundamentally different approach of development between services and products and hence requires decoupled resources and processes, not least because of the required speed of development and release cycles. However, the Head of Product Management (Interview 1L) stated that there is now almost no role in the business that is not at least in part involved in services, which means a certain percentage of every staff capacity needs to be considered for tasks involving services. Some functions cannot be divided and require a holistic orientation on the service business. In the meantime, special departments were established with a pure focus on the service business model. These departments include product management (the term "product management" is also used for services) for the different services, customer service for customer issues or sales support, legal departments for data-based services, development departments for IT solutions, and pre-live and rollout departments, which focus on agile development and improvement of the customer-friendly usage of each service. The departments are detailed at a suitable point in the subsequent paragraphs.

The cultural challenge of the construction machinery case's service division was how to manage the establishment of the service business and ensure a sustainable high-quality service in a partly foreign environment far away from its own comfort zone with well-known players and long-standing resources and processes. These new conditions in the

service business outside the comfort zone were also new for the employees. To date, the motivation for employees has revolved around pride toward the physical products (Interview 2L). The company had, and still has, to identify possibilities to make the use of services transparent for their employees. Good conditions are the six strong corporate values discussed in Section 4.1, which enables a customer-focused organization. That these values are lived in the company became clear several times as the interviewees referred on different occasions to why services were introduced or why different processes were designed as they are. However, the understanding is not equally present in all involved employees as the major blocker for a fast penetration of the service philosophy is a cultural barrier, and in particular a legacy focus on the physical product. The service department has therefore exchanged ideas with various companies from other sectors that have also developed in the direction of services in order to collect success stories as well as invited external speakers, including the doctoral student in his role as a business model consultant for management presentations to talk about the possibilities of digitalization or threats in the case of neglecting services in management meetings. So, the leadership chose the path of external influence as they believed that only relying on an internal voice of disruption might not be expedient enough (*"With concrete success stories where customers from the market have communicated […]. I like this, it benefits me, it provides an advantage. Because the saying 'a prophet is not recognized in his own land' holds true"*, Interview 2L). As the service business is growing in this segment and industry, other industrial sectors of the group like mobile excavators have become aware of the service development and ask for presentations and lessons learned, as one Product Manager stated (Interview 13L). This also underlines the approach of the division for external input as this seems to be more likely to be accepted and support the cultural change.

Another approach to overcome the internal cultural barrier and acceptance of the new services is special service training for all involved employees. In 2010, the company commenced with a structured approach to such training developed by a special *"[...] training department, which shall take over these topics"* of different training concepts for customers and employees (Interview 2L) while also rolling out different training hubs or locations in addition to the two main factories where employees can be trained (Interview 3L). In order to get the most out of this training, comprehensive training documents were also developed and dedicated training modules for different target groups were organized. The training sessions took up to one week and were based at the headquarters of the services. In this scenario, up to 20 employees were trained by an instructor on the theoretical concept of services while also addressing topics related to customer value and what the system is capable of doing. Experiential exercises were conducted with the attendees to explore how the new services work and what value propositions they offer. The approach can be contrasted with a *"[...] classical form of classroom teaching style"* (Interview 12L). Evidencing impact, it was not long before those employees who completed the training first were asking relevant questions about the services (Interview 3L). In different surveys conducted with participants of the training it turned out that *"[...] this is a cultural change, which lasts several years until the understanding is finally generated that this might belong to my area of responsibility"* (Interview 2L). It was clear that no one-time training would solve this issue and build the awareness for a service-based business model, bearing in mind that services are an additional task for employees, requiring, initially at least, acceptance and understanding of the fundamental new value proposition and the possible future strategy regarding how a company is doing business.

The way to a hybrid provision was by no means trivial or over a short period. Rather, the process of restructuring the company had already started at the end of the 1990s with the initial service (remote service) and is far from finished. During this time, cranes were equipped with GSM modems and sensors to support Case A with information over the air if the machine had a breakdown and the customers urgently needed support on the construction side in order to restore the machine to full operation. The Head of Product Management stated that *"[…] when the engine stops (for whatever reasons) it takes at least 20 hours until somebody is on site, then the troubleshooting starts, request for spare parts, deliver […] that means, two or three days downtime, travel time, and costs. This is, of course, for our customers a solid added value to do online analyses, troubleshooting […] and this is an added value our customers are willing to pay for"* (Interview 1L). So, they identified an unhidden tender spot of the customer group and were able to develop a solution with the available technology at that time.

This development was initially driven not by competition or internal business cases aimed at increasing turnover but by the company's core values and its promise to customers never to abandon them, as detailed in the previous sections. In other words, the company introduced telematics services not as a revenue-generating business case or an additional sales offer but as a free, highly valuable add-on for customers—while simultaneously serving as an unmatched unique selling point for Case A (*"That's we thought about very early how we can offer added value the customer is willing to pay"*, Interview 1L). This service and the understanding of the needs of the customer is due to the OEM's direct sales structure and proximity to their customers. There are no dealers in between who

might serve to blur the picture of what customers need or put their own interests first in the communication with the company.

The different factors of the organizational and cultural change are summarized and detailed in Appendix C. Although the company started many years ago with the first digital services, the cultural change is far from complete, as different interviewees mentioned. A key driver of cultural change is time-consuming but relevant communication and transparency of value for the customers and, therefore, for the division. The relevant steps in the organizational development process can be justified with an honest and transparent communication of the vision that was clearly formulated by top management:

[…] a vision has been outlined in which we evolve from being solely a device manufacturer to becoming the preferred solutions provider. The management is fully aware that this transformation includes offering services, and it is also embedded in our core values. (Interview 2L)

Additionally, the use of external support shows the positive effect on the employees' acceptance of services in their daily business.

4.2.3 The Customer Management

The cultural and organizational change that accompanies a different customer approach needs to be viewed as a major dimension in the restructuring process. This section focuses not only on the pure approach of how customers are addressed for, say, a sales pitch, but

it also summarizes all additional identified key elements of the case for successfully interacting with potential, and also existing, customers. Specifically, the data highlight the four topics of sales of services and salesperson training, customer training, life cycle management, and customer support.

Sales of Services and Salesperson Training

The sales approach also presents various challenges when it comes to the service business model innovation. The crane segment of the case company has always had a direct sales structure, which enables them to react flexibly to market needs due to direct and unbiased feedback from their customers. Furthermore, the salespersons team clearly understand what their customers need and where the development of other players on, for example, the construction side is heading. This means that the case has a sales team, which serves the customers directly on site. It follows that relationships and ties grow stronger over a long period of time between individual customers and the corresponding case salesperson who represents the brand and values. Contracts are normally concluded between the customer's company and the case company, with both sides represented by one purchaser and one salesperson from Case A. The purchaser can be someone who is a user of the machine itself, or at least someone who has to do something directly with the machine in the case of a smaller customer. If the customer exceeds a certain size and a purchase department is established, the purchaser is mostly not the user of the machine and receives only the catalogue of specifications (*"[…] the buyer only sees the price and does not recognize the actual benefits – purchasing is purely a transactional process for them. Essentially, it is crucial to reach the end users who will actually work with the product and experience its value"*, Interview 12L). In every setting, customers normally develop

a trusting relationship with the case counterpart, relying on their recommendations concerning required machinery and tools, which then leads to negotiations and contract signing by both entities. The customer approach based on the long-established relationship between salesperson and seller is a success factor as well as a pivotal element in the legacy business model, and every change in the OEM's sales staff might have a negative impact on the order situation due to a loss of trust in, and natural suspicion of, the new structure – something that was continuously highlighted during the interviews.

When the construction machinery company introduced the first services based on telematics and changed the profit model from a service for free to a service for a fee the sales structure was rethought. In the first instance, the new services needed to be offered in a way that highlighted the value proposition and benefit for a customer who does not know the services at all and has no obvious internal need for them (e.g. for process optimization or external pressure by official departments to document each process step on the building site). Without a deep knowledge of the wide range of the services' functionality a salesperson will not be able to sell a contract to these customers or might not sell the services to the customer in the intended way as the real benefit for the customer was not well understood and knowledge gaps inhibit the customer's conviction (*"This is a cultural shift that will take years to fully develop until the understanding emerges that this could become part of my future responsibilities"*, Interview 2L). As the case was not fully successful with its training approach discussed above (see *"organizational and cultural change"*) the management team had to think about different approaches, bearing in mind that the direct sales structure of the physical crane business was, and still is, a success factor for the company as there is a mutual trust between

salesperson and seller, which makes it impossible to fill the position, for example, with a person with a high affinity for IT solutions. In addition, they are convinced that any additional relationship or touchpoint beside the unique salesperson-buyer relationship might cause confusion when a second or third salesperson reaches out to the customer.

The construction machinery company considered new possible ways of making the services for their sales team more attractive. The values of the family-run company do not necessarily align with strict KPIs (Key Performance Indicators) and the pressure on service sales, at least in the current evolutionary phase of the organization where physical sales still dominate. The lack of interest in developing service sales for the salesperson was increased by the lack of an incentive mechanism. Specifically, salespersons get a revenue share for every machine sold. The sales price for machines normally runs into millions of euros, whereas a service contract costs a few thousand euros. Nevertheless, every sales meeting regarding a physical product also includes at least a short advertising of the services, as the interviewees explained. Another challenge is the missing technical understanding of the traditional salespersons. When it comes to the sale and first discussion of requirements and how the chosen service needs to be integrated into the whole system, concessions are made too quickly, which cannot be fulfilled, as a Product Development Services Manager explained (Interview 5L).

Initial thoughts on solving the challenges of selling services to customers had already come to light in 2014, and four years later, a service and support department had been established to address, inter alia, the topic of training for sales employees. The idea behind this special department is not to follow the initial approach of lecturing a large number of

employees in a classroom, but to support the single salesperson during their job when support is required. This system enables different opportunities and benefits for the case company as it is now possible to support individual needs of trained staff and simultaneously support real customer projects. For the company this is an important step and resource in the form of dedicated specialized employees, based in the service headquarters, who can offer urgent sales support, brief training before a sales pitch based on the input of the salesperson to prepare individual propositions and arguments, and many other tasks on the downstream side of the department or in the direction of the customer. On the upstream side of the focal company itself, the department is able to learn the different needs of their customers and collect success stories. In sum, the case company now follows a "training-on-the-job" or "consultative approach" to promote the acceptance and understanding of the salespersons:

And now we have the opportunity for training on the job – meaning a salesperson has a current customer project and receives direct support. This approach aligns much better with the typical mindset of salespeople, who are generally very social individuals. They are primarily focused on the business today, while the future is something they will consider as it comes. (Interview 12L)

The company also realized the need to change the general argumentation in the sales pitch from a more technical or parameter-based proposition in the physical business model to a more individual customer needs-based approach. Strong internal marketing and a lot of communication help to reduce the salesperson's barriers to requesting the service of the specialized service and support team. Furthermore, the case company's own fundamental

values encourage a cohesive approach to put the customer needs at the center of any activity. That means that if a traditional salesperson identifies the customer's needs in any services, they are encouraged to do everything required to satisfy these needs, including drawing on the help of others. As a Customer Service Team Leader explained: *"[…] the approach has grown over the time, but because our customers are, and this is our fundamental value, always in focus and support is always available to them. That we never abandon the customer and that's how we take care that we get across"* (Interview 12L).

Once the deal is successfully negotiated and all requirements, including the services, are documented, project-based manufacturing begins, which initially is no different from a purely physical value proposition. A difference becomes apparent when it comes to the detailed definition of the technological and functional synchronization between the machine and its installed sensors, as well as aligning with the customer's expectations and IT system landscape. Compared to the pure physical business model, much more individual exchange and agreement between different case departments and the customer departments are required to successfully connect and integrate the services into the customer processes and fully evolve the service value proposition (Interview 1L). Thus, the connection to the customer is much closer and more interactive than in the physical business, where a single catalogue of requirements is received, the machine is developed, and then handed over to the customer.

Customer Training

When a service is sold and the hybrid value proposition is delivered, customers normally require much more intensive training for services than for a purely physical machine purchase. This is because of the individual adaptability and customization to each and every customer and the extensive possibilities of the solutions, not only for one task on the construction site, but for an intelligent process overview of the whole fleet including different data from each machine and with respect to the whole company. A key consequence is that no one-time training is possible, for example, at the handover of the machine. In addition, a training hub (training center) is not always accessible for every customer as the division delivers its solution all over the world, as Figure 5 highlights. One approach taken by the case company is the use of new media, such as eLearning. The reason for this approach is economically driven as it is not always the case that an employee can be sent to the customer for a one- or two-day functionality training of the basic data transmission and location system solution (Interview 2L). Another approach, as described by a Product Manager, is the attempt to enable personalized training regardless of the customer's location. At this point two additional approaches in combination with the service strategy and the customer management need to be considered. Training needs to be conducted as efficiently as possible, which can be further enhanced by the usability of the service solution itself. That means the easier the design of the solution, the shorter the training is likely to be. The case company realized this decisive factor a few years ago and also placed this topic on the agenda for already existing solutions. Usability and self-explanatory operation also influence the general acceptance of the service on the customer side and might also reduce subsequent requests for customer support. The second approach is at the same time a new revenue stream in

their digital business. Due to the data gathered by their different systems, including the machines, the company was able to develop a realistic simulation of, for example, a port crane, which is now sold to driving schools to train crane operators, as well as other solutions to general training centres:

There is a strong trend of external institutes, such as those providing crane operator training, showing interest in such simulators. This is, of course, a great opportunity for us – not only can we do business with them, but it also strengthens our position in the market. (Interview 3L)

The new sales channel is now used to promote their products and services, and future customers already have at least a basic understanding of all the systems and functions, which in turn reduces the training effort.

Life Cycle Management

A fundamental difference between products and services is the touchpoints between an OEM and its customers. While the contact between a customer and the OEM typically lasts until the product is delivered, the touchpoints in a profit service business are more frequent, due, for example, to the contractually determined usage of the service itself. The section above has already detailed the development from services for free to services for a fee. For a continuing revenue stream the case company introduced a profit model based on licences with flexible runtimes. A common approach is a one-year inclusive period in the case of the data transmission and location system for promotional purposes. After this trial period the customer can book the service for a yearly paid runtime, but the booking

period will vary in the future as different services will be offered and customers might need certain services only for a short period of time, also known as "services-on-demand" (*"It's moving in the direction where the customer only rents it for a week… This is the foundation that is now being established. However, it also extends to a corporate-wide level – it's not just limited to us"*, Interview 12L). So the case company focuses again purely on its customer needs and the challenge is to design the service portfolio to be as flexible as possible to satisfy these needs. Beside the design of the hardware and standardized equipment of every machine to enable these services, a licence management was introduced to enable the flexible usage of the services as well as to manage rights, including who is allowed to use the services. In order to make the licence management as easy as possible and increase the acceptance, the case developed and rolled out a customer online store, which in turn reduces the barriers for customers to manage services and increase the take-up rate (Interview 13L).

In this regard, the second-hand market also needs to be considered in the design and management of services as a substantial part of the case company's customers are companies, which further lend the machines including the associated services for periods of time. For this scenario, and due to the legal aspects of usage and data discussed in the section above, the OEM has to expand the management of services via a customer portal to enable a usage authorization for their customer's customer, thereby defining different access areas for the different data groups. This guarantees, for example, that no tenant process data can be spied on by a rental company.

Similarly to the software industry with different programs or apps for smartphones, services based on software require continuous updating to meet the latest security standards, features, or any other requirements and hence represent a crucial difference from products from the legacy business model. A permanent connection between the customer's systems, as well as machines, and the case company's systems is crucial for regular software updates, which require well-defined processes and logics to not interrupt processes on the customer side if the services are in use. In addition to the fact that the service is permanently connected to the OEM's systems for intelligent data evaluation and machine learning mechanisms, this also means that the two business models merge and the OEM takes responsibility for its customers' processes, as it is directly involved in providing services for its customers.

Customer Support

In terms of customer support, the online store also relieves the contact centre or vendor of the machine concerning booking or cancelling services. But also in the traditional sense of customer support, new structures and processes are required for the case company as they do not meet the high-quality requirements the brand represents. Case A has a direct customer contact service centre and salespersons are located in different countries to be as close as possible to the customers. This is an already existing structure of the physical business but needs some adaptations for the digital services. In the case of a service issue, failures cannot always be repaired on site due to the complex ecosystem in the background, like internal IT systems or enabling technologies such as the connectivity provided by partnering mobile network operators, or other value-added partners compared to the often mechanical issues of a machine in the legacy business. In the case

of any maintenance questions or any other issues, the well-known salesperson is often the point of contact. The information is then processed by the salesperson to relevant departments at the company. Alternatively, customers have the opportunity to contact the contact center, which protocols the customer's issue, generates tickets, and addresses them to the correct persons. Although the contact center should be the first point of contact for the customer, the case company observed a trend that direct contact with a person of trust is more frequent, this person being, in most cases, the original salesperson of the physical product. Nevertheless, the local representatives are the first-level support and assist the customer, for example, with any operating errors. If a deeper problem arises, the second-level support needs to be contacted, with specialists located in two main factories in Germany and Austria (*"We strive to be as close to the customer as possible on-site, as long as it remains economically viable for us […] First-level support is provided locally, while second-level support is handled from [Austria] or [Germany]"*, Interview 3L). As the service issues are processed by the technicians of the legacy business, the responsibilities are now much more clearly defined and a specialized service team works on these service issues. The employees are merged in the service and support department responsible for a variety of different tasks in the service context based on the above-mentioned "consultantive approach" or responsibly solve any service issue from a customer perspective. The following section provides further details on the partners in the new service ecosystem. It turned out that the OEM is always responsible for the customer support even if he or she is not the one who develops and operates the system, but only distributes it as part of a complete package. However, also based on the company's culture, the process has to be designed in such a way that support is always possible in this case.

4.2.4 Ecosystem Management

In a pure service or hybrid business model the service provision normally does not end with the handover of the goods as is the case with a pure physical-based business model. Moreover, services require an ongoing delivery to, or exchange between, the customer and the focal company as already indicated in the previous section exploring life cycle management. For example, data are sent between different actors in the whole ecosystem, or co-creations (e.g. data transmission standards and telecommunications modules) have to be aligned for an ongoing delivery of the service. In addition, the ecosystem of services requires different suppliers compared to the legacy business model, which encompasses suppliers in the traditional sense of a physical parts supplier. In this case, this has evolved to include services that need to be supplied that form an overall benefit for the customer in a co-creation context. To illustrate the ecosystem of data-driven services, Figure 9

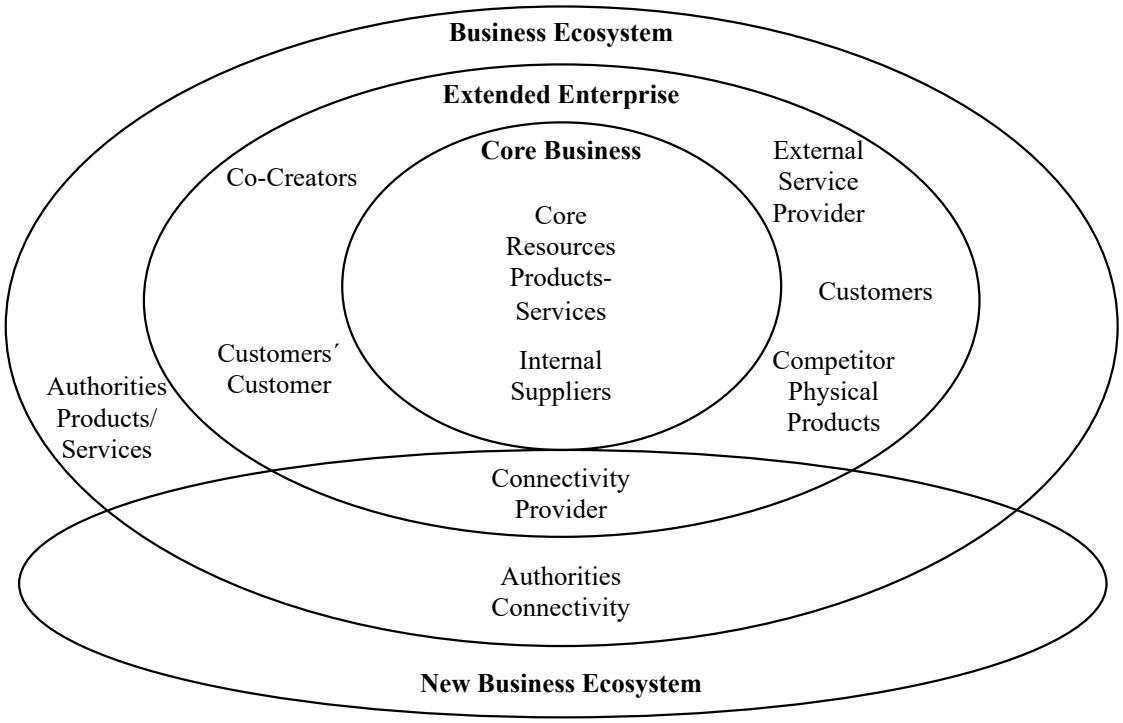

Figure 9: Ecosystem Layer Overview

shows three layers that differentiate the single key elements of change based on their proximity to the focal company.

Core Business

The innermost circle represents the company with its core business of products and services. One of the main benefits of the case company is the conglomeratic structure as discussed in Section 4.1. This enables the case to develop *"[...] almost everything internally beginning through IO modules to sensor technology"* (Interview 1L) or the programming of *"[...] many parts [...] in the [...] factory",* which is another subsidiary of the conglomerate (Interview 3L). So, the circle of the focal company also comprises suppliers of different software or hardware modules, which also belong to the group and simplify the procurement process on the one hand (internal production and delivery), but also the modularity and transparency of technical specifications, which in turn guarantee a more valuable and reliable service for the customer. This in-house production enables the service division to implement changes or other requirements in the initial services development process more flexibly and quickly. This is also accompanied by the adjustment of the core resources and processes responsible for the different development cycles. As services are basically linked to the machines, with every new development of a physical product a forward-looking development of possible services and their enabling technology (e.g. a sensor installed in the physical product) must be considered. Hence, the core business requires a complex alignment between product and service resources (development departments, product/service management department) and the time at which decisions for a service must be made in the product development process.

Extended Enterprise

The middle circle represents the extended enterprise, but it is still a largely well-known and familiar environment for the focal company as most of the elements already existed in the physical business model, requiring (only) further adaptation for the services. The service business model of the company can also connect the machines of competitors, although not to the same extent and with profound data collection due to missing standards and access to all data of the competitor's machines. The Head of Product Management (Interview 12L) regrets, for example, the lack of standards in the industry concerning data measurement points and interfaces. The only existing standard includes a few basic parameters, whereas the latest innovation of services requires parameters more than 10 times higher (more sophistication). Nevertheless, the focal business model is enriched to add at least the basic parameters of the competitor's machine and the case company's customers benefit from a comprehensive solution as the customer fleet normally consists of different brands. The gathered data and learning about how the machines are used also helped to identify and deliver new customer groups with services. This is how pure software services like simulators for driving schools were developed and have helped to expand the customer segments. Equally, licenses and online stores, as discussed in the customer management section, enabled the case company to access their customers' customer and sell services.

Basically, a building site normally requires different companies with different skills typically requested independently by the customer, who is normally a developer on the building site. For advanced services, the case company cooperates with external service providers to contract two different skills and offer an integrated value proposition, but it

equally creates a new dependency between the two ecosystems. A lesson learned for the case company was the orchestration of the processes to guarantee their high-quality service in the service itself, service sales, as well as service and support. Initially all these processes were conducted separately and were difficult to adjust and improve. Customers were frequently confused concerning the locus of responsibility – for example, whom they had to contact in the case of an issue. Case A realized that a parallel process of two different companies would not work seamlessly and discussed with their partners a supplier approach (one service package and only one partner) than a partner approach in front of the customer to guarantee a clear and transparent distribution of the entire value proposition user promise. That means the customers of the position provider are no longer the end customer, but the case company is now their customer. In sum, the case company reduced the risk in the new value chain and immutable factors like service or selling the whole system and transferred critical processes to their value chain to control them autonomously. This also means that additional resources are required to cover the processes while a close connection to the partners must be established to enable a short exchange in the case of any queries occurring in the life cycle of the service. Another very remarkable and innovative element in the extended enterprise layer is co-creators and opening the traditional business model to a platform business model, which enables the case company to cover as much as possible jobs-to-be-done on the digital customer building suite. Platform in this context means forming a digital software and hardware provision including connectivity (communication between machines and x (M2X) via the Internet) to link other physical product providers and their digital services to the OEM platform as partners or co-creators for their customers. Further competitors can be

connected collaboratively so that instead of competing with each other a common approach is used to create value for the customer with a win-win outcome.

The services are based on different data sent from the machine to the OEM's server and back to the customer. The transmission requires a mobile network, which is a fundamentally different requirement and new introduction to the company ecosystem, as the case never had any mobile touchpoints in the legacy business model. The dependency on this new ecosystem is very high as ultimately customers would not be able to use the service at all in the case of any failure in the connectivity process chain. Machines are equipped with SIM cards (subscriber identity module) like the well-known SIM cards in every smartphone. Also, as with mobile communications, the connectivity of the SIM card must be able to be terminated in cases when no service is booked by the customer, or the license has expired after a one-year booking due to legal requirements, while also of course encouraging the customer to book again. The case company therefore uses a software platform of the mobile operator to manage the connectivity of its services.

Hidden traps occurred over time concerning the progressive development of technology and standards in the new ecosystems. By improving the mobile transmission speed and the technology required for this, different modules were required, and different sunsets of transmission standards lie ahead (e.g. reduced coverage of the 3G network). Considering the product life cycle of a machine in this category of 20 to 30 years in contrast to the mobile sector with much shorter life cycles of different standards, the products and services must be designed to meet the latest standards and scenarios while update procedures for the future must be designed:

A cable excavator, for example, can be in operation for 20-30 years without issues, running reliably for the customer. However, for an IT solution, this is unthinkable. IT is constantly evolving, requiring a completely different level of agility and management in the background. (Interview 1L)

Also, different standards in different countries need to be considered, necessitating additional costs for the approval of radio modules to guarantee the service operates effectively in countries where it is needed. The OEM also worked on this aspect with a supplier who specialized in these topics but naturally generates additional costs. On the other hand, the improvement in the ecosystem also enables the construction machinery case to improve and expand the services towards real-time information-based services with data-intensive applications.

Business Ecosystem

The business ecosystem describes parties that, while not directly linked to the product and service creation process, may still have a significant impact on whether the business model is successful or not (Moore, 1993). These parties include authorities, which can be separated into authorities of the product-service business and authorities of the new connectivity ecosystem. In terms of the former, the OEM must enable its customers on the software side to forward data on the machine usage to the local authorities. Additionally, in some countries, local software solutions of the services have to be developed in case the authorities prohibit data transfer to servers located in other countries. The second connectivity authority relates to the new ecosystem and rules not previously considered that must be applied to the company's own business model. In some regions,

the case company must have a branch office in order to offer these services. The company has already implemented this through its sales structure, and the respective national companies have to be expanded for this purpose. This draws attention to the next issue concerning legal management.

4.2.5 Legal Management

The services in this new context need to be seen as completely different from a legal perspective to the machines in the legacy business. Key drivers for the legal requirements are the data and the protection of same, which require different accompanying activities for the case company.

In recent years, data privacy regulation has been tightened, exemplified by the EU General Data Protection Regulation (GDPR). Companies need to carefully manage data collection, storage, and distribution to ensure compliance and security. This applies equally to the construction machinery case, where different data classes are collected. While only machine data were collected at the beginning and belong to the OEM, the services are no longer attractive enough or state of the art. In the meantime, the services are highly complex and use different kinds of data from various data sources, which in turn are processed via intelligent algorithms or machine learning at the case company-hosted servers and sent back to the customer, e.g. for process optimization or any other services. These data include process data, order data, and other personal data, which belong solely to the customer as, for example, the GDPR regulates. The OEM had to find a way to meet these requirements in order to keep the service business model alive and to preserve customer confidence. The process chain now proposes an anonymized data pool

in case the OEM uses these data for product and service evaluation and improvement. For private data, which are not anonymized, no employee of the case company or any other person has access except the system administrator of these systems. The handling of the data also requires a separate contract with the customer, and the case company must ensure that the terms and conditions are signed off by the customer to meet all legal requirements. As the set of rules are constantly changing and vary from country to country, the OEM has to work with many suppliers, notably law firms in order to be informed if any changes occur that might affect or jeopardize the service offered. In this context, additional costs arise in certain countries as the case company must register itself as a company working with data-driven services.

The above-mentioned restrictions for data access and use of data are equally required for the second-hand market, or if the machines are sold to a customer who leases the machines to their customers as already indicated in the section on “Life Cycle Management”. The construction machinery company has to ensure in a contract that every customer signs the terms and conditions, and the direct customers have no access to the personal and process data of their customers. Services require the already mentioned license approach, which includes user management to restrict access for persons or companies if they are not allowed to. In order to design the customer journey as easily as possible, the processes for rights and roles require different online portals like the above-mentioned online store, which are a success factor of the acceptance of their services on the customer side.

Another critical aspect came to light in the interviews in terms of liability issues due to usage transparency and what a customer is doing with the machines. If the data are made available, and the owner can see that a machine is overloading or continuously working at the limits, this person is reliable if something happens. The company had to adapt its service business model and license model for renting machines, so that the data of the renter can only be seen by the renter themselves. It is about product liability and the rental companies' obligation to monitor the product, which is still an ill-defined legal segment and treated carefully by these companies.

Finally, the certification belongs to the legal management and was mentioned several times in the interviews due to its relevance to the new service business. The case company must have certifications carried out in some countries on a yearly basis to maintain the service business and receive a certification for the radio module installed in the machines relevant for sending and receiving the data. Therefore, the case company has to consider the high cost of annual certification. The second regulation concerns IT and data protection and how the processes (data encryption, data transmission, security measures) guarantee the highest standard of the customers' data. This can be reflected in the companies' values ("Highest quality in everything we do" or "We are a trustworthy partner") and gives the customer confidence in the services and data handling. Finally, the case company worked with external certification institutions to formulate data protection contracts with the correct content.

4.2.6 The Evolutionary Process of Servitization

This section of the evolutionary process focuses on the question of how the service trajectory evolved and gives details about the main cornerstones of servitization. In order to answer this question, the first two elements of the CCP framework play a decisive role in providing the basis for this section to show how the company implements gradual change. The process is characterized by different forces (context) occurring over time, which are of different significance in each of the evolutionary stages. At the same time, different innovation dimensions were also involved in the single stages. The context and content reflected what the internal and external influences were (e.g. market demands, internal development) and what was changed (e.g. customer and employee training,

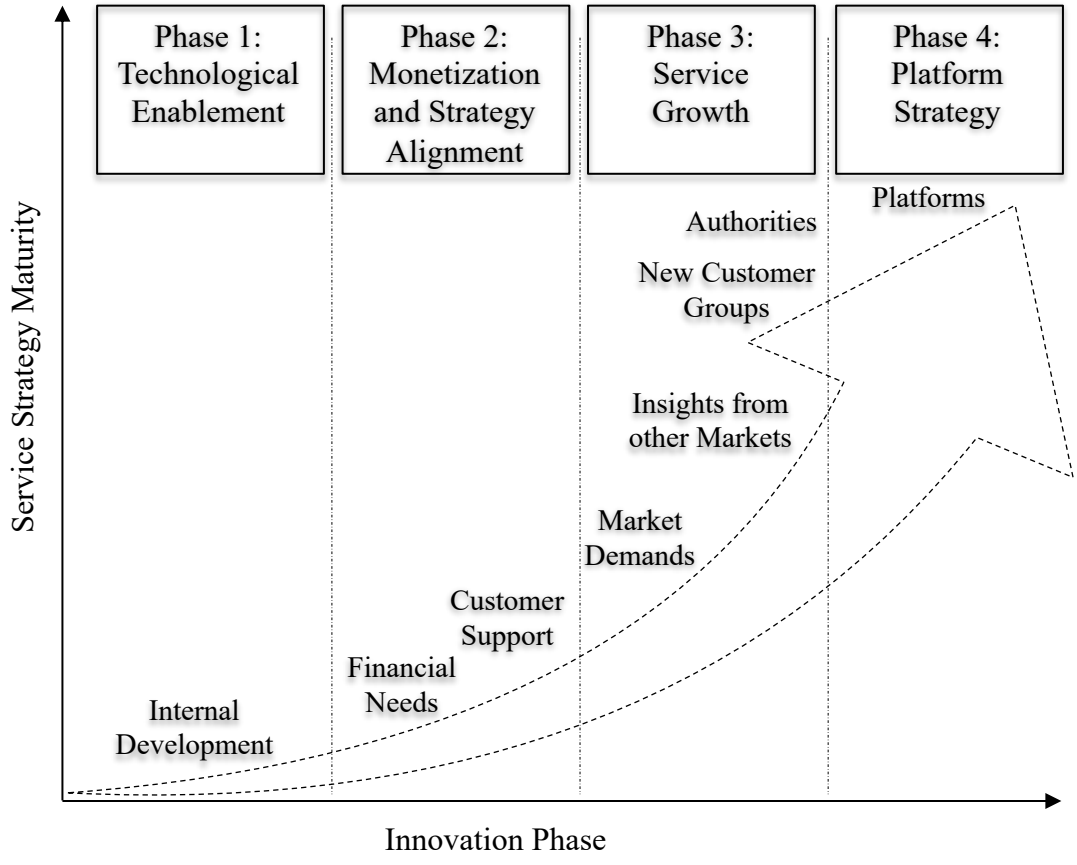

Figure 10: Evolutionary Path of the Construction Machinery Case

customer support, specialized service team). This section deals with how the company has developed so far, taking into account the context and content. The process can be divided into four stages, starting with the introduction of the enabling technology up to the current phase of orchestrating the ecosystem and developing it into a platform provider (see Figure 10).

Phase 1: Technological Enablement

The company's focus was always on fulfilling customers' jobs-to-be-done with a customer-focused business model around these needs. These needs predominantly stemmed from a pure physical product perspective and hence were satisfied by innovative cranes and other products from the division, or any other involved division within the group. The previous sections show that the service innovation was not in the first instance derived from a pure customer request, but rather a fundamentally different approach for the case company to support the customer immediately in cases of failure and shorten the repair process. Consequently, the birth of these kinds of services was an internally driven development and requirement to meet the customers' expectation of the company to enhance efficiency via improving processes internally. Commencing the service with an indirect customer value proposition to optimize the maintenance service founded on more detailed information for the technician about the malfunction, the case company was able to establish the service business model with careful consideration, and without the pressure of external forces like competition or high customer expectations toward the service offering itself. Additionally, an internal service requires considerably fewer resources and processes in terms of marketing, user-friendliness, and service management. From an evolutionary perspective, the service orientation was not the focus of the top management. Furthermore, it did also

not contribute to the company's success and was also not anchored in a strategic long-term planning. Financial and human resources were predictable, likely due to the value focus on customer care rooted in company values rather than direct revenue generation. The effort of the establishment was predominantly managed by the workforce of the legacy product-based business model. From an innovation dimension perspective, ecosystem management plays a decisive role from the very beginning as the mobile telecommunication ecosystem contributes significantly to the provision of the service and enables the data transfer between the customer's physical product and the OEM. Hence, contracts with players in the new ecosystem were relevant right from the beginning. Also, the inner layer of the focal company was affected as sensors and software are required. Through its diverse industries and capabilities, the company was able to develop and procure parts and software internally from subsidiaries. With the introduction of the first telematic services, the cultural change began and also had an impact on the organizational change. Although the service path was in its infancy, it was necessary to convince top management and employees already involved in this phase to expand the services. Of great advantage here were the long-embedded customer-oriented corporate values. Resources for organizational change were limited due to the lack of full support from top management, and shared resources dominated this phase. It turned out that the other dimensions were negligible in this phase, but their importance increases significantly in the next phase.

Phase 2: Monetization and Service Strategy Phase

The decision to change the strategy from a service for free to a service for a fee entailed some decisive adjustments in the business model, so the dimension of customer management comes to the fore. The driving forces for the case were mainly an additional

financial revenue stream, market demands, and cross-industry analysis, which initiated a rethinking of strategy. To implement this strategic change, several changes were required in the organization. Thanks to the commitment and communication of top management to transform from a product manufacturer to a solution provider, the cultural change was strongly supported. With clear top-down commitment and an inclusion of services as part of the corporate strategy, the construction machinery company formed its brand as a solution provider and mechanisms were put in place to develop employee acceptance. Further, success stories, constant communication of the services' need for the organization, and demonstrating internally the customer value helped to gain the trust of employees and show the relevance of services. At the same time, it was possible to build up the necessary resources for the creation of services. The service business model has been allocated its own resources and departments like the product management department to *"[…] detach from the day-to-day business"* (Interview 1S).

In this phase, the customer management dimension comes into its own to make the services manageable in front of the customer and give the services a place as a source of an additional value stream. Several factors of the dimension are applied to implement this phase of monetization, but most of them are in their infancy and are only truly optimized over time through trial-and-error experiences. Accordingly, training for all employees, including the sales team, is carried out traditionally, as in a classroom. An online store is not yet implemented as the case company offered the services initially as a one-year trial license, which is automatically renewed annually, when an invoice is issued. Adjustments were also necessary in the contractual framework, which are deficient in the legal management dimension. The case company had to draw up a contract that deals in

particular with the customer data and describes the rights and obligations of the two involved parties of supplier and customer. Particularly noteworthy here is the customer's duty to deregister with the company when the machine, and thus also the service, is sold. As the customer management dimension is not fully developed in this phase, especially as related to the life cycle and online store management, the services cannot be managed reliably nor customized by the customer themself.

Phase 3: Service Growth

The service growth phase encompasses an advanced evolutionary service phase and customer value propositions, processed from aggregated data and different data sources. The large amount of data is processed by advanced algorithms to provide a user-adapted experience (*"This is a platform that enables the analysis of productivity data and based on machine learning and intelligent algorithms, provides optimization suggestions"*, Interview 12L). Detailed analyses of customers and trends have spurred the company on to develop new more profound and complex services. New partnerships were required to be able to offer customers in-depth services from a single point of contact, as described above with other players on the building side.

In this phase, the three dimensions of customer management, ecosystem management, and legal management are equally significant. IT systems and processes are required for a service license management and the online store. New customer groups can now be achieved, for example, as services are becoming bookable by the second-hand market. This requires complex data protection precautions to ensure data can be accessed only by authorized persons as well as other IT systems.

The sales approach and downstream processes in the customer management dimension increase proportionally to the complexity of the service itself as the services are deeply integrated into customer systems and processes. For this reason, a sales team consisting of experts from different fields on both sides, the OEM and the customer, is necessary. The case also identified the requirement of customer training. To meet this challenge globally, in this phase different approaches had to be established to train the customer either on site, remotely, or via a training hub.

As the ecosystem management dimension was already present right from the beginning due to the new cooperation with the telecommunication industry, it now comes into full play in the outer two layers of the extended enterprise and the ecosystem. The contextual forces of market demands, new customer groups, and authorities are present and drive the case company to a new cooperation with other players for even more comprehensive and simple customer benefits. A distinction is made here between the two influencing stakeholders and authorities for the product business as well as connectivity in the new ecosystem (see Figure 9). In this process, the legal management dimension and its aspects imposed by the authorities also find importance. The offering of a value proposition that also consists of products and services from other stakeholders requires new resources and processes in managing this cooperation. Alignment and maintenance of the company's quality standards and values, sourcing of the technical equipment, IT, and support processes are the most outstanding elements. In this phase, country-specific authorities and legal requirements become highly relevant in different ways. Firstly, authorities have become aware of what is possible from a technological viewpoint, and what services OEMs are now offering along with which data can be collected.

Customers have to prove the correct usage of the machines, which requires consideration of the requirements of relevant authorities in the design of the service (e.g. suitable reports with relevant data). Furthermore, as the services now go far beyond pure machine data, the case company must take into account data protection regulations (e.g. the GDPR) or meet other local requirements if the country prohibits data processing outside the destination country (*"There is a whole range of legal aspects that need to be considered. On one hand, data protection and privacy concerns, such as tracking user behavior, […] and on the other hand, legal obligations that our customers must comply with"*, Interview 2L). In order to cover these requirements, personnel resources for the monitoring of such obligations and for training internal employees must be set up. The results from the ongoing monitoring and exchange with local authorities need to be considered in the design of every service, its project plan, and business case. The case company highlighted the significance of this task as non-compliance jeopardizes the new business model, or at least the corresponding service. The same claim also applies for the (foreign) ecosystem layer and the implemented connectivity functions of the machines. The service growth phase and international rollout requires the compliance of communication regulations, and the case company had to establish resources and processes to register in target markets as a connectivity-based service provider and to establish a national company. Beside the authorities, the second-hand market as a new customer group could now be established, as already mentioned. In addition, driving schools were added to the portfolio and could be acquired as customers with driving school simulators.

Finally, the dimension of organizational and cultural management still has ongoing relevance in this phase. The services developed for the construction machinery segment of the group took on a pioneering role and set an example of how to include data as a benefit for their markets so that the solutions can be adapted and applied to other segments of the group as well. Another organizational adaptation refers to the development of services. To meet these significantly shorter development cycles, the case company introduced an agile development approach to engage customers much earlier and request feedback at an early stage for customer-oriented development. Likewise, the cultural aspect was further addressed. Success factors that contribute positively to a cultural change are above all hiring employees with experience in the service context, training on the job, presenting services and their benefits to internal employees, communication of success stories, and presentations from outside.

As a result of this development, the case company is highly advanced in the evolutionary servitization process. Both the service business model itself and the integration of the legacy and new business models have evolved from project-based service development into a sustainable, mass-market-ready offering. However, influenced by various contextual factors, service development continues to progress, once again driving changes across the entire organizational model as the company moves toward the fourth phase of becoming a platform provider.

Phase 4: Platform Strategy

The latest phase of the evolutionary process is the platform strategy phase that the company has reached. The gathered data revealed that service complexity rises

continuously and has now developed to the point where it can no longer be managed by one company, even with a single cooperation as discussed in the service growth phase. The case company is eager to develop further as a platform provider to offer the customer a platform to which different actors in the ecosystem can connect and contribute to the overall customer value proposition:

So, it's an industry solution. Our approach is moving exactly in this direction – integrating competitors, not seeing them as enemies or obstacles, but collaborating with them. This represents a new way of approaching the market compared to the traditional industry mindset. We are pursuing a very open approach. (Interview 12L)

The three challenging factors of technology, culture, and competition counteract this evolutionary development of the case company and the whole industry. An industry-wide uniform platform requires technical standards (e.g. data transmission). Second, the cultural change slows down the development of the new platform model due to the attitude towards an open structure, and it is within the company still traded in the traditional competition-based thinking. Third, direct competition is not yet eager to allow such platform discussions. Therefore, the case company has started seeking conversation and cooperation with non-competitive actors with less market overlap as they are more open to such arrangements. Basically, the challenge for the case company is to develop a platform that is sufficiently attractive for the customer that other competitors decide to participate and open their data access to more sets of data. The case company also reconsidered the pricing model and its yearly based payment model. To be ready for the

platform model the case company also indicated future adaptation of the licence management and intends to introduce a pay-for-use model.

4.3 Conclusion of the Construction Machinery Case

The construction machinery case has undergone remarkable development since the company started to introduce telematics services for free. Figure 8 presents an overview of the identified key dimensions involved in the service business model innovation to implement a hybrid model, which has its origins in the product-based business model and is still focused on these machines but also involves other players and their equipment in the overall value proposition. Nevertheless, the interviews showed that the significance of services has developed into an important part of the vision of the specific company segment and is adapted step by step by other segments and subsidiaries of the group, which justifies the success and importance of, as well as the need for, services. The new service value propositions have also been a unique selling point on the customer side since their introduction and differentiate the company from competitor products or even open the door for tenders.

Similarly to other industries and companies, digitalization or servitization is in the meantime an inevitable demand from the market, and the case company is going to manage this transition successfully and in a deliberate fashion. Two major factors have made a substantial contribution to the success to date. The introduction of the case company gives a comprehensive overview of the company structure and its origins. The

company is still a family-owned, second-generation family firm. Hence, innovations are not necessarily driven by turnover and time to market and results in a well-considered approach. All activities focus on customer support in the first place, and only after that does the possibility of profit drive the business. This was highlighted in several interview discussions as development phases are, for example, very long for single services (Interview 6L) but result in a sophisticated value proposition with no unforeseen issues when it comes to the rollout (Interview 1L), as the introduction of the data transmission and location system showed. Basically, the OEM does not face the challenge of orchestrating a wide range of different suppliers as they have most of the hardware, like sensors and control units for their physical products, developed in-house due to the different industries and divisions illustrated in Table 6 and the large number of employees.

CHAPTER 5: CASE STUDY B – THE CONVEYOR TECHNOLOGY COMPANY

The conveyor technology company was founded in 1920 in a German city with a focus on repairing electric motors. As the business was going well, the founder expanded and introduced its own product, a light station followed by other different electrical products. At the end of the 1940s the company introduced its first forklift truck and since then has grown into a world-famous producer of forklifts with more than 7,800 employees and a yearly turnover of 1.95 billion euro in 2015 (Conveyor Case Homepage, 2018a). The focus of the products is the premium market with the target markets being Europe, the Middle East, and Africa (Conveyor Group Homepage, 2017). The company has been taken over several times since the death of the founder in the 1950s and belongs now to a parent company with several acquired manufacturers of forklifts, warehouse equipment, and industrial trucks in its portfolio. The holding company, as the second-largest manufacturer of forklifts globally, is thus able to serve different market segments and target markets with different subsidiaries, and the case company is one of two in the group serving the premium end of the market.

With a strong corporate parent, the case company can innovate while relying on financial backing and different resources from a group with a workforce of 30,000 employees worldwide. With its headquarters in Germany, the group comprises seven different brands, allowing it to focus single brands on specific market segments and markets. That's why

the case company can concentrate on the premium segment and has been given the lead for the different service innovations in the group with a focus on premium services consistent with its premium product positioning. The company develops different products and services for a variety of industries, including logistics, automotive, mechanical engineering, food, retail, and beverages (Conveyor Case Homepage, 2018a). Within these markets it has a highly diversified structure and delivers to customers regardless of size, retailer, or service provider.

The conveyor case is most well-known for its gas- and electricity-powered forklift trucks. However, the company also develops a range of other products in the conveyor technology domain, including different trucks, hand pickers, and tugger trains. It also offers intralogistics systems involving different products of racking systems, warehouse automation, material and data flow management, fleet management, and intralogistics consultancy. Based on this focused business and long experience in the conveyor technology industry, it was able to identify different service innovations, which require a radical shift in thinking and culture to create a different service business model in parallel with the legacy business. In this research, the focus is on the forklift trucks in general in combination with different services in the fleet management category. Hence, similarly to the construction machinery case, the conveyor case combined a product business model with a new service business model and forms a hybrid structure of both models to create a premium customer value proposition.

5.1 Brand, Customers, and Competitors of the Conveyor Technology Company

The radical service innovation being pursued by the case company would not have been possible without its parent group's global presence and scale, which has enabled it to further push the development in radical services due to shared resources within the group and a strong group brand. While the case company's reputation as a high-quality OEM of different logistics solutions is widely recognized in the product marketplace, customer trust in the brand and in its potential to include information-rich, product-based services is built up and underpinned by the company's values.

The management of the case company formulated seven philosophical statements as a brand concept. Some of these factors were identified in the case study interviews, demonstrating their relevance as key components and enabling factors in a radical innovation process. The seven statements are clearly outlined on the company homepage (Conveyor Case Homepage, 2018a):

- "We are available for our customers. Their satisfaction guides our activities."
    - The conveyor case offers customized solutions for their customers. This also appears in their explanation of the first radical innovation, which began as a locally developed customized solution only for one country.
- "We offer excellent solutions and apply intralogistics to create a competitive advantage for our customers."
    - Directly reflecting this value, the case company explicitly highlights the ambition to be the leading supplier within their industry. The interviews confirm the leading position at least for some of the service innovations.

- "We assume responsibility. Our strength is team performance."
    - Again, this value is shown in the ground-up first step in the service innovation initiative.
- "We conserve our environment and act sustainably."
    - The company's fleet of forklifts is predominantly powered by electricity. Also, the further development of services will include ecological aspects and meet the values of the company.
- "We are reliable and act compliantly wherever we operate and respect social and cultural variety."
    - The case company aims to always meet the legal regulations in every country in their portfolio. The service business also complies with this value and subordinated processes and departments in the group were developed to legally prescribe and monitor developments in the target countries. In particular, the General Data Protection Regulation (GDPR) was examined in detail and its requirements incorporated into the service offering.
- "We want to be a benefit to everyone who is associated with us."
    - The case company introduced different services as new customer needs were identified.

The organizational structure of the case company with an affiliation and close cooperation especially in technological and legal aspects within the group also reflected the strong core values connection between the parent company and the subsidiary. Hence, the values of the group play a vital role for all its subsidiaries. The interviews reveal how the four

major group values of integrity, collaboration, courage, and excellence perfectly matched and complemented the values driving the service innovation within the case company in close conjunction with the strategic direction formulated in the group's "Strategy 2027".

These statements and values were adapted and honed over time, and in the global market the whole group is in second place in the ranking of the "Top 20 Industrial Lift Truck Suppliers" released on a yearly basis by the publisher Modern Materials Handling (Modern Materials Handling, 2018a). As the focus of the innovation research is on the subsidiary, it seems to be a successful brand on the customer side, with only Toyota Industries Corporation, a significantly larger company than its corporate parent, ahead of it in the physical product marketspace and Jungheinrich AG in third place. Over the years the case company has won prestigious prizes, including the award of International Forklift Truck of the Year (IFOY) for one of its physical products (Modern Materials Handling, 2018b) and regular annual certifications as a great employer for seven years running from the "Top Employers Institute" (Conveyor Case Homepage, 2018b). Awards like these highlight the readiness of the company in its existing business ecosystem to develop innovative customer value propositions with a strongly motivated team, perceived as they are as a premium manufacturer and a premium employer with a well-balanced company culture.

5.2 Empirical Service Innovation Analyses of the Conveyor Technology Company

The analyses and discussion of the second case study follow the same approach as introduced in Section 4.2 and follow the core idea of Pettigrew's CCP (1988) framework, with detailed analysis of the lessons learned and of the key dimensions of change in the

innovation process. This empirical analysis to follow examines the questions of why the company chose to innovate, what aspects of the company's operations had to undergo change, and, as the process is ongoing, the key outcome milestones reached so far.

5.2.1 Driver for the Conveyor Technology's Strategic Realignment

Over the years the conveyor case company has continuously developed and introduced new fork lifters with great success based on a well-established product business model, as the awards discussed in Section 5.1 demonstrate. In addition, devolution within the group has given the subsidiary the strategic freedom to focus solely on the premium market and certain regions. However, within the last few years different drivers have occurred and caused it to rethink its strategic direction through adding new services beyond its excellent traditional product maintenance service.

This section discusses the context dimension and gives a detailed overview of the internal and external environment (Pettigrew and Whipp, 1991) in order to examine why the company decided to pursue radical service innovations beyond their comfort zone.

Internal and External Context

The conveyor case company was traditionally focused on the physical business model and the quality of its field maintenance service. The first innovating move towards the development of information-based services was taken at country level. The French organization recognized the need for information required by customers for their local authorities. Simultaneously, the company wanted to reduce the effort on their side to

manually compile information and respond to single customer requests. This was the force behind the internal development of the first information-based service, and the national subsidiary decided to introduce this value to the local market. Sometime later, after the successful launch of the service, it was adapted and rolled out in other countries, while the success of this service is highly dependent on the legal requirements:

[The service] was rolled out in France and proved to be relatively successful, serving as an excellent tool for colleagues there to meet legal requirements. When [the service] was subsequently expanded to other countries, additional requirements from those markets emerged, and the topic continued to evolve. (Interview 3S)

The interviews revealed that the stricter the local regulations and the more effort customers have to devote to the processes imposed by the authorities, the stronger is the demand for this service to save time. As the regulations in other countries are currently not as strict as in the French market, the uptake of the service offering remains quite limited, but the pilot has proven to be a very valuable learning opportunity and launching pad for further expansion into the information services marketspace.

Following the birth of this information- or software-based service, individual departments within the case company started to screen the market to identify gaps in the sales concept and match them with requests or ideas from their customers. This led to the creation of two additional services based on matching customers' demand and the OEM's possibilities, and these formed the basic service business model for a certain time. Top-down interest in expanding the initiative subsequently came from not only the early

promise of these new value propositions but also from the desire to build more financial resilience in the face of economic volatility and the downturn in physical product sales through the creation of new revenue streams. Demand for services is more consistent, arising from the more interwoven and continuous interaction between supplier and purchaser yielding a more reliable relationship-based ongoing profit flow. Evidence of this striving for resilience coming from the parent company is highlighted in an interview with a Product Manager and confirmed by the group's press releases (Conveyor Group Homepage, 2014). This indicates that the overall strategy of the parent company is communicated and lived by the case company and its employees.

The case company developed the first services in the context of certain jobs-to-be-done identified by single departments within the company. As the service business was continuing to grow, with the initial three services and later increased to five, the company began to restructure its organization and processes. This became necessary as not all of the services launched were successful, and some had to be withdrawn from the market:

That was in 2011, and it is now being officially withdrawn – although unofficially it had already been pulled in 2014. The salespeople, however, stopped selling it as early as 2012. In other words, there were several stages: the salespeople ceased to sell it because they said, "What's the point? It only causes me trouble, and it doesn't work anyway. (Interview 4S)

The case company has since moved on to developing and testing service ideas in a lab drawing on expertise from across the whole group. The main driver for services now is

the overall strategy to expand the service portfolio and foster the business not only for the case company but for the whole group. Accordingly, the context of the service innovation has changed over time from a decentralized identification, development, and rollout of single solutions to a group-wide consistent service strategy by using synergies of all subsidiaries. The competition is only partially the driver for this development as the case company itself was a pioneer of these solutions. According to the interviewees, the company was not always first to the market and other third-party providers were faster with single customer value propositions, but they had, and still have, the advantage of comprehensive proprietary access to the data of their machines and have learned to match these data with other data, for example customer relationship data, to form a unique customer value proposition, which cannot be imitated easily. The main driver now is the recognition that such services are becoming a must-have in the digital era, increasingly linked as they are to *"[…] customer loyalty and the expectations of customers, especially younger customer growing"* as the Senior Director Digital Solutions and Support explained (Interview 7S). With the new strategy and growth of its service portfolio the company is driven by the force of becoming a platform provider and aims to offer the customer a much more advanced value proposition consisting of different products and services in the overall ecosystem.

What can be learned here is that a common approach of three business sides, the OEM, its customers, and the regulator of certain markets together, provided the impetus for the early development of the data-based service innovation based on the physical products in the legacy business model. The early move into this space by the case company was supported by the two factors of organizational structure, the direct sales structure with

proximity to, and enjoying almost unfiltered feedback from, the customer and the freedom of the case company's country organization to develop local solutions for their customers. These enabling factors allowed them to identify clearly what the market required and to raise the quality and richness of the data from customers to a level that makes it possible to offer the services at all. The later innovation phase is characterized by the general development of the digital era, in which customers are accustomed to being informed and to using digital products in the form of services as well as similar developments in other industries. In this context, the case company recognizes that it must continue to focus on these kinds of innovation to remain state of the art and defend their prominent position within their market and among their competitors. Finally, they realized the benefit of services in terms of the more consistent revenues compared to the legacy business model

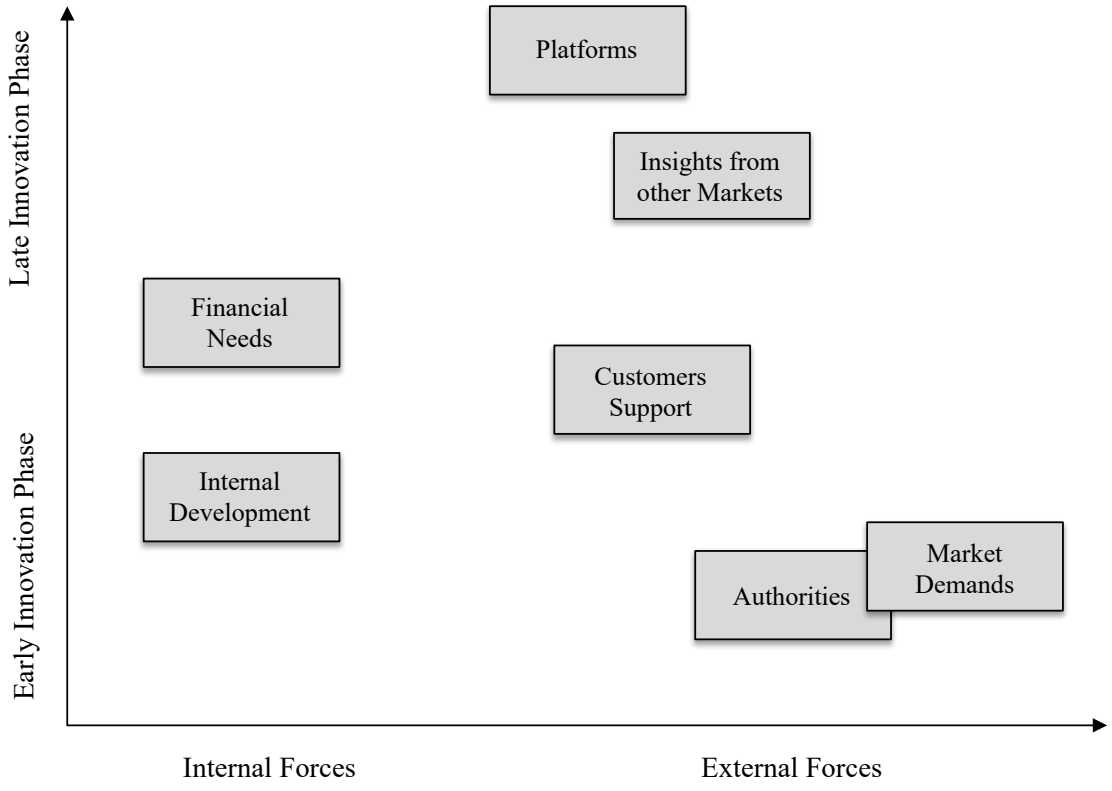

Figure 11: The Internal and External Forces of Innovation of the Conveyor Technology Case

and resilience in the case of any financial crisis. Figure 11 summarizes the forces driving the innovation process and provides an answer as to why the company started to step off the treadmill of competing solely on the basis of its traditional product-based business model.

5.2.2 Organizational and Cultural Management

The discussion and results of the interview program with the case company are in its structure comparable to the previous case study discussion for a consistent empirical evaluation. The structure focuses on the key elements of the service innovation content (Figure 8) evident in each of the case studies and on what business model elements had to be adapted or created for the new information-rich service model.

The service innovation of the conveyor case company shares the same three attributes as those of the other case studies and their trajectory of innovation. These attributes are software, information, and connectivity and they necessitated a radical rethinking within the company about its go-to-market strategy as well as a very different combination of the process and resources needed to create and deliver these kinds of value proposition. Although the new service models build upon the physical product, different resources and processes had to be established over time through a trial-and-error approach and entailed new organizational structures, which ultimately affected the whole company group. The four dimensions of innovation provide a helpful structure for examining the different cases with slightly different results within each of the categories.

The company has a very good organizational approach for decentralized innovations as the first software-based innovation showed. The local entity developed a value proposition to satisfy the requirements of the customers in the country driven by the legislation. This approach made the initial start of the new stream of value propositions easy and flexible but hindered a uniform appearance of the whole company when other services were added to the new service portfolio. These services were identified, developed, and rolled out from departments within the company that identified the customer needs in their segment. From an organizational perspective, while these customer needs could be satisfied in a short period of time, the potential for more sustainable cross-unit synergy effects tended to be neglected. The services were developed in collaboration with experts of the physical business model and drew on their intrinsic motivation to find new types of sales opportunity. The decentralized organization, shared resources, and the additional responsibilities on the physical business model staff for services also brought setbacks for single services due to limited resources in many disciplines (e.g. design, testing, training). Hence, the initial approach had both clear upsides and downsides, and this prompted the case company and the corporate parent to rethink the virtues of the decentralized and loose organization when applied to these service innovation initiatives. The case company established for its part a specialized department for these kinds of services to consolidate all activities as well as know-how. The still growing department combines different roles to develop and support services successfully based on the ideas formulated in user stories. However, the IT department, as one of the key resources of digital products, is not represented in this team and is established centrally at the parent company and as a resource for all different brands in the group. The common approach of IT standards, bundled know-how, a centralized

server, a comprehensive data pool, and many other factors is behind this approach. In addition to the centralized IT and the latest organizational developments, the parent company also established a subordinated unit or lab called the "Digital Campus". A key driver for the lab is the need for additional opinions from other people to evaluate new service ideas from a customer perspective, add fresh impetus based on market input and help create initial dummies for testing, as the Head of Business Solutions explained:

[…] involving customers from the outset in the development of new products – conducting interviews to understand exactly what they want – and then quickly launching these traditional offerings to gather feedback, etc. At the [the company] level, we have also established a Digital Campus, an overarching unit within [the parent company], to support this process. (Interview 7S)

In a next step, the service will be developed internally at the case company except for the IT components, which are developed again at the parent company. The third organizational-specific factor is the legal department, which is also located at the group level. The requirements from a legal perspective in service-based business models were initially not evident and considered, thereby requiring effort in later stages of the product life cycle. Especially the recent changes concerning new legal requirements in data protection required the establishment of additional resources to cope with all the inquiries in data-based services. This compromises the GDPR regulation for data privacy, which has implications for several elements in the new service model – for example, contracts between the OEM and customer and anonymization of personal data. Changes and requirements of the new regulations had to be implemented from 25th May 2018 for

organizations located in Europe or doing business there (EU GDPR.org, 2018). Finally, the group restructured the collaboration model to cope with the dynamic factors of services and their different life cycles compared to physical products. An agile approach was adopted to help to speed up development cycles, add missing perspectives in new value propositions, and increase design effectiveness, especially given the large element of software development involved. The current agile solution revolves around the creation and operation of BizDevOps teams. Urbach et al. (2019) describe the BizDevOps team as an organizational configuration for digital products to form one entity of business (Biz), development (Dev), and operations (Ops) in order to reduce barriers between these functions. In the more traditional approach, these three departments or teams act and plan as separate entities with different requirements, which substantially slows down all phases of development. According to the Senior Director Digital Solutions and Support, this was one of the key changes and it took several years of persistent effort to bring it to full fruition:

Our IT is outsourced, and we have established so-called BizDevOps teams with them, where we work closely together from the outset. […] However, as mentioned, this process took several years, and it required considerable effort in persuasion and in getting familiar with these methods. (Interview 7S)

The cultural management of services goes along with the organizational changes, especially the agile restructuring, which requires some effort to train the whole organization. However, building the new service orientation of the case company was, and still is, challenging, especially the transition from depending on the intrinsic

motivation of individuals at the beginning to creating a comprehensive service-oriented company culture with a pronounced service concept. Communication and transparency of the service value for the organization seem to be a crucial tool, as noted by various interviewees. A key driver is the commitment of the management board and updated strategy (called “Strategy 2020”) of the organization with a focus on services. According to the interviewees, this top-down commitment enables the acceptance of service-related decisions in the legacy business model and helps persuade employees to allocate resources for service-related activities. The Senior Director Digital Solutions and Support (Interview 9S) explained that supporting instruments for the cultural change and acceptance of services are internal events, e.g. “digital days” or “touch and feel”, for employees to demonstrate the benefit of services. A critical success factor of selling services is the sales forces as well as regional service managers and their attitude towards services. The Regional Service Director (Interview 1S), for example, pointed out that the traditional maintenance service staff were worried about the transparency of their own work to the customer and initially tended to view the transition to data-based services as a tracking instrument for their customers and an additional level of control on their work. In this case, internal information campaigns helped to overcome their concerns and to drive cultural change forward.

5.2.3 The Customer Management

The case company had to profoundly adapt elements relating to the customer management dimension. Following the structure of the first case, the following section describes the most significant adjustments in the four categories:

- Sales of Services and Salesperson Training
- Customer Training
- Life Cycle Management
- Customer Support

Sales of Services and Salesperson Training

The case company relies for the sales of services on their existing salespersons from the physical business as they already have a very close relationship with the customer. However, a small service sales team was also established to sell services in parallel or downstream and sells services if a service benefit can be identified in the sales pitch of the physical products (Interview 3S). The sales organization is divided into the two areas of salesperson and fleet salesperson (*"In our organizational structure, we have a forklift salesperson, an area salesperson, and we also have fleet salespeople who exclusively cater to large customers"*, Interview 1S). Although the move into services is a "blue ocean" venture (Mauborgne and Kim, 2004), new customers are still mainly acquired via the product business (*"We conducted a study and found that during the initial contact, a salesperson must first focus on functionality and only later present the services that the customer can utilize"*, Interview 1S). However, just as in the first case, several customers now include the functionality of the services in the tender for the products. The case company experienced some initial constraints among the salespersons in their approach to sales of service. This might also be due to the more intensive sales preparation, as this requires more detailed knowledge of the customer, his/her usage habits and fleet to demonstrate the benefit in contrast to the physical product where the sale is based only on technical data and price (Interview 2S). The challenge for the salesperson is to be able

to prepare and demonstrate transparently the benefits and costs saved, which will be different for each customer. This allows the customer to accurately assess whether the price in the form of a regular fee is justified for such a service and its intended use. To help in this regard, the case company developed a “benefit calculator” to support the salesperson in making the sales pitch:

[...] using modern media on the iPad, such as videos and the 'Customer Benefit Argumentation' tool, where the customer can actually specify how much time they save through a particular function, what benefits that function offers, and which of those benefits are relevant to them. (Interview 5s)

As a sales feature for existing key accounts, the salesperson has the option, for example, of displaying the data of the customers on their devices directly in the app of the respective service, thus showing the customer the benefits live. A major challenge and additional effort for the salesperson is checking the reliability of the customer’s data in advance. As the Senior Director Digital Solutions and Support reported, this could cause distrust (Interview 7S). Additionally, the company supports the salespersons and their potential customers with key users to communicate the benefit and answer critical questions from the direct user environment:

The service team leaders should support and guide the sales representatives in their region so that they can sell the services themselves […] Additionally, there will be a software key user who can address particularly challenging questions if necessary. (Interview 6S)

To overcome the obstacles of selling services, the case company introduced incentives for the salesperson *"[…] that they push it massively into the market"* (Interview 1S). As one Product Manager reports, another success factor in the selling of services is the reliability of the service functionality. The sales team tended to lose confidence in the services and stopped selling when a service was not working properly (Interview 3S). On the other hand, the customer has the opportunity to test at least some of the applications free of charge for a certain period of time. This reduces the cultural barriers and doubts about the actual use of the services on the customer side.

The salesperson works alongside marketing or simple orders through the online channel, which is one of the critical elements in the success of selling services. The case company introduced several mechanisms to train their organization as well as the salespersons so that they understand the benefits of the services in detail and can successfully sell products related to the services. As the Product Manager Business Solutions (Interview 3S) states, salespersons are trained recurringly and intensively and have their own access to each service. The company expects this to increase efficiency, as employees can experience the system for themselves and are not only familiar with it from training courses. With this self-experience, they are also given the opportunity to demonstrate the system live to the customer via iPad and different videos as well as a customer benefit tool to show the customer the time and money required to be with a given service, as another interviewee explained (Interview 4S). These initiatives are also intended to arouse and intensify enthusiasm for the services, which should result in increased sales. Basically, the training is split into central and decentral. This is also due to the indirect sales approach, and training courses need to be developed and held for the regional companies

in order to make the management team aware of services and to encourage their own sales team to sell services (Interview 5S). A further subdivision of the training concept is the split between salesperson, sales organization, and technical employee due to the different needs and focus of each of the three categories. One key resource for the training that takes place several times a year is Product Managers who train the salespersons either remotely or on site. Also noteworthy is the element of the training in which a ticketing system is demonstrated to the salesperson (Interview 7S). This is important, as salespersons are the key contact with the customer not only in the sales pitch but also after the sales and during the operation.

Customer Training

Customer training is seen as relevant by the case company but was not addressed at the beginning of the service sales initiative. In contrast to the physical product, services are subject to constant optimization and new features are added. This requires an ongoing training of, and communication by, the customers. In the case of minor updates, online training sessions are offered to demonstrate new functions. Major updates require a more intensive training by the Product Managers at the headquarters or directly in the regional sales organization to which the Senior Sales Director reports (Interview 9S). Beyond that, the responsibility then lies directly with the local entities to provide their customers with optimum training. However, this training concept is currently being optimized, and web sessions are being established to reduce time- and cost-intensive site visits. Additionally, the factor of customer training is also connected to the service design. The more self-explanatory a service itself or the updates are, the less training is needed for the customer. The initial training of the services is downstream of the handover of the product and

conducted by a technician, and it is the responsibility of the respective local entity (Interview 8S).

Life Cycle Management

This case also highlights a fundamentally different service life cycle management requirement in contrast to physical products. As mentioned earlier, major differences include the regular updating of services and the possibility of adding new features via software updates. This guarantees that the service will be up to date throughout the whole life cycle and can be adapted to constant change and user expectations. The financing of these updates and the source of revenue are based on a regular monthly or yearly payment model preceded by a trial period for the customer, to give the customer the opportunity to get to know the system and to become more familiar with the benefits (*"And the hardware includes 5 years of communication costs to familiarize oneself with the system – in other words, for 5 years, no additional fees are charged to receive the data"*, Interview 4S). The interviewees justify this phase by saying that the advantages of a service over a product are not always immediately apparent. In order to manage the payment model, the case company had to develop an online platform for the customer on which he/she must register and log in (Interview 9S). This enables the company to see what the customer is using and how, which requires a major change in the organizational structure. While the physical products are sold by subsidiaries, the online store represents a direct channel to the manufacturer. This enables the company to reach customers in the second-hand market as they also have to register to use services. Without this functionality the case company would only be able to recognize the customers during maintenance. The management of the second-hand market and the change of user in

general is still challenging for the company. As one Product Manager stated, *"[…] now it starts slowly that some devices send out information where we do not know, should we switch them off or do we filter them out"* (Interview 5S), which comes from the fact that earlier services were sold by the dealer in combination with the product and activated for five years. The planned subscription model, including licenses, should help to create transparency. Life cycle management also covers the hardware enablement for services and the sunsetting of the telematic modules (2G). The legacy hardware is not suitable for new transmission technologies, so the manufacturer must further develop the equipment of the physical products with newer technologies and establish processes for updating products already in use in the field to ensure that customers can still use services that process data from these physical products.

Customer Support

Customer support is a quality tool and decisive for the external image of a company. The case company currently relies on the well-established structures of the physical product business and the regional subsidiaries as a first-level support for the customer. In the event that the first point of contact cannot help, the service center as second-level support will take up the case. Only if no further help can be provided here is the problem addressed to the third-level support and the developers of the service. Here, too, the company is working on a new support concept and intends to establish a dedicated service-specific first level of support in more than the two current languages of English and German (Interview 9S). The reason for this new structure is the complexity and the ongoing release of new services, which makes it complicated to train the employees of the existing support structure linked to the physical product business. Also, the missing knowledge of

the local subsidiaries in terms of software systems and platforms is challenging and should be covered by the dedicated first-level service support:

The customer has the sales representatives or service technicians as points of contact on-site, and they are also trained. Additionally, there is a designated contact person in each branch […] the customer always contacts their service salesperson, who first tries to resolve the issue. If they are unable to find a solution, they consult experts for further assistance. (Interview 8S)

While the subsidiaries are provided with workshop manuals and standardized processes exist, services are more complex and are *"living products"*, as one Product Manager stated (Interview 5S). In sum, the case company was facing the challenge that existing support structures cannot be easily adapted for services due to their complexity and to the remoteness of the established national subsidiaries from the systems operated directly by the manufacturer. Furthermore, the future concept considers the challenge of identifying the source of the fault, which can be with the device itself (e.g. an installed sensor or telematics module), the service and the underlying systems, or, in the case of a faulty connection, a connectivity provider problem.

5.2.4 Ecosystem Management

The ecosystem also requires in this case adaptation in the different layers of core, extended and business ecosystem, and the elements of each layer are comparable to the previous case (see Figure 9) with slight adaptation coming from the structure of the case and outsourced activities in the holding company. Nevertheless, the elements are also

evident in this case. Consequently, the core business has changes in the products-services as well as the internal suppliers. In the expanded layer, what particularly stands out are the competitors in the physical products market, the connectivity provider, the customers' customer, and the co-creators, while the outer layer consists of authorities.

Core Business

The core business is dominated by the changes in the internal supplier structure. The case company equips the physical machines with sensors and control modules to enable data-driven services so that the service is ready to use as soon as the customer books it. This requires new processes for the new technology and the company had to start a development cooperation with a university to then enable them produce in-house. The same applies for the IT-related hardware and software for which the company can draw on the expertise of the group's central development division and which can be provided to the single subsidiaries (Interview 1S). The second point worth mentioning in this ecosystem level is the development of product-service combinations in the core business. The case company highlights the challenges posed by the different development cycles of products, where the five-year cycle typical in the case of physical products contrasts with a six- to 12-month service development cycle to customer readiness (*"[...] that the development takes at most one year, rather than four or five years as with the forklift [...]"*, Interview 5S). For this reason, the company had to establish processes to define relevant interfaces between products and services with a sufficiently long horizon to provide for efficient manufacturing stability while also being able to keep the much shorter and more flexible development of services as self-sufficient as possible (Interview 8S).

Extended Enterprise

The extended enterprise layer is more pronounced and contains more elements to be considered than in the previous case. Of major importance was the consideration of competitors' products and the compatibility of retrofit solutions in order to include these products in the overall service such as fleet management, which, according to a product manager, is a significant advantage in order to be able to sell a service to new customers, as their fleets usually consist of products from different manufacturers:

[…] this is a prerequisite – only in this way can you successfully position the offering with new customers. It starts with taking over routine maintenance for third-party vehicles, which then enables you to install the service products on competitors' vehicles. Everything must be in place to access new customers and promote customer acquisition. (Interview 2S)

However, just as in the first case, this is only possible to a certain extent since in-depth data of the competitor products cannot be accessed easily (Interview 1S). A challenge for the case company was the used trade and resale of vehicles equipped and registered for services. In such cases, the SIM card of the sold product remains active and certain data can be viewed by the follow-on customer. In the case where a machine is sold and the services are not used by the second owner, the SIM card still generates costs for data transmission as it cannot be terminated (Interview 5S). This might be solved by the planned introduction of the online store and licenses as discussed in an earlier section, which could also enable the selling of services to indirect customer groups.

The next element is the key element for the strategic direction of becoming a platform provider and includes co-creators in value enrichment for the customer. Currently the case company is reorganizing the online store and corresponding IT systems to offer not only services, but also products and especially spare parts, drawing on an existing cooperation with suppliers on one platform. Intensive conversations with key customers take place to identify value-added offers and include more co-creators on the system*:*

We are considering a digital customer platform: what exactly do we want to offer – one single interface or multiple ones? We are currently analyzing this, and it's crucial to stay close to the customer by conducting interviews to understand their expectations. Then, we need to observe where the market is heading, keeping in mind that entirely different players might emerge. (Interview 9S)

Finally, the connectivity provider is a key enabling element and is part of a fundamentally new ecosystem. Without this player and the new ecosystem of telecommunication, the products would not be able to send or receive data unless they are within range of a stationary Wi-Fi. The cooperation with a telecommunication provider and equipment of products with corresponding SIM cards were new to the case company and required processes between the players. The management of activation and deactivation in the case of a booking or cancellation of product-related services is triggered by the case company and then processed by the telecommunication provider. As customers require the services to work seamlessly in different countries, the telecommunications partner must be able to provide almost worldwide data transmission capability over its network. This is

particularly challenging for markets like China, where the extended enterprise collaborative network must also include a separate local provider (Interview 7S).

Business Ecosystem

The outer layer is the business ecosystem and considers the requirements of the product-services authorities in the new service business model, as in the case of China, highlighted above, where local authorities prescribe the cooperation for data exchange with local partners and may restrict the sending of local data abroad. Furthermore, the demand on the case company for an information-based service was itself driven by authorities for which the service was introduced, and the introduction of any new service model must also be able to cope with the legal requirements.

5.2.5 Legal Management

The legal management dimension includes legal issues that have become relevant both with regard to state institutions and customers in the course of the introduction of services. In particular, the challenge of data protection stood out in the interviews, and this has required enormous efforts to comply with new laws. Here, however, the case company benefits from belonging to a group with centralized functional expertise to monitor legal issues and to advise the subsidiaries of the group. So, in this conveyor technology case the legal management dimension is closely connected to the organizational and cultural dimension due to the pooling of resources on legal issues in the group. Nevertheless, new roles in this discipline had to be established within the subsidiary to interface with corresponding departments in the group in, for example, the drawing draw up of the additional data processing contracts that become necessary. Separate contracts with customers are required

to obtain permission for processing these data as well as the anonymization of the data where possible. These contracts, drawn up by the case company, often tends to clash with the requirements of customers who want to have contracts of their own design signed off in relation to data storage and use. The Senior Director highlighted such challenges with several customers, as the acceptance of their contracts had first to be reviewed by the internal legal department. Moreover, such additional legal management requirements also tend to increase the tracking of customer-specific contracts, where changes might become necessary due to further legislation over time. In the event of deviations from the standard contract, each contract must be individually reviewed and adapted:

Larger customers that deploy this system have, in turn, developed their own contracts to comply with the General Data Protection Regulation, and they naturally expect us to sign their contracts – particularly with regard to the Fleet Manager, where we ensure and guarantee compliance with the new regulation. On the other hand, we have our own standardized contract template for this product that we intend to offer to our customers. (Interview 7S)

The case company considers data protection policies to be of prime importance and regularly monitors legislation to stay continuously up to date. A breach here could also call into question credibility in the eyes of the customer and access to customer data within the company is restricted and requires the express approval of the customer.

5.2.6 The Evolution of the Servitization Process

As in the previous case, the path of servitization in this case was not a straight one and had distinctive phases along the way. The data in the conveyor case also highlight four discernible phases of technological enablement (I), monetization and strategy alignment (II), service growth (III), and platform strategy (IV).

Phase 1: Technological Enablement

The technological enablement phase and introduction of the data-driven services was purely triggered by an identified customer demand in one of the case company's target markets. The new service had nothing to do with telecommunications services back then and was just a service to help their customers in reporting topics in response to the safety checks on physical products prescribed by the authorities. This service was the starting point for the servitization paths subsequently followed at the company, *"[...] and from this, the first software products were developed, and it was seen that it had added value for the customer and then it was started to be rolled out to the entire organization"* (Interview 4S). The service demand was identified by intrinsically motivated employees from the operative business and was hence triggered bottom-up. In this phase, the case company was able to show the relevance of their service as well as justifying basic technological building for further services, e.g. resources for software development. As the first service was based on software developed by employees in the target market, the customer management dimension was of particular significance at this time, arising from the processes and resources it used in the development of a user-friendly service based on the feedback of their customers. Since no separate resources were allocated for this development, the employees from the legacy business were responsible in parallel to their

daily roles in the product business. Through their commitment they had an early impact on the cultural change as they had to justify additional resources for the development and sale of information-based services, as well as carrying out some internal marketing to demonstrate the success and future potential relevance of such services. Building on, and propelled by, these early efforts, the company entered the next evolutionary phase.

Phase II: Monetization and Strategy Alignment

The data show that the introduction of the first service and the technological enablement was a success and justified the development of further services. The case company started to develop additional, more profound services, which were rolled out to other markets. As the need for services was identified and the commitment of the management grew stronger, the strategy was also aligned. As one Product Manager stated: *"It is clearly identified we need a reasonable service innovation process not only for touchable products"* (Interview 2S). Although individual departments were allocated resources to develop new services, the development effort for innovating new services was not yet centralized. As a result, each product area tended to develop services for its own segment. Furthermore, the interviews have shown that this phase was characterized by a learning process regarding how to develop services and develop them to be reliable. One Product Manager reported (Interview 4S) that one service *"[…] has been taken back because it does not work"*. This phase is characterized by the ecosystem management dimension as the more profound services require cooperation with the telecommunication provider and the SIM card technology to send and receive machine data for different services (extended enterprise). But new suppliers also emerged in the core business to develop and deliver sensors or the equipment for data transmission. As the services attract more attention

throughout the company, the organizational and cultural as well as customer management dimensions also come into focus. Salespersons for physical product must sell the service on top of that and the usage of services must be designed to be customer-friendly, which in turn means more resources specifically for services. This increasing servitization also sets in motion the cultural change of the entire organization and increases awareness of the relevance of the services, which helped to inspire the subsequent service growth phase.

Phase III: Service Growth

The third phase is characterized by the development of a more centralized service strategy that entailed a structured service portfolio with new services. The two previous phases were formative learning periods for the case company in terms of improving the reliability of data and service transparency in the eyes of customers across different service offerings. Driven by external forces, the insights from other markets, and, once again, market demands, a new strategy was adopted that entailed, in particular, the development of further services, with more corporate-wide consistency and coherence. Because the early data-driven services had been developed locally for particular markets by the respective regional entities, they lacked a central development process in terms of a company-wide uniform structure, a "look and feel" design, and a uniform system landscape. This phase addresses these shortcomings and results in a uniform service offer consisting of various modules that the customer can book without a system break and different logins that were a common early source of customer frustration (*"[…] we have a new software system that is built in a modular fashion, is web-based, and features a platform hosting various applications. Essentially, there is just one platform that provides access to different areas."* Interview 5S).

This evolutionary step of the case company's servitization transition requires profound changes in processes and resources located in the organizational, culture, and customer management dimensions. To deal with the criticism of the customers and the scattered service portfolio, the single services were redesigned and merged into a service family with individual modules. A key enabler for this is the adaption of IT in the background and, as the Senior Director Digital Solutions and Support stated, shifting to cloud solutions (*"Additionally, we have now begun developing applications that run in the cloud"*, Interview 7S). This major IT upheaval is also accompanied by a comprehensive organizational change. Firstly, networking and centralization with the parent company increased and different tasks and responsibilities were centralized in the group. Secondly, the hardware and software development activities of the group were concentrated in a newly founded subsidiary (Interview 9S), which enables an agile way of working separate from the group's actual manufacturers. Another organizational and processual decision was the introduction of a superordinate digital campus to develop and test digital products faster with additional perspectives on customer benefits and the potential for success and early feedback. Both changes support the overcoming of cultural barriers, as service-relevant processes can be decoupled as far as possible from the processes of the physical products. The changes in the organizational and cultural dimension enable the changes in the customer dimension. The sales of services and life cycle management are particularly pronounced here. The already mentioned modular structure and uniform *"look and feel"* across different single services promote the online sales channel. Furthermore, value propositions can be booked and cancelled more easily through the recently introduced customer portal. With the profound changes in the organization, as well as customer-

centric adaptation of processes and IT systems, the case company has reached the next evolutionary phase of forming a platform.

Phase IV: Platform Strategy

The conveyor technology case was in its first moves towards the platform strategy phase stimulated by the external cross-industry trend towards platforms. One of the enabling strategic actions for this phase was the modular structure of services (Interview 4S), which gives the customers the opportunity to book and cancel services individually right through to planned pay-per-use (e.g. one day) subscriptions. The platform, limited in the previous phase by corporate boundaries, can now be expanded and can add additional players in the market. According to the Senior Director Digital Solutions and Support, it becomes essential to open these boundaries and *"[…] we also need to have the option of perhaps being able to register ourselves on other platforms with our data. These are topics that are now also on the agenda. How can we make the whole thing even more open, even more modular than what we have today?"* (Interview 9S). For the case company, this will require the ability and willingness to enable other companies to access its platform for mutual benefit and to more easily exchange data with other related platforms.

5.2.7 Conclusion of the Conveyor Technology Case

The evolutionary process, with all its triggers and changing content, went through ups and downs with introduced services, some of which were withdrawn and optimized again in a learning process, as well as other necessary learning processes. The case company still has its main focus on its physical products, which account for by far the largest share

of sales. Without the services, however, the products would be interchangeable with competitor products at any time, so the company, in addition to the other forces, is constantly driven to further expand the service business and increase the lock-in effect for customers. Here, it has been shown that the company had to develop the individual elements in each of the four innovation dimensions step by step and on a trial-and-error basis as it moved through the evolutionary phases of its servitization transition – for example, in terms of gathered data quality and thus the reliability of customer services. The foregoing description of the case company's servitization journey to date also shows the dependencies between the individual phases, as was also exemplified in the previous case (Figure 15). This also applies here as, for instance, service licenses go hand in hand with an online store, just as the booking of a service has legal implications.

A key enabler was the intrinsically motivated employees in the single markets and their ability to incubate the services in their units. This, however, resulted in a scattered service landscape without a uniform strategy, IT systems, and *"look and feel"* for the customer. These could only be unified in the advanced phases. However, the case company can take advantage of belonging to a group, which puts it in a position both to bundle the expertise of the individual brands within the group and to drive innovation more strongly through newly established agile joint departments. The company is now moving into its fourth evolutionary phase and sees an opportunity to provide services within a networked platform model either through the development of its own proprietary platform or as a participant on other platforms.

CHAPTER 6: CASE STUDY C – THE AGRICULTURAL TECHNOLOGY COMPANY

The third case company is, like the two previous companies, a global player in the agricultural industry and one of the global leading suppliers of combine harvesters, trucks, and other products and services in this sector. The company was founded in 1913 in Germany and successfully innovated a few years after its founding with its first patent. In 1930 the first prototype of a combine harvester was invented, which laid the foundation for the path to success. The year 1989 is a keystone for the company, which still operates mainly in Europe in terms of servitization. As of then, the company made great efforts to internationalize and also acquired other tractor manufacturers. The business area was not only expanded in the product business, but also in digitization. The company had already established a farm software division in the 1990s and bought out and integrated a market leader in this sector. Several years later another subsidiary was founded to bundle the competences around the electronics development in its own company (Agricultural Case Homepage, 2023a).

The company does not belong to a group and therefore allows for a responsive and focused customer centricity. The company is fully focused on agricultural machinery and produces tractors, combine harvesters, forage harvesters, presses, and loaders in the physical segment as well as digital solutions in the same industry sector. With these customer solutions the company achieved sales of 4.926 billion euros in 2022. The company is represented in 20

countries in Europe, Russia, America, and Asia as well as Africa, with 36 locations in these regions. In total, 12,116 employees are working for the company worldwide, with almost half of them working in Germany (Agricultural Case Annual Report, 2022). As with the other cases, the agricultural case has grown into a company with a global presence and is therefore close to the customer. Like the other cases, and as emerged in the interviews, this is key for servitization – for example, to understand the individual customer needs in services or to meet the legal framework of countries.

6.1 Brand, Customers and Competitors of the Agricultural Technology Company

The agricultural case has a pure focus on the agricultural industry and started early with the development of digital services in agricultural machinery as well as agricultural software. The company's brand is not only known for its high-quality agricultural machinery but has also made a name for itself in the digital sector over the years. This is certainly also due to its down-to-earth strategy and its values, mission, and vision, which focus on its own employees and customers. Four principles of management that revolve around the company's own employees were formulated. These include respect for the employee, involvement in decisions, reliability including credibility, loyalty, and trust, and to be prepared to change as constant change is an opportunity (Agricultural Case Homepage, 2023b). Also to be emphasized are the company's vision and mission as both can be observed in their history and further servitization. Its mission reflects the passion of the company and its customers and strives to bring people together with sophisticated technologies to create value. Their vision is similarly focused on helping customers thrive in their working environment with the support of their solutions. (Agricultural Case Homepage, 2023c).

The case company is listed as the market leader in combine harvesters (Mordor Intelligence, 2022) and has already won many awards not only for its physical products (e.g. the Farm Machine Award 2022) but also in the category of digital product development (Quitter, 2022). Its global presence, innovativeness, and high quality are also represented in the servitization, as the interviews reflect. Driven by intrinsically motivated employees, the company has already made an early start with the evolutionary process and has been offering the customer data-based services for some time. However, especially in the second round of the interview program, which took place some time after the first, a new strategic direction focused on intensive innovation was identified, and the organizational shift towards servitization intensified. This might also have been due to the competition in the premium segment in which the company operates on the market. Looking at the competition e.g. of John Deer or Fendt and their service portfolio, smart farming and data-driven services are now an integral part of their offer.

6.2 Empirical Service Innovation Analyses of the Agricultural Case

The discussion of the gathered data follows the same structure as applied in the first two cases and follows the core idea of Pettigrew's CCP (1988) framework. The first part of this section discusses the drivers (context) and why the company had move into servitization and which factors were responsible for its further development. Hereafter the characteristics (content) of servitization answer the question of what processes and elements of the business model had been established. Finally, the evolution (process) of the servitization is discussed.

The company, as a global operating premium OEM for different agricultural machinery, e.g. tractors, harvesters, and field choppers, has introduced radical services that go beyond conventional incremental services like guarantee extensions. In 2004, they introduced the first service in data-driven telematic services for their B2B business and are based on the IoT technology (sensors in the machine, SIM card, mobile network providers, etc.).

Basically, the services of interest are based as mentioned on the IoT technology in order to collect different kinds of data like personal, machinery, telemetry, or process data. The art is to form an additional value for the customer that he or she is also willing to pay for. Currently, the customer value proposition is described by the Head of Service Products and Connectivity as follows: *"[…] we are in this position with our CVP, that we complement our machinery value proposition and tell our customers, we supply a building block system which further integrates your machine into your processes"* (Interview 1C). This statement makes clear that the company perceives the physical products in the meantime only as a small piece of a whole and wants to ensure its position by firmly integrating and connecting its vehicles and machines in the whole ecosystem of its customer. Translating this idea of CVP means to connect machines, collect data, and process them in a useful way, forming value for the customer. This value is currently offered in different service categories like the already mentioned telematics service, farm management software, precision farming, a machine optimization system, or steering systems. However, all services are basically far off the companies' traditional comfort zone relating to the traditional and well-established development process of tractors and other vehicles in this sector. Nevertheless, the company had to innovate themselves and forge new paths of doing business driven by internal and external forces.

6.2.1 Driver for the Agricultural Technology's Strategic Realignment

Along the servitization path different forces have been initiated and have further driven the company to innovate in this area. Figure 12 summarizes the emerged forces from the interview programme and clusters the internal development as well as customer support as internal forces whereas the authorities, market demands, and platforms belong to the external forces. The initial impetus for the innovation was not a customer value proposition. It was rather an internal demand for clarification on how the company's own machines are working in terms of lessons learned. The Head of Service Products and Connectivity states: *"[...] in the history, the development was originally justified by the technology respectively after sales. That means, originally the technology was used to monitor the machines in the field, which was difficult to achieve and resource-intensive"*

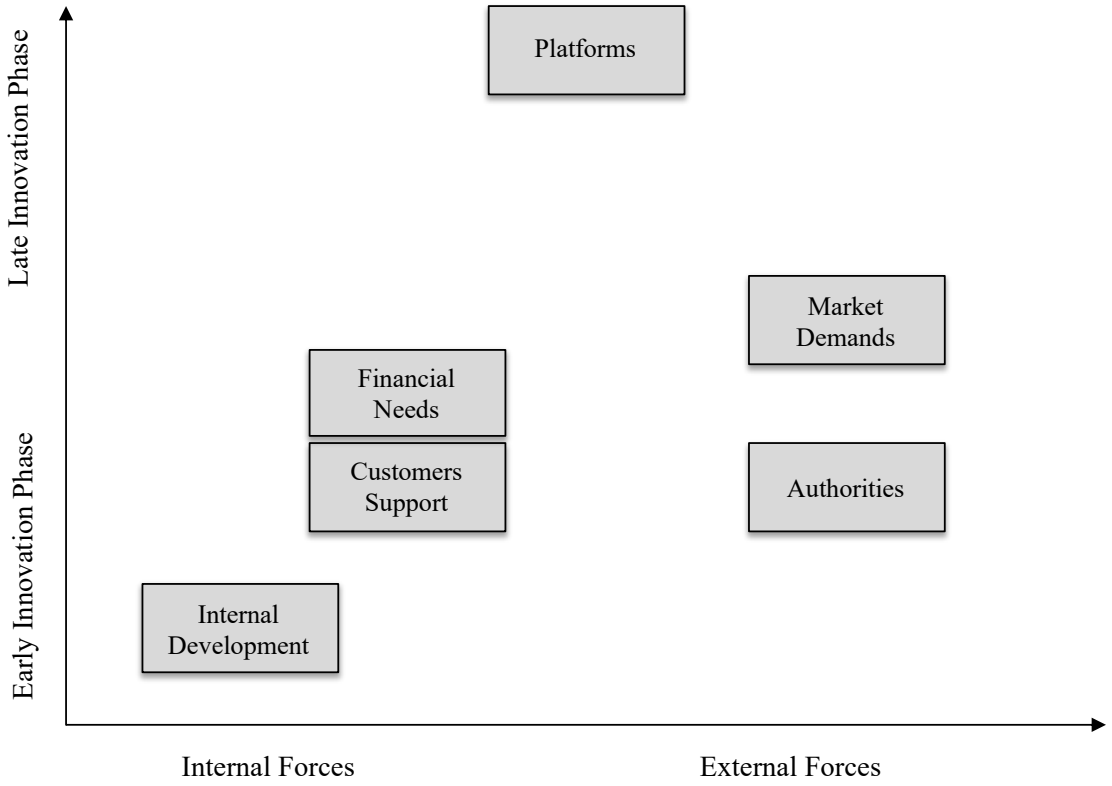

Figure 12: The Internal and External Forces of Innovation of the Agricultural Technology Case

(Interview 1C). Hence, the company initially took advantage of the technology to better analyze its own products. This meant they were able to optimize telematics over time into a customer-friendly system without establishing relevant customer processes from the outset, and likewise there was no competitive pressure, as the company was the first among the premium brands. In due course, the external force of authorities as well as financial needs and internal/external customer support came together. In Europe for example, agriculture and the fertilizers are subject to centrally regulated regulations of the common agricultural policy (CAP) (European Commission, 2023). The obligation of the farmer to provide evidence and notification of, for example, fertilizer (Interview 1C) could be served with new value propositions by the introduction and further development of data-based services by the case company. In contrast to the previous force of customer support, customer demand is purely externally located, and the company's customers proactively reach out to the company and ask for services. One interviewee explained that *"[…] customers today tend to come to us in the sense of "I want your machine, can you provide this service?" or "can you network into the following system?"* (Interview 1C). Particularly, the last question regarding network signals represents the final driver of the platform strategy to date, which is increasingly becoming the focal point of the business. Several interviewees highlighted the networking of physical products and services in general across different suppliers and platforms to prepare networking. A decisive step was the cooperation with a direct competitor to set standards in data transmission as well as to open their clouds to exchange data (Farm&Food, 2019). So, the company has already started with a platform that was able to offer the customer a range of products and services that go beyond the boundaries of the company (Interview 5C). But the course is also being set within the company to have a fully networked offering concept. According to the Head

of Marketing, a big project was initiated based on remote data *"[…] within the spare parts business […] to bring all services together on a single platform in order to offer customers maximum added value"* (Interview 4C).

In terms of the forces, the case study indicates that a purely internal-driven value proposition (get to know and optimize your own machines) can also imitate a successful path of servitization without the pressure of competition or customer demand. The early introduction of certain remote services for internal use has the benefit that no effort needs to be made towards the customer, and the company has the freedom to first concentrate on the technology and reliability of the data. In due course, the forces increasingly move in the direction of externally driven up to platform development driven becoming the overriding force of global trends toward digitization.

6.2.2 Organizational and Cultural Management

The discussion of the outstanding characteristics is structured in the same way as in the first two case studies and represents changes of resources and processes in the identified key elements of innovation (Figure 8). First, the changes in the organizational and cultural management dimensions are described followed by the dimensions of customer management, legal management, and ecosystem management.

The organization and culture of the case study company was subject to major changes to establish customer-ready service offerings. It became clear in the interviews that the agricultural case has taken organizational measures to centralize service- and digitalization-related competences as well as cultural initiatives to demonstrate the

relevance of services and establish the service concept in the company. The introduction of this case study has already pointed out the early efforts made in terms of services and the acquisition of a software company. Likewise, another subsidiary and center for electronics development was established. The separated division is responsible for connectivity-related technologies to implement service value propositions formulated by physical product development departments, after-sales, or the product management department for services. The latter department was established both on the sales side and in the product companies *("We have product managers both in the product companies and in sales who then jointly form this interface and this interlocking and talk a lot with the customer and then think up and specify appropriate features before they then go into development"*, Interview 2C). Also, the servers for all customer services including anonymized customer data are operated by the subsidiary, whereas the IT infrastructure for the company is operated by the focal company (Interview 1C). In addition, a major shift of responsibility for the generation of services change took place. Service innovation, which used to be strongly driven from the classical product development, has now been shifted to an after-sales department set up specifically for services. Finally, a Senior Management Advisor stated that in addition *"[...] organizational changes have been made in the area of sales, because the regions have been further expanded, and more tasks have been assigned directly to the regions"* (Interview 3C).

Just like the organizational adaptation, the company invested in cultural change to create a strategy rooted in the idea of service in the company. An efficient lever to do so is the formulation of a service strategy that includes defined goals as part of the overall corporate strategy:

We are actually starting to see where we want to go. Simpler, faster, providing customers with better services centrally, getting to know them early on along our sales journey and also supporting the digital side as a digital twin, and then also creating the corresponding organization, process, and structures to make this possible. (Interview 6C)

The interviewees stated that the servitization culture gained a lot of momentum when there was a change at the top of the company. The top-down commitment also creates the resources for cultural change. This includes the communication of the relevance of services to employees through various media, involvement in decisions concerning service-related topics, as well as the introduction of agile working methods and the formation of interdisciplinary teams:

We announced these topics about one or two years ago, communicated them, and informed all management levels. Ultimately, it may take another year or two before these topics are fully recognized for their relevance. This timeline is significantly longer than what we currently observe with the machine. (Interview 5C)

In summary, the dimension of Cultural and Organizational Management shows that servitization requires specialist departments. The interviews revealed a particular focus on two areas here. On the one hand, departments need to be established that deal purely with IT (in this case the subsidiary), and on the other there is a need for a department to take the leading service generation (in this case after-sales). From a cultural perspective, the demarcation already ensures that the departments set up specifically for services can

develop their service culture from the outset. The other areas are driven forward in particular by the top-down commitment and the resources it grants.

6.2.3 The Customer Management

The customer management dimension with its four subsections sales of services, customer training, life cycle management, and customer support are also subject to profound change in this case and have been adapted by the company over many years.

Sales of Services and Salesperson Training

The company reported a significant change in service sales, which can be attributed, in particular, to two key aspects of the direct sales activities of the sales staff. No matter which of the services in the considered context are sold in an ABO model (e.g. monthly, yearly) they make up a fraction of the cost of a machine and consequently the commission for the seller. Second, the sales staff has little experience and knowledge of digital services. The company also trusts in its physical business sales team for the sales of services, with their deep knowledge of the physical products and the trust they have developed over a long time with their existing customers. Since to date services are mainly sold to existing customer groups, the company had to act in this area to proactively drive service sales in their existing indirect sales approach via dealers and national subsidiaries. In order to enable and motivate the sales team, the company changed the training concept and added the topic of services as a fixed component in the training courses. Additionally, the bonus system was adjusted to motivate the salespeople to sell services on top of the product sale and help the company to reach a certain percentage of sold services (Interview 5C). The most promising approach was to train service sales staff

as specialists who assist colleagues in product sales, and the Head of Service Products and Connectivity stated that *"[…] we find that penetration is significantly better when we have a specialist there on site who helps explain the topic and is available as a contact person"* (Interview 1C). However, the company has chosen a different approach depending on the country, based on the wishes of the national companies but also to test the different approaches of pure service sales specialists in parallel to physical sales and classical sales personnel trained in the service area. However, according to the interviewees, the company's preferred solution is the dedicated sales team approach. The reason for this is the additional effort required to sell complex data-based services in addition to the product selling.

Moreover, the digital sales channel was established, and the company is *"[…] also trying to solve the so-called digital end-customer channel via web shops and the like, where we say we no longer need physical sales personnel. Instead, we are also going into online direct sales for such products"* as stated by the Head of Information Service Sales (Interview 2C). This shows a major shift in the company's traditional sales approach towards a hybrid approach, with physical products in combination with services in an indirect approach via dealers and their sales team as well as a direct sales approach solely for services. This also has an impact on product selling. One interviewee designated the approach as *"artificially intelligent enriched distribution"*, which means that data-based services help to identify the customers' real usage of the products, and the algorithm then suggest specially selected products and services for the next purchase.

Customer Training

The better the customer understands the service and perceives its benefits, the more they will use it and enhance it with data. The company has recognized the need for customer training for services, as they are typically not as self-explanatory and intuitive as the products. Since most services are closely tied to the product, the customer's training begins with the handover of the product. In the past, the company provided a detailed catalogue with product-related introductions, which has now been extended to include services, introducing the basic functionality of the booked service features (Interview 5C). However, the respondents suggest that a detailed introduction to all service functions should take place after a certain period, once initial data becomes visible in the system. The Head of Service Products and Connectivity stated a team should *"[…] take a look at what data the machine has now recorded – for example, what cases have occurred and where the Smart Services are now intervening"* (Interview 5C). This approach has already been implemented in a few markets and is managed by the individual national companies. A dedicated team has been established in these markets to focus specifically on this issue. Additionally, the company is exploring other options and plans to introduce digital, bookable training sessions via a platform. On this platform, customers will be able to book various training sessions, either free of charge or for a fee, watch videos, or view tutorials:

We have certainly already considered the topic of training, ensuring that customers have the option to book relevant courses – such as driver training – or access various tutorials. At the same time, decisions need to be made about which videos or tutorials should be

offered for free, and which have become valuable enough to warrant a fee for full access. (Interview 4C)

Life Cycle Management

Unlike a product, a service presents both various advantages and potential threats throughout its life cycle. The evaluation of the interviews identified three main points that must be considered in this context. First, one advantage of service is the update capability in terms of bug fixing, adding new features, or general further development. Second, services can be charged individually and be recurring. And third and as a threat, services are highly dependent on the hardware and its support by other suppliers. To address the first, the company had to implement the possibility of updating their services. This was not possible right from the start of the first services since the data traffic was only one-way from the machine/customer to the focal server. But now, with the new communication module, the company will be able to *"[…] make online software updates or even activate functions on the machine in the future over the air after they have been paid for by credit card"* as the Head of Information Service Sales explained (Interview 2C). However, this requires ongoing resources for the case company and the consideration of operating costs along the entire life cycle of a product. In contrast to products, services can be charged during the life cycle. Therefore, the company introduced an online store and a license model, which enables the customer to book and cancel the services individually:

The online shop is available. We have the customer portal […]. Various shops are also integrated underneath it. It must be noted that the shop for ET topics – and indeed the

essential portal for rental machines – performs significantly better than the one for licenses. (Interview 5C)

A precondition is the registration of the customer in the customer portal for the management of the payment model and change to a direct sales model. Finally, the life cycle management also includes the technical assurance of the service during the entire runtime. The Head of Information Service Sales stated that they have machines on the market that are up to 40 years old and *[…] in this respect, we are already looking at 20–30 years in the area of software, which must be updateable for 20–30 years, and, theoretically, also be able to send the data. Of course, we have challenges, which is why we also have the new communication module where we can access the machines in order to make software updates much faster, contrary to the machine release cycles* (Interview 2C). The company had to evaluate options and took measures to keeping the services running on the hardware side. The concept includes an exchange of the communication modules in the affected markets (Interview 1C).

Customer Support

The company's core values not only reflect its innovative strength, but also its efforts to support its customers as partners. This especially includes customer support, which is mainly applied after the sale and is particularly relevant for services. As the company has an indirect sales approach the salesperson on site is mostly the first point of contact and has a direct contact with the development department:

The development department], along with the field service team, also serves in part as an extension of the workshop and as an information source. This creates a very positive and cooperative relationship, and in critical situations, a developer will accompany a field service representative directly to support the dealer. (Interview 3C)

However, the official support levels are still the classic levels as established for the product business; that is to say separated into first level (service partners on site), second level (national companies or importer) and third level in-house in the development department) (Interview 1C). The difference from product support is that the challenge for first and second support was training the employees in these two levels and establishing an efficient interface with the parent company to share issues. Therefore, the company developed a *[…] service-online system, which is in principle SAP-based and every dealer in the world, no matter where he* [sic] *is located, whether in deepest Africa or in Asia or wherever, can now communicate with us via this system. That means, if he has problems/issues, it all goes one-to-one into this system* (Interview 3C).

This also improves the product availability and reduces downtimes due to fast and efficient problem solving. With the combination of products and telematic services, the company is also able to remotely check the functionality of the products. Therefore, another tool was developed for the dealers to enable them to perform a pre-audit. With this dashboard, various other things such as due dates of services can also be viewed in order to be able to serve the customer optimally at all times. With the investment in the dealer, the company is pursuing various other objectives besides fast customer support. A key element among these is the direct communication channel back to development,

allowing for direct feedback on product and service quality and the rapid elimination of errors. However, the systems that have been introduced are of no use if the employees are not trained accordingly. For this reason, the company had to extensively revise the existing “Training Academy” to cover the entire content of the services.

6.2.4 Ecosystem Management

The ecosystem of the agricultural case company changes with the introduction of the telematic-based services. Based on the ecosystem layers introduced in Figure 9 the three layers of core business, extended enterprise, and business ecosystem are influenced by the servitization.

Core Business

The interviews revealed changes in the core business and adaptations in the internal supplier as well as the core resources’ products-services. As the company has established an IT competence center, the new subsidiary develops and delivers hardware and software for services formulated in the central company. This includes sensors for the physical machines, telecommunication modules, and other relevant enabling technologies as well as the already mentioned data server for the services whose data are also supplied to the central company, e.g. for product improvement. It should be emphasized that everything that the company has established in the IT systems for data transmission, server, data-processing or dashboards *“[…] is also 100% its own work and self-provided”,* as the Head of Information Service Sales explained (Interview 2C). This means, the networking between the subsidiaries in a supplier and user construct is extremely high but requires few interfaces beyond the company boundaries. The second outstanding challenge for the

company was the difference between the development cycles of products and services. The interviewees reported from a five- to ten-year development cycle in contrast to from few months to a few years. Special attention was paid to the data gateway (platform which exchanges data between different systems) and was a key influence factor in the development. With a proper design of the gateway the company realized *"[...] that a service is completed in half a year that would otherwise have taken us three years"* (Interview 1C) and equalizes the two development cycles, since some parts of the services do not have to be ready until later in the product development process.

Extended Enterprise

The interviews revealed that changes in the elements of competitor physical products, co-creators, and connectivity providers are affected. The first mentioned element refers to the integration of physical products in the company's own software, so that the customer can take advantage of a transparency of the whole fleet across different providers. However, the retrofit solution of the company for their competitors' products does not allow the same in-depth data insight as with its own products. Nevertheless, the customer can add the competitors' machines to the fleet management services to access basic data provided at the ISOBUS interface (*"In agriculture, there is a unique aspect: the so-called ISO Bus Standard. This means that certain information, such as fuel consumption, is available in a more or less standardized format and can therefore be further processed accordingly"*, Interview 1C). Services usually require horizontal cooperation, which means they cooperate on one level, but continue to compete on another (coopetition). This is also true for the case study company and is allocated here in the element of co-creators. As already mentioned, the company has entered a partnership with a direct competitor to

establish a standard for data exchange. Furthermore, an interviewee mentioned the relevance of accessory equipment behind the tractor. Hence, the customer benefits from the services of both manufacturers offered by the company. But the manufacturer of the accessory equipment also benefits from the case company and the connected products, as *"[…] the plough, for example, now receives the latest information and software updates via our communication module; i.e. we have such a host scenario"* (Interview 2C). These opportunities also entail dangers as the case is highly dependent on the co-creation of another player. Finally, the connectivity provider as a new key stakeholder is emerging in this layer and forms the interface to a completely new ecosystem of the telecommunication provider. Without the technology of the mobile network, the case study company would not be able to connect the machines remotely and offer different services created from different data sources. The telecommunication provider as a key partner in this service context is a new *"[…] partner with whom we have essentially set this up. They now also supply our EU-27+ a bit more by default"* (Interview 5C).

Business Ecosystem

The outermost layer is the business ecosystem and includes indirect stakeholders. In terms of authorities from the new telecommunication ecosystem, the agricultural company relies on the partnering mobile network provider. The Head of Service Products and Connectivity explained that the new partner is responsible for all concerns including legal topics or providing the relevant infrastructure with regard to data transfer in the target markets in a kind of full service (*"Any additional topics [legal topics] or issues that arise afterward are essentially managed by [the partner] itself"*, Interview 5C).

6.2.5 Legal Management

With the introduction of the data-driven services, the company also had to deal with new legal issues envisaged by the regulatory authorities in data processing. The machines are equipped with SIM cards to send or receive data and are switched on regardless of whether the customer has booked a service based on it or not. In terms of data protection, the company has established a two-step concept, the first stage of which is the anonymous transmission of data and in this case the customer cannot prevent it. The second stage is a much more extensive data collection process that also includes personal data, such as location or name. In this case the customer has to accept and sign a release agreement:

And then there are various levels at which the customer must provide consent. Specifically, the first level is that the machine always transmits data, but in an anonymized form – so the customer cannot object. However, if the data is transmitted with names and possibly even location information, the customer must give their consent. (Interview 4C)

The reason for the two-stage concept is that the case study company has the internal value proposition, which they want to legally maintain without customer consent. Here, only the general information about the customer was necessary because the device sends anonymized data in any case. With the second stage, the company enables the services for the customer and processes their personal information, for which the customer must give his or her consent (*"The customer has sensitive data that must be protected, and nothing can be done with it without their explicit consent"*, Interview 6C). In order to always be aware of the latest developments in legal data protection topics, the company has introduced a staff position that deals exclusively with these matters and advises the

departments. At the next level, a legal in-house department for the EU-27 countries has also been created, which deals in detail with service-related issues and is also linked to other external law firms. This department then also provides support in the contracting of services. However, the respective national companies will once again be tasked with examining the regional legal situation (*"What we do is try to meet the basic requirements for data protection for the EU 28, and then we approach the respective national subsidiaries during the rollout to verify compliance with local legal protection standards"*, Interview 5C). With reference to the General Data Protection Regulation introduced in 2018, the Digitalization and Processes Manager emphasizes that the monitoring of and legal compliance with the issues are of paramount importance. Changes in legislation can have a major impact on the service business model. For example, the introduction of the General Data Protection Regulation (GDPR) has not jeopardized the service model but has entailed significant adjustments in processes and resources to comply with the requirements of the law (*"There will eventually be significant process adjustments due to data protection reasons. This will prove extremely challenging, and I can certainly imagine that it will be somewhat limiting because of GDPR"*, Interview 6C).

6.2.6 The Evolutionary Process of Servitization

The agricultural case made an early start with digital services and was the first company in the industry with connected machines. Nevertheless, the interviewees reveal an evolutionary process from the first introduction of data-based services till the latest stage at the end of the interview program. Just like the two previous case studies, the four phases

of (I) technological enablement, (II) monetization and strategy alignment, (III) service growth, and (IV) platform strategy are clearly visible.

Phase 1: Technological Enablement

The technological enablement phase and introduction of the data-driven services was purely triggered by an internal value proposition from the development department to learn more about their machines:

[…] grounded in technology and after-sales. […] this technology was initially used to monitor machines in the field that were difficult to access or required significant manpower. A typical example is one of our pre-series machines operating in Russia. Essentially, the goal was to ensure a certain level of transparency regarding the machine's performance, and telemetry proved to be the simplest solution. This approach eventually evolved into a customer product. (Interview 1C)

This starting point provided the company with the possibility to establish the relevant infrastructure without the pressure of a customer-ready product. This had a particular effect on the non-essential customer and legal management dimension at this point and, rather, the company could focus on the cultural and organizational as well as the ecosystem dimensions. The intrinsically motivated employees who developed the service could carefully prepare the benefit of the services through the company's internal experimentation phase and initiate cultural change also through the customer-focused corporate values. However, the data reveals that at this stage the organizational perspective of the dimension was not very pronounced as the service-related tasks had to

be done on top of the daily business by employees in the product business without dedicated resources. As the first services already relied on the telecommunication technology, the company had to deal with the new ecosystem at an early stage. At this time the machines were equipped with pluggable SIM cards and managed by a new partner who was responsible for the data management. So, from the ecosystem management dimension in particular, the SIM card and data processing were of relevance, especially for the core business, in enabling the machines to send data and to extend the enterprise with the new partnership of a player in the telecommunication ecosystem.

In this phase the few intrinsically motivated employees should be emphasized as they managed most of the relevant tasks in the two mentioned dimensions, in addition to their actual work in the development department of the product segment. Furthermore, it seems that these employees also had the skills to overcome cultural barriers with appropriate arguments for servitization and to pave the way for further services that enabled the company to move on to the next evolutionary monetization and strategy alignment phase.

Phase 2: Monetization and Strategy Alignment

The technological enablement phase with its focus on internally used services has given the company the advantage of being able to identify the new opportunities without customer pressure, but on the other hand it has not generated any profit as a result. However, this enabled the company to enter the next evolutionary phase and introduce services to their customers based on the extensively tested technology in the previous phase. As the case company was first on the market, the contextual forces were located mostly internally but were also driven by the claims of the authorities to provide its customers with solutions that

complied with the cross-border guidelines. In this evolutionary phase, all dimensions are affected first and foremost by the customer management dimension as services are now sold to the customer. First approaches in the salesperson training were introduced to distribute services on the market as well as dealer training to be able to offer support to customers. In addition, IT systems were required to make services usable in a customer-friendly way. This went along with organizational changes, and it began the spin-off of all development-specific activities into the subsidiary. The corporate culture was supported by a still restrained services strategy in this phase, but which nevertheless included its service departments as own resources and thereby continued to promote the cultural change. The not fully developed service strategy was, according to an interviewee, due to the fact, that the company was led by a management board in which everyone could vote equally on decisions (*"[…] we used to only have a management board, where all members were essentially equal, and one person served as the spokesperson for the management"*, Interview 6C). Activities from a legal perspective became relevant as customer services now required confirmation from the customer in the form of an additional contract.

Phase 3: Service Growth Phase

In the service growth phase, servitization picked up speed primarily due to the external force of market demands. At the same time, the company management changed, and a new CEO had now taken over the management of the company, pursuing a proactive approach to services. With this force and management change, the company took a major evolutionary step. Due to the new CEO, the interviewees reported an intensification of servitization. The Digitalization and Processes Manager reported that *"[…] the CEO considers all these service and digitalization topics to be very important and central.*

That's why this is definitely a focus here" (Interview 6C). The top-down commitment had a mature impact on the cultural change; this was also due to the fact that various areas of the company had received a call to intensify their work in the direction of services. As an example, the sales department was encouraged to increase sales of services (Interview 5C). Likewise, the ecosystem, or more precisely the extended enterprise layer was affected in this phase. As stated in the section before, the case entered a coopetition with a direct competitor to define standards in the data exchange. This phase was characterized by a clear management thrust towards services within the company and cooperation with competitors in the immediate environment. The services strategy initiated in the previous phase was also intensified and new specialist areas for services were introduced – for example, the last interviewee in the interview program whose task was to manage the central connect platform, consolidate all applications and use these to create a portfolio that is suitable for customers. Beside the organizational, cultural, and ecosystem changes, the legal dimension also became more and more present in this phase. As the service portfolio grew and services became increasingly complex and were processed through various data sources, the company had to pass and safeguard legal requirements with regard to data protection and data security. The legal requirements and changes in this dimension also had a direct impact on the customer management dimension as, for example, the company had to design IT systems in such a way that the customer has transparency about his or her data usage (*"The customer has sensitive data that must be safeguarded […] and it is essential that the customer enjoys optimal transparency"*, Interview 6C).

The summary of this phase highlights a strong service orientation, with services as an integral part of the overall corporate strategy. The decision to pursue an intensive service strategy led to significant changes across all innovation dimensions. As the company's services no longer merely provide the customer with superficial information but also intervene in their processes and directly contribute to value creation, the role of services has become increasingly central. The renewed commitment of top management during this phase has further driven the company towards a service-oriented approach. Moreover, the close collaboration and intensive service strategy laid the foundation for the subsequent platform strategy phase.

Phase 4: Platform Strategy

The company emerged from the previous phase with a clear service strategy as well as its own resources for services and a profound IT infrastructure towards. Furthermore, the agricultural case has begun in the previous to enter into cooperation unprecedented in this industry to define data standards with the goal of enabling data exchange between different manufacturers and their products and services (Farm&Food, 2019). This standard is the basic prerequisite for a cross-company platform and has already been started by the company in this phase. The farm management services, which were enabled by an acquisition of a software company many years ago in the second phase, and introduced several years ago, were extended and linked to this in order to offer the customer an in-depth and more comprehensive value proposition. According to the Head of Service Products and Connectivity, other companies were also given the opportunity to network here and participate in the platform.

6.2.7 Conclusion of the Agricultural Case

The agricultural case began its digitalization journey a long time ago. The introduction of data-based services, which are considered in this study, started at the turn of the millennium. However, the analysis revealed that despite the early adoption of digital services, they only gained significant momentum starting from the third phase onwards. This was due to the cautious attitude of the management board which did not allow them to extend their lead any further. It was only when a new CEO, with a focus on services, took over at the helm of the company that the organization gained momentum and entered collaborations that now have the potential to set industry standards.

To reach this stage of evolutionary development, numerous changes were necessary in all four innovation dimensions. Triggered by intrinsically motivated employees who wanted to monitor and learn more about the company's own machines, the services were then further developed for the customer in the second phase. As of then, profound changes in the customer management dimension (e.g. IT systems, dashboards) were required but success was still muted because of the lack of a top-down commitment, which also inhibited cultural penetration in the direction of services. In addition, the indirect sales approach shows that additional efforts in communication and training are necessary to build up the service culture for national companies and dealers.

CHAPTER 7: RESULTS FROM THE CASE STUDIES

The contribution of the thesis is developed from interviews of three innovative case companies in the B2B industries, which belong to global leading actors in the industries. Similarly to biological ecosystems and their components, the companies and their branched corporate structure with many partners also strive for a delicate balance (Moore, 1993) across internal and external processes and elements to sustainably deliver the intended value for their customers. Although the overarching goal of the companies involved in the research project is to create paid B2B services based on the data collected from their machines and other sources (e.g. ERP data), the path to the current service portfolio and company structure was not straightforward, with different approaches clearly evident in each case study. Specifically, the service innovation trajectory of each company is characterized by internal and external forces (competition, legal regulations, company strategy, capability of the employees, …), but importantly, from the structure of the original company and its legacy physical-based business also emerges (e.g. direct vs indirect sales channel, dependencies of the company within the group, …) thereby suggesting a variant of path dependency (Vergne and Durand, 2011) or lock-in. Consequently, it is not surprising that each company had and still must follow its own idiosyncratic restructuring process of innovation and arrangement of the business model elements in an activity system for the intended overall tailored customer value proposition of products and services. As unique and different as the companies are, there are many similarities.

In this section, the results of the case studies are summarized and provide insight into outstanding similarities and differences. It follows the structure of the detailed analysis sections of the case studies and summarizes the cases based on drivers (context), characteristics (content) and service development (process), a structure used in both strategy research (Pettigrew, 1988; Whipp et al.,1989; Pye and Pettigrew, 2005) and in research that examines the development of servitization (Bigdeli et al., 2017). As the servitization of cases is a process that takes place over a longer period of time, the context and process element of the CCP framework is divided into four phases. These phases were derived from the data collected and reflect the development process and the respective forces in each phase. A tabular comparison of the three companies based on the phases and the four innovation dimensions can be found in Appendix F.

7.1 Contextual Drivers of Servitization

It is notable that the *"context of change deals with the circumstances of change […]"* (Baines et al., 2020, p. 3) so that external and internal forces must be adequately taken into account when examining business model changes (Armenakis and Bedeian, 1999). The comparison between the cases illustrates the different contextual forces of the servitization journey and at the same time makes it clear how much the internal and external forces differ in the individual organizations. Based on the data, these forces can be divided into four phases, which represent the different development stages of the innovation process and have already been used in the previous chapters to present the findings in a structured way. Forces in the first phase stand for internal and external circumstances that are relevant for the introduction of technological infrastructure and ensure entry into the monetization and strategy alignment phase in the next step. The

service growth phase summarizes the forces that are relevant for large-scale development with an extensive organizational restructuring of companies due to the strengthening of the service offer on the market. Finally, in the latest evolutionary phase the forces lead into a transformation into a platform provider connecting the focal firm, customers, competitors, and other stakeholders. The context comparison is also used by Baines et al. (2020), who show how a different service impetus of each company led to the same aspiration of being a platform provider many years after the introduction of a data-based service.

Phase 1: Technological Enablement

In each of the case study organizations the initial idea of a service trajectory was already born many years ago during the rise of the Internet era (the turn of the millennium). That said, the first impetus differs slightly from case to case with respect to ideas concerning the value proposition and the actual starting point within the company. While the key force for the construction machinery case was an indirect customer value proposition and focused on an effective maintenance support (hybrid context), the conveyor case and also the supporting case already had a clear customer focus in directly supporting customers (external context). The agricultural case intended to primarily learn more about its machines (internal context), which in turn would support the customer with improved products in the next development cycle. So, the first phase represents the start of the servitization and the development of the technological infrastructure to create first services for external or internal customers.

The cases reveal that the use of common technology to generate data on physical products can still result in fundamentally different value propositions and business streams, including improving physical products as in Case C, improving rudimentary maintenance in Case B, or directly supporting the customer with a data-based service in Case C. During this phase, however, the services were developed on a decentralized basis in all cases, with no evidence of a centralized overall service strategy as only individual needs and internal or external contextual drivers should be satisfied. This was also evident in an interview with the Head of Service Products & Connectivity of Case C, who stated, *"[...] over these past two years, we have certainly seen the first attempt at a digital strategy here at [the company]"*, while the introduction of the first services dates back more than a decade (Interview 5C). Likewise, it is also illustrated by the example of the conveyor case and its digital service of proving the maintenance of physical products to the authorities. The official proof was only necessary in one country at that time and inspired the service development and concept by the local entity of the conveyor case. This ad hoc development of services can also be observed in the other companies, and the contextual forces have driven internal technological development.

Regardless of the intention of the value proposition i.e. whether it was an internal or external job-to-be-done for all the case study companies, it was a pioneering step using new technology to enable the digitalization and collection of data. At this time, none of the companies had a service concept or service strategy and the gathered data allow the conclusion that there was no positive business case for the first services and the companies simply identified the job-to-be-done. In this early phase, the characteristics of the context dimension were not shaped by external constraints such as competition but

were solely focused on local external and internal value – for example, local authority requirements in the conveyor case as an external context factor for their customers. The technological enablement phase was certainly characterized by the decentralized and project-based development of the services. This could be seen as an inspiration for the initial path of services, but it later led to complexity and challenges when it came to developing a concrete service strategy and a portfolio of services that required a consistent corporate image to be presented to the customer.

Phase 2: Monetization and Strategy Alignment

The monetization and strategy alignment phase summarizes the contextual forces of a clear customer demand as an external context factor, and the development of an initial service offering in the data context. All case companies recognized the value of the data generated and started to further equip the machines with sensors to gather data for internal and external use. For example, the Head of Product Management of the construction machinery case highlighted the strong company values underpinning these decisions:

[…] [the company] never abandons its customers, that means also when the machine is sold customers can always ask … and will be supported. We have installed more than 15 years ago GSM (Global System for Mobile Communications) modules in our machines and have offered, respectively, tele service or remote service for free. (Interview 1L)

As an additional external contextual factor, competitors began introducing similar services, while customers increasingly recognized the benefits and value of data, as well as the broader trend of digitalization across various industries (*"A lot of aspects came*

together, and eventually, [the company] observed that other industries had already begun developing in this direction, which then served as an approach to follow", Interview 1L). The interviews of all companies revealed that customer tenders require a certain degree of services, otherwise the companies would not be able to present offers to their customers. In this stage, a strong customer pull has evolved for the cases and was also identified by Baines et al. (2020). The drivers converge across the cases, and they were forced to offer data value propositions based on their machines in order to sell them, due to the external context of competition and market demands, which was also identified in the supporting case. Additionally, the fundamental digitalization of the entire economy and mega trends were seen as factors especially for the construction machinery case and have driven the development of additional services. Main differences were still identified in the internal drivers or locations of development. The construction machinery case, with its broad product portfolio, centralized the radical services in one subsidiary and the product management, which was the nucleolus of the servitization and intrinsic motivation of the team:

The Head of Product Management initially started as a Product Manager and has been in this role for several years now. In the early years, he was a true lone fighter, actively advocating for resources, explaining why they were needed, and promoting the importance of his work. (Interview 2L)

The product management department is ideally suited for these radical innovation activities, as it is close to the customer (sales) and has interfaces with the development department to align customer needs with technical possibilities. By contrast, the impetus

for service development and leadership within the other case study companies was still in the development departments from which the service innovations originated. Depending on the corporate structure and regional or country-specific decentralized development departments, service innovation was also scattered, and each regional department developed its own services. This is particularly highlighted in Case B, where different countries had their own development teams that independently created services tailored to their specific markets. As a consequence, especially in the conveyor case, there was no common and centralized development, which in turn resulted in poor single services with no standardized platforms or single access to the data, interfaces, and front ends.

In summary, the data shows that once the technological foundation for data-driven services is in place, the services are being rolled out without an overall company-wide strategy. This might be due to tentative development and possibility of profit generation, which do not yet justify any major internal company investments. This is also shown by the statements of the interviewees in all case studies, namely that the development in this phase was predominantly driven by intrinsically motivated employees. The customer pull also spurs development, as a clear customer need and value proposition is visible to these motivated employees.

Phase 3: Service Growth

The third phase that emerges from the data is a phase driven by forces that lead to the growth of services. Across all cases, basic services generated from machine data have become established and more than a decade of experiences of this technology has been

gained. Every machine the companies have sold so far is equipped with sensors and the SIM technology to gather and send data from the machines to the OEM or directly to the customer. All companies were facing the ongoing digitalization not only in their B2B market but also in other markets, and their customers were used to being informed digitally in many areas of interest, which was also revealed in the analysis of the supporting case (e.g. online banking, smart home), and also to navigating in digital areas. Case A, in particular, was using insights from other markets to improve the services in terms of user experience and intelligent data processing with multiple sources of data. But also, the other companies highlight the influence and technical process of other industries which inspire their services. For instance, Apple seems to serve as a model for ease of use. In this phase monetization becomes obvious as the service divisions have taken a significant share of resources within the companies and have a greater influence in each of the cases. Services were now specifically used to generate monthly or yearly revenue shares based on subscriptions, which not only cover the internal costs but also help to survive bad times in physical product sales. As the Head of Product Management of the construction machinery case detailed:

It allows us to offset peaks in economically difficult times because we have ongoing revenue through licensing revenue, through usage revenue, because we are broadly positioned, which is not directly affected by the economy like direct equipment sales. And that, of course, also makes us more resilient. (Interview 1L)

Phase 4: Platform Strategy

The final phase represents an evolutionary stage in which all companies pursue the platform model strategy. Building on the previous phases and the continuous alignment with contextual situations, companies expand their interfaces beyond their own boundaries. They aim to establish – or at least participate in – platforms that offer not only their own products and services but also sales offerings from other stakeholders to enhance the customer experience. A platform means a unique selling point for the company and a greater lock-in effect for the existing and new customer groups. Preconditions are common data and interface standards, which were a stumbling block for all main cases and the industries. Therefore, the companies strive to achieve a standard for a win-win situation through cooperation (coopetition) with competitors. Another precondition is cultural maturity, as the industries are still old-fashioned and product-focused. Although they have started to cooperate and open the company boundaries, they are only at the beginning of the platform strategy phase –for example, the agricultural company has entered into a cooperation with a competitor (Farm&Food, 2019). As these collaborations were made by two of the largest companies in the market, it could encourage other providers to join as well. A similar situation was evident in the construction machinery case, which proactively approached competitors, but regretted that only a few competitors in the market are opening in this direction (*"Our path is moving exactly in this direction – integrating competitors and not seeing them as enemies or obstacles but rather collaborating with them"*, Interview 12L). This shows that only a few companies have undergone the necessary cultural change and are prepared to follow the example of other industries that are already in the middle of this phase or have already gone through it.

7.2 The Content of Change Across the Case Studies

The characteristics of a business model relate primarily to the "what" question and define how the individual elements of the business model are designed and interlinked within the business model construct. This alignment is the challenge of a successful business model (Johnson, 2010) in an activity system (Zott and Amit, 2010) focusing on the reinforcement or substitution of activities (Porter and Siggelkow, 2008) or consistency[3] (Zott and Amit, 2013). According to the research of these authors, elements or activities in a business model need to be both established and carefully integrated into the broader business model, linking them with other elements to successfully deliver the value proposition and secure a competitive advantage (Porter and Siggelkow, 2008), whereas *"[…] inadequate alignment of elements inhibits service innovation"* (Kindström and Kowalkowksi, 2014, p. 106). The coding of the data from all main cases resulted in a clear and meaningful breakdown into the four aggregated key dimensions already presented in the case study sections above and which are also applied in this section. Each key dimension affects different business model elements. It became evident that across all cases almost the same elements of the business model are affected and can be allocated to the four key dimensions. Significant differences arise from each company's origin and initial situation (e.g., direct vs. indirect customer approach, dealer network) as well as its structure (e.g., group affiliation vs. autonomy), since different starting conditions necessitate different adaptations.

[3] Zott and Amit (2013) summarize the consistency of the business model's activity system with a focus on internal consistency, consistency with other business models, and consistency with other elements.

Comparison Based on the Four Innovation Dimensions

The case study companies are focused on both value streams, i.e. both the physical and the value contribution resulting from the data-driven business model, having started to develop and integrate these service-related activities at around the same time. Given the different initial structure, the data shows that the business model elements involved in the innovation process are similar. The elements in the key dimensions were not developed or adapter at once right in the introduction phase of the first data-based service. In fact, the elements are highly dependent on the context and process and needs to be considered as a reaction for example of the overall servitization strategy at first, and then on the interplay between the elements. For example, the data for the servitization strategy shows that direct customer contact across all channels (elements) for services (e.g. offering software services as a strategic orientation) requires a direct customer approach (element) and also entails service license management (another element). However, evolutionary considerations are set aside for now and will be addressed in the next section, which focuses on the process description of the CCP framework.

7.2.1 Results of the Organizational and Cultural Management Dimension

Based on the case analyses and coding, it was clear that organizational and cultural management has a great significance across all cases. Organization and culture directly influence each other as the companies try to partially separate and organize the much more agile services from the legacy product business, which also requires a different company culture. The cases reveal that acceptance of services, brand, leadership, and corporate values can have an impact on the service business model just like the organizational change in terms of division and shared/own resources (see Figure 13). The

involved elements of this dimension and experiences from the cases are summarized in Table 7.

The identified organizational change and its separation of service divisions within the companies is in line with other researchers (Christensen and Raynor, 2003), whereas the specific responsibilities assumed by the division vary slightly from case to case. The conveyor company is part of a holding company and has set up a cross-brand innovation center to develop new ideas and exploit synergies with the help of the other brands in the holding company. The construction machinery case also belongs to a holding company but has taken the development role within the group and uses the synergies predominantly for the equipment of the company's machines (e.g. sensor development in the holding) and hence, the ability to understand in detail every part of their physical products, which in turn results in improved data quality for the services. The agricultural case is an independent company but also follows the approach of spinning off business units. The spin-off is an independent electronic hardware and software company acquired and

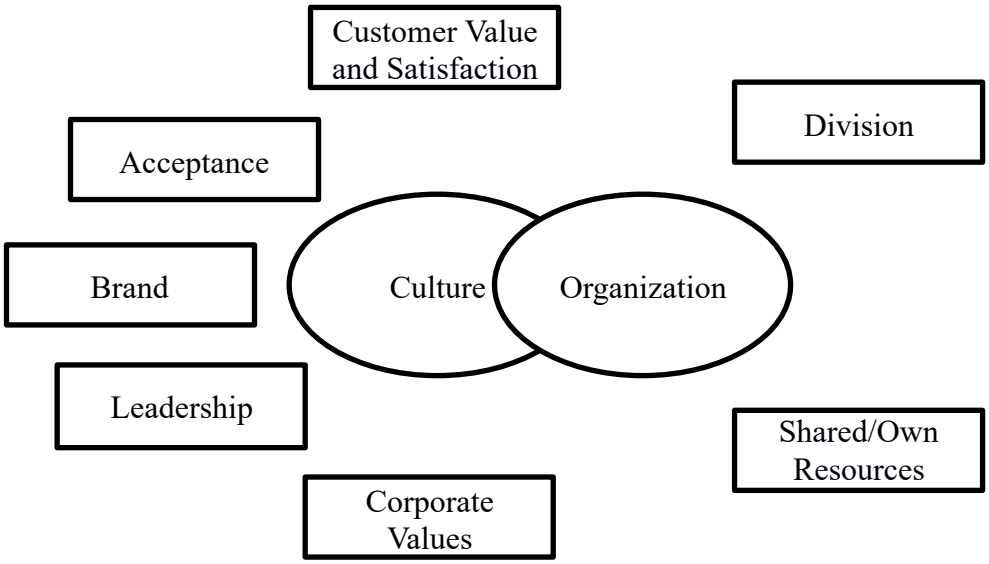

Figure 13: Summary of Culture and Organization

restructured several years ago (*"[…] three years ago, it was rebranded […] to further expand and strengthen its focus – not only on agricultural software systems but also on consolidating electronic development even more"*, Interview 2C). All electronic hardware and software development activities were then outsourced to this subsidiary in order to bundle the company-wide expertise in this area. In this case, the culture and awareness of services are largely decoupled from the legacy company and follow their own processes, leaving only necessary interfaces between product- and software-based business. This approach is also supported by the supporting case, which separates certain areas from product-based business (e.g. R&D of services). However, the organizational separation of services from the product-based core business is not completely possible due to the inherent nature of the services and the dependence on the machines, which results in the shared use of resources in all cases. Although service divisions were outsourced and largely decoupled from the product business, shared resources build up the interface between service and product business. From the interview regarding share resources, it was clear that all cases decided to rely on their existing product-oriented sales staff for services as well, in order to leverage the relationships built up over many years between salesperson and customer. But the construction machinery case, in particular, decided to establish an additional team as their own services-focused resources, among others, to support the traditional sales team. All cases exhibited a common strategic thrust in building their own service (product) management departments, which orchestrate most of the activities based on the strategic direction. In summary, servitization in the case study companies means organizational change and the challenge of building new departments and carefully managing owned and shared resources to support the development of the fundamentally different culture between products and services.

"Servitization is an enormous cultural change for manufacturing firms […]" (Kapoor et al., 2021, p. 9) and is identified as one of the key barriers in business model innovation (Friedrich von den Eichen et al., 2015). Cultural change goes hand in hand with organizational change and is highlighted as a challenge in all cases. The Chief Technology Director of the construction machinery case questioned in an interview how to make their existing employees proud of the offered services and *"[…] have the same pride in our services as we used to have in our excavators"* (Interview 2L). Similar sentiments came to light in the other cases. For example, the Head of Service Eastern German States of the conveyor case stated that *"[…] the technicians and also the service managers of the local units were skeptical"* (Interview 2S) when the first services were introduced. The companies were facing similar difficulties in the cultural and organizational change, and this shift and challenge is still ongoing, even though services were introduced more than two decades ago. This reflects the tremendous difficulty of shifting mindset and the substantial reach of such change across the entire organization. As the Head of Product Management in the construction machinery case points out, *"[…] there is no department in the company, which is not involved, that it does not concern […]"* (Interview 1L). Interestingly, the case study companies took a broadly similar approach to addressing the uptake of services within the company but differed slightly in terms of marketing them internally. Whereas the construction machinery case focuses on the whole focal company via offering trainings, publishing success stories, or inviting external presenters to drive the conviction through outsiders – the agricultural case, for instance, had a clear focus on customer-oriented functions like salespersons, as the Head of Services argues: *"We have included training for sales and technical personnel, i.e. those who sell the machine, maintain it, repair it, […] we have included basic scopes in*

the training courses" (Interview 3L). The conveyor company tried to increase internal acceptance by having employees work with the software and services (*"I started distributing it quite generously internally to create acceptance within the company. When people use it themselves, they realize what it can do, the benefits it brings, and why it is important"*, Interview 3S). It became clear that the company's values apply equally to all employees, regardless of whether they are dealing with services or products. The construction machinery case particularly stands out with multiple respondents highlighting values like customer centricity (also highlighted in the literature e.g. Schneckenberg et al., 2016) or delivering a high-quality value proposition rather than being the first on the market. This focus on customer benefits and satisfaction also became clear in the interviews with the other companies. Although the conveyor and agricultural cases do not relate to their corporate values and are therefore not lived to the same extent as in the construction machinery case, they also focus on the value for the customer, although the pure customer perspective only emerged later in the evolutionary process (e.g. scattered services landscape and no common look and feel or login).

The above-mentioned orientation toward customer value and satisfaction is mostly supported and driven by a clear leadership and highlighted by all cases and shows how top-down commitment of the service orientation can hinder or promote the cultural change towards a service company. The agricultural case has shown that the former leadership did not initially endorse services as a crucial part of the company's overall success, which led to a delay in the innovation process due to a reluctant opinion of the leadership with regard to services. The construction machinery case, which stands in direct contrast to this, underlines the strong commitment of the leadership and use of top-

down communication to promote service acceptance. Surprisingly, this has gone so far that the company management has announced a strategic change from product provider to solution provider. This was also identified in the supporting case, whose vision and mission were adapted, thus emphasizing the top-down commitment. The commitment of the management level also has a direct impact on the resources provided for servitization. The conveyor company is also firmly anchoring the strategy in its corporate objectives as a top-down commitment (*"We are currently in the process of establishing the fundamental digitalization strategy […]"*, Interview 9S). This is also reflected by the literature and is seen as a decisive factor in new business models along with the responsibility of the leadership management to create a relevant culture (e.g. Teece, 2017).

A strong brand is an enabling factor of successful platform business models (Kohtamäki et al., 2019). Unsurprisingly, this is also true in all other cases, as they all enter into partnerships with other global, world-renowned brands. The brand of each company has evolved over many years due to the excellent quality of the physical products. Companies are using their well-known brand to enable services while also needing to uphold high-quality standards in the business sector, as shown by the construction machinery company. The employees and, above all, the new partners must adapt the values and culture of the company in order to do justice to the brand. Services, especially when companies enter into the platform strategy phase with many partners to create an advanced customer value proposition, are often in a "one-face-to-the-customer" situation. This means customers do not necessarily perceive the delivered service as a value proposition, which is created and offered by many suppliers in parallel.

The platform provider must therefore ensure that at least its standard and service culture is adhered to throughout the entire value chain.

7.2.2 Results of the Customer Management Dimension

Customer management is the second key dimension that emerged from the data analysis. The evaluation of the interviews revealed five subject areas – "sales training", "customer training", "life cycle management", "selling services" and "customer care" – which the case study companies had to adapt for the new service business model (see Figure 14). Although the companies saw a need for action in all five areas, there are some differences in the way they approach the different areas and the extent to which they integrate the areas into the business environment. The involved elements of this dimension and experiences from the cases are summarized in Table 8.

Salesperson Training

The business-to-business sector is very much based on the relationship between the customer and the salesperson, as was highlighted several times during the interviews. For example, the Head of Product Management of the agricultural case stated that *"What we*

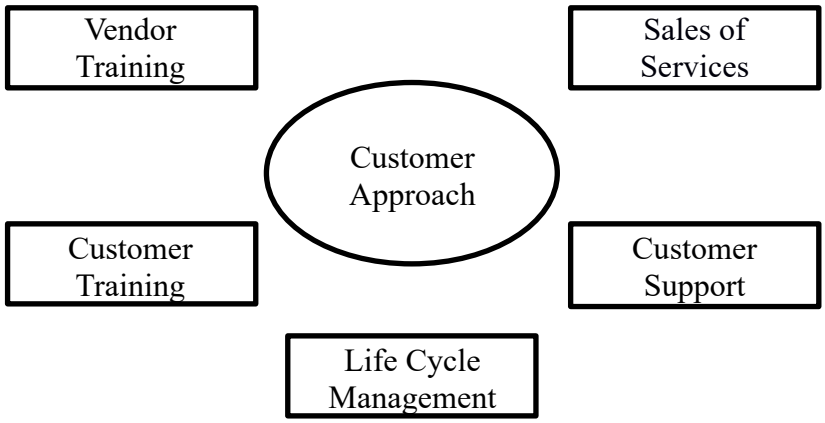

Figure 14: Comparison Customer Approach

don't want is to cut the personal relationship that has been built up over years and decades, or to take any measures to approach the customer directly and leave the traditional salesperson out of it. So, this partnership is very important to us" (Interview 1C). Intangible value propositions such as services and their benefits therefore depend primarily on the seller's argumentation and advertising. Factors that enable the sale of services are the training of the salesperson, but also the quality and reliability of the services themselves (*"[…] we are really making sure that this stuff really works and also strengthens the self-confidence of the sellers, of course, so that they also promote these products"*, Interview 12L). The other companies also emphasized the importance of their salespersons. The agricultural case follows an indirect sales approach, and the respective national companies are responsible for distribution. Nevertheless, training of the salespersons now occupies a high position in the whole process but still faces major challenges to reach every branch and salesperson in every region. In the case of the agricultural company, this challenge is addressed, for example, by the Product Managers carrying out continuous training (*"[…] partly web-based, then the application is shown several times a year and there was also on-site training. Or you go out to the regions and visit them and try to motivate them"*, Interview 7S). An excellent approach is realized by the construction machinery company in the further course of the innovation process by using its existing product-based sales staff due to their well-established relationship with the customers but going beyond just regular training of services through on-the-job training, which means that the salespeople are trained and supported in real sales conversations by a service specialist. For this reason, a dedicated department was established within the organization:

So basically, they have us as the support behind it and we also do really quick training with salespeople, screen sharing, quickly going through it; that's the benefit for the customer, that they basically have a solution really quickly, just what they need in this situation for this customer. (Interview 12L)

To summarize, in all main cases the need for training of sales staff in the service sector was seen, as also described in the literature. In the context of the transition from traditional business models, it is often the case that salespeople are not able to understand and communicate the value of the services and that there is a lack of skills on the sales side as to what the benefits of a service are (Kindström and Kowalkowski, 2009; Kindström et al., 2015; Grubic and Peppard, 2016). Basically, all cases trust in their existing salespersons, which have a long-established and trusting contact with the existing customer group. The salesperson training approach itself varies between the cases. As discussed, the construction machinery case showed a promising approach with a dedicated service expert. This approach also promotes the motivation to sell the service and also to use services as a value driver to sell machines. In contrast to this example, the conveyor and agricultural cases provide regular trainings for the salespersons on a regular basis and provide a dedicated sales team for services in parallel.

Customer Training

An often-neglected cornerstone in the service sector is customer training and the focus on the person who is to use the service and manage the huge variety of data (Kindström and Kowalkowski, 2009). The Head of Service Products and Connectivity from the agricultural case compared the use of these services with a common customer portal and

stated that *"[…] in terms of the sheer scope and functions, it will then take significantly more time to explain the operation of the core function than a briefing in the portal"* (Interview 1C). As already mentioned, services are clearly less tangible than physical products and are often customized according to customer requirements. On the one hand the service (often software tools) must be as intuitive as possible (UX/UI design) as stated by the Senior Director Digital Solutions and Support from Case B, but on the other hand, it still a certain amount of training, which often does not yet bring the full scope and value directly during the handover as data are generated during the use of, for example , physical products and are not available right from the start:

This is a major topic in UX/UI. Especially when we develop something new, we always invite our customers to be part of the process […] Across all applications, we have achieved a relatively high level of harmonization. We collaborate with a partner company for design and strive to maintain a consistent design and navigation across different applications – wherever possible. (Interview 9S)

As a result, the construction machinery company has developed new training approaches and offer eTraining for their customers, set up training centers or organize on-site training for customers who are unable to use the other approaches. This indicates the centrality of the customer to the success of the construction machinery case, as the Head of Global Customer Services explained and described:

[…] we now also have two things that we are pushing hard. One is the whole new media topic with e-learning and so on, which we are building up strongly here. In particular,

courses in the direction of short training courses, which we do much more via e-learning sessions, and on the other hand that we can better cover classroom training courses regionally, we have now started [so] that we have five training hubs in addition to the two main plants, that is just in the development phase which we are in the middle of. (Interview 3L)

The agricultural case also highlighted the need for customer training, which is currently part of the handover process of the machine (*"[...] in the handover itself of the machine, these issues were integrated [...]"*, Interview 5C). The case has implemented a tool and checks whether the customer uses the booked service and generates data:

Three weeks after the handover, we'll be back to give notice and take a look at the data. We take a look at what data the machine has now recorded, for example, what cases have occurred, where the Smart Services are now intervening, and whether we could perhaps do more for you here. (Interview 5C)

The data of all the main cases show that there is still a focus on the physical product, but the need for intensive customer training was recognized. All companies have started to introduce tools to check whether customers are using the services they have booked. Training courses have also been developed and conducted with customers. Ideally, as in the case of the construction machinery or agricultural company, the customer is approached again a few weeks after the handover, when data has already been generated, in order to train the customer in a real scenario. This is supported by new training approaches either on site or using new media approaches.

Life Cycle Management

Life cycle management represents the question of how to generate a monetary value stream. Respondents across all companies highlighted the complexity of pricing, particularly the dilemma of a one-off payment versus regular charges for each service or bundle of services. A key aspect is the license model that has been introduced for the services in all cases. This means a service can only be used when a customer buys the license for a specific service. Licenses vary in period of use (for example, the construction machinery case and conveyor case initially introduced a one-year license) or in the number of people who are allowed to use the services (e.g. the conveyor case). As the salesperson can no longer be the contact person for the flexible activation or deactivation of license-based services, other digital options had to be found. For this reason, all the main cases introduced an online store for their customers to easily book and cancel services on their own. The online store is also a tool that enables on-demand services, which is particularly important for seasonal industries such as agriculture. However, life cycle management in services does not only focus on the initial sale of services and the physical products, but also on the second-hand market or the corresponding leasing business of organizations. In both cases, the companies do not know the customers' customer, and required contracts (including data protection law etc.) are only concluded with first-time customers. Licenses help to manage and sustain the service business, highlighted especially by both the construction machinery and the conveyor case, whereas the agricultural case is only aware of the need but had not yet made any efforts in this respect at the time of the interviews.

In sum, the introduction of the online store and license-based selling is key for the companies to successfully manage the service life cycle and to meet relevant regulations of, for example, data protection. License models are also mentioned by Gebauer (2020) as a relevant part of a service profit equation and, in combination with an online store, are another distribution channel (Hacklin et al., 2018).

Customer Support

The fourth area in the dimension of customer management is the support of the customer itself when it comes to any malfunctions of the service or to any questions a customer may have. An effective support available at all times is a relevant provision in service-based business models (Visnjic et al., 2016; Forkmann et al., 2017; Hasselblatt et al., 2018; Raja et al., 2018) and is also seen by the case study companies. For this reason, the companies have taken various steps in the innovation process to develop a suitable customer support infrastructure. Different support levels – from basic customer questions as the first, more complex issues as the second, and complex support as the third level – help to manage the number of requests and relieve the developers who are only consulted when serious problems arise as a third-level support. Each of the case study companies manage the support differently. The construction machinery case, for instance, summarizes all service-relevant topics in the already mentioned established department (see salesperson training in this section), with experts also responsible for solving severe problems, as the Service Engineering Manager explained, and which was restructured as part of the innovation process. In the past, the customer support was simply dealt with by the technicians who actually look after the equipment (*"Now we have split this up so that we do it as a separate team, because we are much more involved with this topic, as a*

relief for the sales staff, for the technicians and in order to give the customer support more quickly and also the sales staff", Interview 12L). When it comes to a decentralized sales approach as implemented by the agricultural case, the first level is the *"[…] sales partner or our dealer, i.e. the retail level. The second level is basically either the national company or an importer […]. And then the third level is the organization […], which has the relevant experts to further develop the people experts to support the people even further"* (Interview 3C). The conveyor case, in contrast, has a *"[…] first and second level. First level is always the direct support branch for the customer"* (Interview 9S). In sum, the construction machinery case has a separate department and team established, whereas the other companies use their existing support structures and only resort to experts in the last instance (3rd level).

Sales of Services

Finally, the sales of services differ fundamentally to legacy sales, as already indicated in the salesperson training. All the case study companies see the need from the customer perspective and the opportunity to develop customized services based on the actual needs of their customers. There is hardly any difference between the case study companies However, the construction machinery company illustrates the complexity of identifying the right contact person for the customer who actually uses the service in everyday life (*"So, with these products, of course, it's very very important to reach the users. So, the buyer himself is probably […] the wrong person. Because he buys, he only sees the price, but he doesn't see the benefit, the buyer just buys"*, Interview 12L). One difference to physical products mentioned across all the cases is the increased effort on the part of the salesperson, as they need more information about the customer compared to physical

products in terms of justifying the service and its benefit for the customer. The complexity of services is also made transparent by a statement by the Head of Product Management of the construction machinery company:

So, this intertwining with the customer is not like it was in the past [...]. there is a purchase from the customer and a sale from us [...] these two people negotiate a deal and make a contract. Now it's really an approach where 10, 20, 30 people from the customer are in contact with 10, 20, 30 people from us. So that's growing together extremely strongly and is very closely intertwined. (Interview 1L)

The agricultural company, on the other hand, has evolved from indirect to direct sales in the services sector and is even taking it a step further *"[...] by leveraging web shops and other digital platforms to establish a so-called digital end-customer channel. We are also moving into online direct sales for such products"* (Interview 2C).

The section on the customer management dimension emphasizes that processes and resources across all cases had to be adapted for the radical service innovation. Although the cases study companies differ in their corporate structure and the sale of physical products, the areas within the customer management dimension that emerge from the data are of similar importance in all companies. The key points are that the customer gets much closer to the focal company and the process-relevant services require a more sophisticated and faster customer support. A dedicated service department, as established in the construction machinery case, seems to be a promising approach to support salespersons and customers when it comes to sales, customer care, or training for both sides, i.e. the

internal team and the customer. An online store and the introduction of licenses are also key enablers in the servitization transformation and open up new customer groups and revenue streams that were previously unavailable or did not exist in the first place. At the same time, however, the data from the customer management dimension opens up the challenge that the company is no longer solely responsible for value creation for the customer. Other important players make a significant contribution to value creation and are discussed in the next section.

7.2.3 Results of the Ecosystem Management Dimension

The results of the primary data collection showed that the cases are no longer able to provide value propositions on their own with their own resources and processes respectively with the help of other stakeholders in the same ecosystem. Rather, the successful offer of the new service value propositions is highly dependent on the new ecosystem of the telecommunications industry (mobile network, SIM cards, etc.) as data needs to be up- and downloaded between the customer's physical product equipped with the SIM card and the OEM's systems to prepare the data with the help of algorithms. In addition, however, it was clear that there were effects on partners, suppliers, and even customer groups that were changing. Heikkilä and Kuivaniemi (2012) built on Moore's (1993) insights by introducing an approach to mapping actors based on their level of commitment to the focal firm. Their research reinforces the framework in the context of servitization, identifying key actors within the layers of core business, extended enterprise, and the business ecosystem, depending on their degree of commitment. The data shows that other ecosystems are being brought together to provide the service as a telecommunications ecosystem, which did not play a role in the companies' previous

business model. The following pages summarize the findings from the data in the order already presented, starting with the focal company. The involved elements of this dimension and experiences from the cases are summarized in Table 9.

Focal Firm

Decisive differences between the cases can be seen in the investments in new equipment (e.g. sensors) and also in the supplier structure. The construction machinery case has the great advantage that it has innovative capabilities to develop almost any technology (e.g. sensors) itself due to the many business areas within the group:

We are in the fortunate position of being able to develop almost everything ourselves, from the diesel engine to IO modules and sensors. And even [...] and that of course gives us the opportunity, for example, to reach down to the engine control unit during teleservice without interface losses. (Interview 1L)

In contrast, the other case study companies do not have a comprehensive vertical integration. Nevertheless, there are signs that attempts are being made to develop as much as possible in-house, as the Product Manager of Automation and Systems of the conveyor case explains:

The subject of vehicle components are complete in-house developments. This is generally internal development, so that we can get to where we want to go in terms of price. The whole topic of application software development is currently completely outsourced but is controlled internally. (Interview 2S)

Regardless of whether the development is in-house or outsourced, companies are faced with the complexity of reconciling the different development and life cycles of physical products and services. In the case of the agricultural company, for example, up to 10 years development time for the physical product was mentioned. It must be designed and equipped in such a way that the software can be updated for 20 to 30 years after launch. Similar time periods are also mentioned in the other cases. This collides with the development and life cycle of services, which are much shorter compared to the products. Services cannot be planned so far in advance and require agile development. Therefore, all three main cases introduced an agile method of operation using approaches like SCRUM and DevOp teams as, for example, the Senior Director Digital Solutions and Support in the conveyor case highlights:

But in order to get the digital products onto the market […] first of all, my unit, which we have reorganized, and we have developed new working methods, or we are in the process of establishing them, i.e., also in the area of project management, using agile methods like Scrum and the like. (Interview 7S)

On the basis of these methods, companies are able to react more quickly to pick up on influences from the ecosystem and implement them more promptly than was necessary when focusing exclusively on physical products in the past (*"[…] which we want to change accordingly with the new communication module, so that we can also make software updates online, or also activate functions on the machine in the future over the air after they have been paid for accordingly by credit card"* (Interview 2C).

Extended Enterprise

The extended enterprise describes the close environment around the focal company as *"[…] customers, complementors and second-layer suppliers, as well as standard-setting bodies in the particular field of business"* (Heikkilä and Kuivaniemi, 2012, p. 20). Additionally, and in contrast to Heikkilä and Kuivaniemi's (2012) allocation to the outermost layer, competitors can be considered as part of the extended enterprise as they contribute to the overall service value of the customer in a platform model as cooperation partners and not as competitors in the traditional sense. All case study companies make an effort to link their clients' competing products with their services to enrich the overall data as *"[…] data is the raw material in the future […]"* (Interview 2L). The more data each company collects, the better the quality of service. This is why the case study companies have developed communication boxes for competitor products in order to improve data quality. These technical boxes can also be used to connect competitors' products in the customer's fleet to the data services. However, they are limited in recording and lack an interface standard so only basic data can be read out. In-depth information of the machine, control unit, or sensor is normally encrypted so that others cannot access it. Accordingly, in the agricultural case the lack of data access – e.g. for accessory devices from competitors – is mentioned, as this is where it becomes interesting, and the data is very valuable. The Head of Product Management of the construction machinery case states that there are only *"[…] 10-15 data points that can be accessed via services"* (Interview 12L) and the only existing standard. For this reason, the construction machinery case and the agricultural case enter successively into cooperation with other competitors in the industry to define an interface standard for a win-win situation and increase the quality of every service.

What is unique and stands out from the data is the approach of the construction machinery case, which enters into cooperation with other players on a building site and implements their product and service as described in the case report. However, there are obstacles to ensuring a consistently high standard and transferring the focal company's own values to ensure that the client maintains a consistent image, even if the general partners operate in the background. The other case study companies do not yet have this form of cooperation but stated that they would like to pursue this approach in order to increase customer benefits. But what all the companies have in common is the connection to other data sources, like the ERP system in addition to the pure machine data. In this regard they aggregate process data, order data, accident data, or customer data via smart algorithms based on machine data, to provide comprehensive value for the customer so as to reduce and take over or exceed the effort on the part of the customer. The relationship with the customer is therefore much more versatile and lasting than the sale of products alone, which increases and strengthens customer dependency. This goes to the extent that, especially in the construction machinery case, it develops a marketplace, which gives competitors and other stakeholders the option to participate and overcome the barrier of missing strong standards and isolated solutions (*"So, our approach is to offer platforms that are so attractive to our customers that the other OEMs can decide to drill down into their data sets"*, Interview 12L). Likewise, the willingness to cooperate in the agricultural case is particularly noteworthy. The company collaborates with direct competitors to establish data standards beyond its own corporate boundaries. This ensures that customers with mixed fleets can enjoy a better user experience in the services sector.

The connectivity providers are fundamentally new to the case companies and are an interface to the new ecosystem of mobile communications. As they are direct partners in the new service business, they are part of the extended company. All cases are using the technology of SIM cards, which are relevant for sending data to or from the physical product (e.g. for software updates, activating service, sending machine data). As with smartphones and connectivity providers, OEMs are dependent on mobile network operators (MNOs) to manage connectivity and data transfer. The companies therefore have no influence on the quality of the signal or the network coverage and have only limited familiarity with the underlying technology. Therefore, companies need to collaborate with the MNOs and rely on their service and reliability. New resources had to be installed in terms of the management of SIM cards, their installation in the products, the trigger of activation or deactivation (when a service license is booked or expires) as well as internal processing and analyzing of the data, including storage. One key challenge with the unknown connectivity is the identification of trends and the technological development. Similarly to the quotes above and the update capability of 20 years, the network technology installed (2G, 3G, LTE)[4] in the machines must cover the life cycle of the product. Due to the long life cycles of the machines, the companies have to react, and it was mentioned, for example in the agricultural case, that *"[...] we are currently investigating for the individual markets whether we will continue a retrofit strategy there [...] whether this will then basically lead to a correction of equipment per market for our Ex Works-concept"* (Interview 1C). Differences were identified in data storage, with concerns from the customer side regarding trust in what and how data is

[4] 2G, 3G, and LTE represent different mobile standards and associated transmission standards.

stored. To address this, the conveyor company implemented the option of storing data internally on the servers of an outsourcing company (big data), due to a lack of infrastructure and to enhance customer trust, but *"[…] we are bringing this back in-house because our service structures, which we are now building up in the area of eMobility, are now moving in the direction of BigData via new technologies […]"* (Interview 3S). This is also reflected in the literature and especially becoming a challenge in servitization when data becomes the central component of a business model (Frank et al., 2019).

Business Ecosystem

The ecosystem perspective also reveals indirect stakeholders, which are not directly involved in the service development or operations but have a decisive impact on the service business model itself. The biggest impacts come from authorities and local laws, which regulate the operation of connected services themselves, and also from offering products in combination with services as predominantly reported in the construction machinery case. For example, an interviewee reported that in certain countries, such as *"[…] Australia and California, CO2 emissions must be reported per construction site"* (Interview 3L). Non-compliance with local regulations can lead to the maintenance of the service business being jeopardized if the laws are not observed. Therefore, the case study companies establish local businesses in the target markets and have new services reviewed by local law firms, as there is no uniform regulation and constant adaptation of case law in this still new environment. Alternatively, the agricultural case has entered into a more extensive cooperation with a mobile communications provider that was contracted for the ongoing legal review, so that no additional resources had to be built up within the company itself. In addition, the analysis of the conveyor case has shown that a service

that prepares legally relevant information must also comply with the corresponding prescribed format. This means that the service cannot only be developed according to the customer's wishes but must also consider the legal requirements.

7.2.4 Results of the Legal Management Dimension

Legal management is a dimension that should not be neglected in the innovation process, as the introduction of services has a direct impact on the offering concept. Respondents named process and personal data as critical, but these are crucial for the data pool and meaningful data preparation for the service value propositions. Hence, these data groups require a careful handling and anonymizing wherever possible due to legal requirements. For this reason, dedicated resources were used in all three main cases to monitor the regulations in their markets and ensure compliance with the law. For example, as the Senior Director Digital Solutions and Support in the conveyor case stated: "*We also have an additional data protection officer […] who takes care of this. But this is more about the basic data protection regulation. When it comes to analytics, we will probably set up a unit within the group that will focus on this issue"* (Interview 7S).

The conveyor company saw a major challenge in the implementation of the GDPR in 2018, when the contracts had to be amended with regard to consent to data protection and the anonymization of existing and future data collected. A similar approach is also reported in the agricultural case, emphasizing that they have their *"[…] own data protection officer specifically dedicated to these topics"* (Interview 5C). Initially, their focus is on meeting the fundamental requirements for the EU-27, and then they *"[…] engage with the respective national subsidiaries to ensure compliance with local legal*

protections as part of the implementation process" (Interview 5C). The construction machinery case also had to deal intensively with the topic and the classification of the collected data, as a Product Manager explained:

From our point of view, there has been a relatively dramatic change in data protection over the last two months. And that is about the consideration of what is personal data and what is not. And while in 2014 or 2015 it was still assumed that personal data would only become relevant according to the regulations on personal data if one really explicitly accessed personal data […] in the meantime it has become the case that, for example, in the case of a car, a license plate number plus GPS position plus perhaps the IP of the modem, that is already enough for one to infer which person is on the road. (Interview 9L)

The construction machinery case also highlights the restriction of data access internally and builds up a complex system in contrast to the other cases to ensure not only the access but also the service specified in the contract:

So, machine data is quite clear – we also have access to it. This is open, and the customer also signs it to us when he buys the machine […]. Process data belongs to the customer, we have no access to it. We don't look at it, we can't do that either. An administrator who maintains our server, […] can of course have administrative access. But no one else has access to process data. And if a customer downloads the telematics from the machine, the data is stored on the machine, we have a redundant system, there is always a backup, i.e. process data cannot be lost. (Interview 13L)

Furthermore, the construction machinery case makes great efforts for certifications and follows up the questions *"How do you secure internal processes and procedures, who certifies and secures them, etc.? And you have to work together with the external partner, otherwise it always looks like nothing"* (Interview 8L). Finally, the construction machinery case also invests in detailed monitoring of market-specific regulations in terms of registration of their services, as this becomes relevant as soon as telecommunication technology is used. The prerequisite is often a branch in the respective market (*"In certain countries, you have to have your own local branch office to be able to offer such a service at all, and we are in an extremely comfortable position here, thanks to our direct sales structure"*, Interview 12L).

The summary of the legal management dimension exhibits decisive challenges for the cases in their journey of servitization. The involved elements of this dimension and experiences from the cases are summarized in Table 10. Most actions for the cases in this dimension resulted from the new telecommunications ecosystem mentioned in the section before. The exit from the traditional well-known core business has given rise to unforeseen legal requirements and non-compliance, which jeopardizes the service business. To counteract this, companies have had to invest considerable resources to comply with data protection and connectivity laws in each target market. Finally, even if the individual elements can be assigned to specific dimensions, there are interfaces between them. It becomes clear that, as a rule, no element can be introduced or changed on its own without affecting another element. An overview of different elements and dimensions is shown in Figure 15.

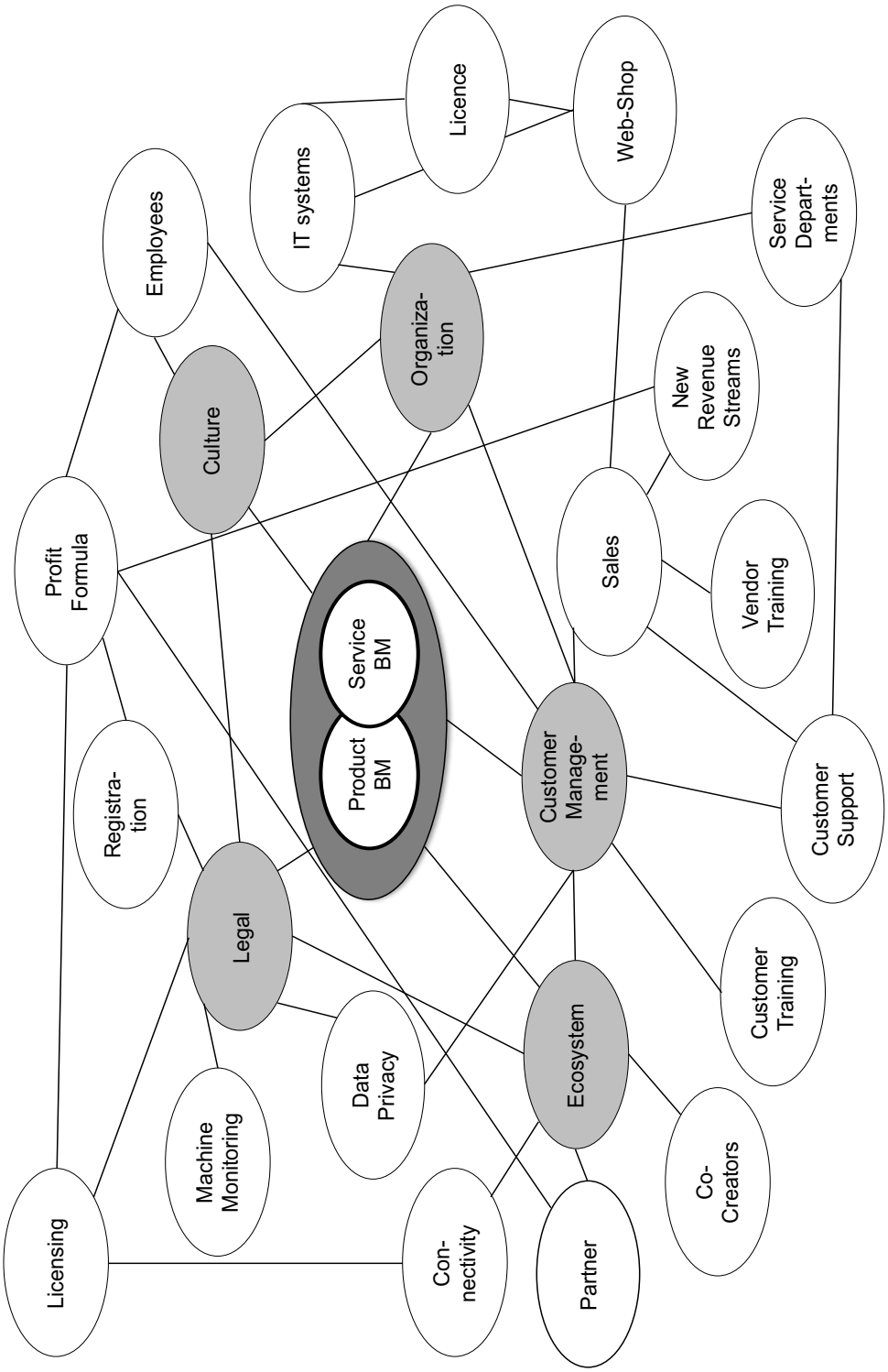

Figure 15: Elements and Dependencies of Dimensions

7.3 The Evolutionary Process of Servitization

Business model innovation is an evolutionary ongoing process (Ramdami et al., 2019) and all cases began at the turn of the millennium with the adaption of their business model to offer the first data-based service value propositions. While the cases had to go through different evolutionary phases, they firmly incorporated the service business into their long-term strategy and are now in the process of transforming into a platform provider. The data collected across all main cases allows for categorization into the four phases of service development – technological enablement; monetization and strategy; service growth; and platform strategy – but they differ in context, particularly in the initial momentum phases and the reason for the adoption of enabling technology and data-driven services. In the second phase of monetization and strategy alignment the evolutionary progress is advanced, and services become more stable and customer friendly with the company's own resources. Additionally, the cases include services in the long-term strategy of the company. The service growth phase is characterized by the continuous and structured development of new services based on a strategy developed in the previous phase. Finally, the platform strategy phase shows a clear pursuit of platform models.

In the first phase, the cases have started to lay the foundations for the introduction of services. As all companies had a different intention with the introduction of services, the context varies from case to case. The construction machinery case focused on improving maintenance support while the conveyor company focused on internal learning and utilization analysis. The agriculture case, on the other hand, had already started with a direct service to the customer and was the only case with a service that the customer pays for, although the service was initially developed for only one market. Regardless which value proposition was met in

this phase, all the main cases started with the technological enablement and infrastructure for the services. It is obvious that the more the service has been created directly for the customer and is to be used by them, the more customer-oriented elements need to be provided, e.g. a customer dashboard for displaying information. However, the services were developed without a structured strategy and with very limited resources. As services do not generate a direct profit in this phase (except in the conveyor case) and a business case cannot be calculated with sufficient accuracy, in all cases intrinsically motivated employees were the key factor responsible for establishing the service business in the first place and justifying the development and introduction of the first services. Due to the lack of experience with services in terms of customer needs, customer acceptance, or acceptance rate, in the conveyor case the market launch of the services focused primarily on their known markets with at least known customers and laws from the physical business and in a familiar environment. In summary, what the cases have in common is that they were originally developed in a small intrinsically motivated team that was able to be convinced of the need for services and to justify the technological investments for enabling services, reflecting a strategically autonomous behavior versus a centralized organizational strategy (Burgelman, 1983). The case study A and C equipped the machines with sensors and case study B enabled the IT environment (e.g. data interfaces and dashboards). In this phase used only a few close-to-the-machine or business data without the enrichment of further data sources and algorithms. This phase was also a relevant learning process, as shown in particular by the conveyor case with its direct customer service, which highlighted the need to present accurate and reliable data to the customer and the challenges involved in the first phase. The construction machinery company also reported underestimated expenditure for the introduction of the service, which continued into the second phase.

In the second phase, processes and resources were increasingly standardized across all the companies, and they began to introduce more services in order to develop additional sources of revenue alongside the physical business model. In addition to the broader monetization of services, the companies also included services as part of their strategy. The cases also saw the relevance of services to their business due to external forces from competitors, financial needs, and the data and service orientation in other industries. The importance of services for their business therefore increased and was also recognized by top management, which led to services being incorporated into the corporate strategy. The construction machinery and agricultural company began to monetize their services, and also to refinance the expenses that had to be incurred to provide the services. For example, stated one interviewee that *"[…] we have started to think about which products and solutions can on the one hand finance the new development […] and [we] saw in other industries that already a development begun in this direction"* (Interview 1L). The underestimated costs mentioned in the construction machinery case were still present in this phase, as well as the complexity of different hardware–software variants and the consideration of entire cultural and country-specific requirements for services. Gradually, new services were added in all the companies, and the variety of data became increasingly complex, as services were no longer based solely on machine data. Customer-facing resources and processes from the customer management dimension became critical, in particular the selling of services and the support structure across all three main cases. The ecosystem expanded to include the mobile network technology, which made the services more complex in terms of management (activate/deactivate data transmission and service) and the cases had to rely for the first time on a new ecosystem and co-creators to offer their services. Initially, the payment model was based on a multi-year trial or flat-rate

period in all cases for a number of reasons. First, a trial period makes a new service more attractive to customers and encourages the purchase. Second, all the main cases report that they were not ready to manage the services in full due to missing customer-facing IT-related processes and resources. With the new services, the legal dimension gained in importance with regard to data protection, but also the rights and obligations of the customer. What was fundamentally new for companies and their customers was the additional contract for services and the breakdown of which data belongs to the customer and which to the OEM. This led to complex anonymization processes in order to comply with the law. Overall, this phase is also characterized by a learning process and lays the foundation for the intensification and expansion of the service business.

The third evolutionary phase is the service growth phase. Triggered primarily by external forces, companies' service portfolios were growing, and the new services were becoming even more complex and intelligent. Whereas the ecosystem had gained decisively in importance in the first two phases due to the telecommunications ecosystem, the inner two circles of the existing ecosystem dominated this phase. The construction machinery company's services in particular were becoming more mature and were enriched by additional services from other players in order to cover customer benefits even more comprehensively. The services of the other cases also grew considerably in order to meet additional customer needs of different customer groups. As the services were scattered (e.g. in national companies) in particular in Case B and were not developed centrally, the appearance and the technology used differ from service to service, as reported by the conveyor company in particular. The customer-oriented elements were therefore completely restructured and standardized. In this phase and from an organizational

perspective, the companies had the introduction of agile methods in common, which emphasized the development from an initially small and project-related service development to a service offering to a broad mass with standardized elements. The expansion of the ecosystem is particularly emphasized in the case of the construction machinery company and the partnership with other players on the building site in order to offer new services with additional customer benefits.

In the most recent platform strategy phase, the cases have begun to take strategic and organizational development to a new level and to seek discussions with other stakeholders and competitors in order to define certain standards in the technology of data transmission of, for example, control units. This is the prerequisite for a platform that connects different players for even greater customer benefit. The construction machinery company is the most advanced in this respect and uses its market position to persuade stakeholders and, in particular, its customers to place their trust in its services. The other two cases have also started to lay the foundations for the platform strategy and are working with other market participants to define certain technical and fundamental standards without which a platform model would not be possible. The platform model has tremendous strategic value for the focal organization but of course should also provide the customer with an even deeper user experience in advanced product-service systems, connecting physical products and other systems or services, regardless of manufacturer, to a vendor platform. For this reason, the customer management and ecosystem management dimensions are particularly affected in this phase.

7.4 Conclusion

This chapter summarized a comparison of the companies in terms of the key forces driving their development and which elements of the business model were particularly affected. It also provided an overview of the differences and similarities between the different evolutionary developments within the four phases. It turned out that the companies started around the same time with the first basic services for a specific customer group, but the forces were different at the beginning. Interestingly, the development paths went on to converge and all are currently at the stage where they want to become or participate in a platform provider. On their way to this final phase, they had to make different adjustments to their business model in the four phases, which show many similarities between the companies. They all had to overcome the challenges of various resources and process adjustments, which are summarized in the four dimensions of customer management, legal management, ecosystem management, and organizational and cultural management, and which came into play to varying degrees in the four phases. It is noteworthy that in all cases, almost the same resources and processes had to be adapted or introduced throughout the different phases. However, it was found that the construction machinery case carried out the most thoughtful evolution process in terms of high-quality services right at the beginning and throughout the rest of the servitization process. This could be due to the strongly practiced corporate values that focus on the customer and prefer to support their customers efficiently rather than compete with their competitors. The early commitment of top management and its strategic communication to become a service provider also supports this development.

CHAPTER 8: DISCUSSION

This chapter discusses the contribution emerging from the case findings as well as the identified research gaps (Figure 16) to answer the research question *"How do traditional product-centric companies reinvent themselves and foster radical service innovations?"* To answer the question, the research has drawn on both business model (innovation) approaches and previous core findings from the ecosystem and servitization literature, making a significant contribution to each. Additionally, it considers and contributes to the very relevant and significant development of the IoT and platform strategy (Snihur and Markman, 2023), which is the context for the study, since the case studies and the servitization operate in this environment. To appropriately explore the research question, it was broken down into three sub-questions. The first sub-question deals with content i.e. what business model elements are most likely to be involved. The case study findings reveal that several business model elements are involved in the innovation process, highlighting that the business model must adapt in the four key innovation dimensions of customer management, organizational and cultural management, ecosystem management and legal management. The second part of the chapter addresses the question of how

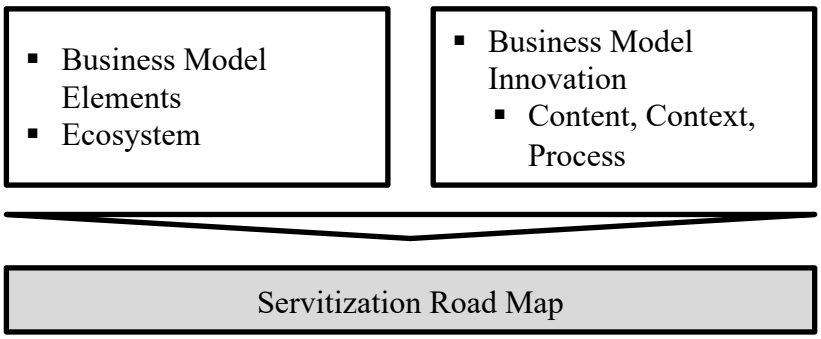

Figure 16: Contribution Overview

business model innovation is successfully incubated and scaled. Here the case findings highlight that the evolution of the service business can be divided into four phases. Furthermore, the data reveals contextual forces that are responsible for the further development of the business model and its key innovation dimensions. Consequently, in order to answer the question of evolutionary development, the context as well as the content must be taken into account, since this changes over the course of time.

Research on business model innovation and IoT has only gained momentum in the last five years, with the understanding of how they influence each other still in its infancy (McIntyre and Srinivasan, 2017; Markfort et al., 2022). For example, Paiola and Gebauer (2020, p. 256) note that research on the IoT *"[…] is still in its first phases and plenty of under-investigated areas and research streams could be highlighted".* The insights contribute to existing research in terms of detailing the specific business model elements involved in servitization, while also proving an understanding of how the business model changes over time, starting with basic machine services through to a platform provider connecting machines, other data sources and services, customers, and stakeholders. Notably, the literature highlights the necessity to further investigate journeys of business model innovation in this context (Raddats et al., 2019; Baines et al., 2020; Paiola et al., 2022). Responding to this call for further understanding, the insights on context and content are combined to discuss the process perspective resulting in a servitization road map model, as has been called for in the literature (Baines et al., 2020).

Existing literature exploring business model innovation has already provided multifaceted insights into what a business model is (definition), as well as offering

overarching frameworks and disaggregating possible elements coupled with highlighting the complexities of the same (Budler et al., 2021). The regular summaries of business model innovation research reflect both the essence of the knowledge already gained, but also show changing research priorities over time, particularly from clarifying what a business model is through to engaging with the latest trends (e.g. Industry 4.0) to explore how they influence business models. Zott et al. (2011) provided one of the first comprehensive overviews of the flourishing research in business models, highlighting definitions as well as ecosystems and value chain dynamics, which were until then the focus of research. Similar effort was made by Wirtz et al. (2016) some years later, where an analysis of several hundred papers (n= 681) revealed that the research focus had evolved to focus on innovation, change and evolution, performance, and controlling and design. One of the latest summaries of the business model evolution by Budler et al. (2021) draws on a bibliometric review to highlight new frontiers in networks and Industry 4.0 (IoT is a subset) amongst others, and shows a clear development of research from a basic understanding of the concept around the turn of the millennium to a new trend of researching highly networked and platform-based corporations with the help of the business model perspective, thereby highlighting the contemporary relevance of the current research. A closely linked research area is concerned with the innovation of business models (Ramdani et al., 2019). As the development in industries, especially as related to Industry 4.0, has gained momentum, there is a requirement for novel perspectives and renewed contextual understanding of business model innovation. The existing body of literature provides a general understanding when speaking of an innovation – for example, by changing one or more elements, or what enables the innovation. Recently published systematic reviews focus on experimentation to develop

new business models (Ramdani et al., 2019), drivers (Kraus et al., 2020), and triggers (Bashir et al., 2020) for business model innovation, or take a process view (Loon and Quan, 2020). These summaries show the development of business model research and highlight the relevance of the contribution to business model innovation in the Industry 4.0 context. This is the latest research focus and an area of ongoing calls for additional insights (e.g. Budler et al., 2021) and suggests the importance of further research in business model innovation as well as a more holistic view of key elements that are of central importance in the course of servitization.

The case study analysis revealed critical fields of activities in the customer value proposition, illuminating fundamental new value for the customer based on data, and equally the creation of new customer groups or revenue streams (e.g. services for the second-hand machine market). The four major dimensions of customer management, organizational and cultural management, ecosystem management, and legal management are shown to have a substantial impact on the existing business model structure. Notably, the servitization business model is developed in parallel, retaining decisive links to the legacy model. Single-business model elements had to be developed and interconnected carefully to the legacy business model resulting in an evolutionary process, which in turn is highly impacted by the strategic choices of a company, ranging from starting with basic services through to radical services in a platform provider configuration. The existing body of the business model literature has already put the topic into context via connectivity technology (Kindström and Kowalkowski, 2014) as this technology opens new possibilities for services (Gago and Rubalcaba, 2007; Holmström et al., 2010) based on the introduction of the IoT and the establishment of platforms as a new strategic

opportunity for companies to differentiate themselves from the market, which is an increasingly relevant field of research (Budler et al. 2021; Markfort et al., 2022). The insights from the cases help to extend existing findings on servitization from a business model perspective, highlighting its key elements and required infrastructure, as well as the challenges of running two fundamental value propositions in parallel. The current research, therefore, addresses recent calls by the likes of Budler et al. (2021), including for research to provide further understanding of *"[…] which building blocks (elements) and success factors are critical in the development of new and network-based business models"* (2021, p. 490). Likewise, practitioners are still wrestling to understand the scope and dynamics of business model innovation, including servitization, as evidenced by the Boston Consulting Group's ongoing series of publications "*Sustainable Business Model Innovation"* (e.g. Young and Reeves, 2020).

8.1 The Critical Elements Supporting Hybrid Business Model Evolution

The analysis of qualitative data from case study companies transitioning to offering both products and radical services revealed important patterns regarding which business model elements are most affected and how both the legacy and the new service-based business model must be structured to create and implement the hybrid offering successfully. There is still unabated interest to uncover the organizational structure most conducive to encouraging innovation in business models and their elements. Moreover, trends like digitalization enable a constant enhancement of insights and the reconsideration of previous approaches (Foss and Saebi, 2017). The first part of the overall contribution answers the question of what key elements of a business model are involved in the servitization efforts and how the hybrid value proposition serves to shape the business model.

The evaluation of the interviews revealed that profound changes were needed in all four dimensions and several elements stand out in particular, as shown in Figure 17. Researchers often refer to the business model as an activity system (Demil and Lecocq, 2010; Foss and Saebi, 2017) in which discrete activities influence each other, as discussed by Zott and Amit (2013). When companies decide to innovate, insights from the servitization literature highlight how changes in almost every activity or element are necessary (Kindström, 2010). Furthermore, servitization in the given context means that both value propositions are offered i.e. the physical and the service-based one. Markides and Charitou (2004) state that companies develop and maintain two or more business models in parallel and that parts of one business model are also parts of the other business model (i.e. hybrid setting) (see also Markides, 2013).

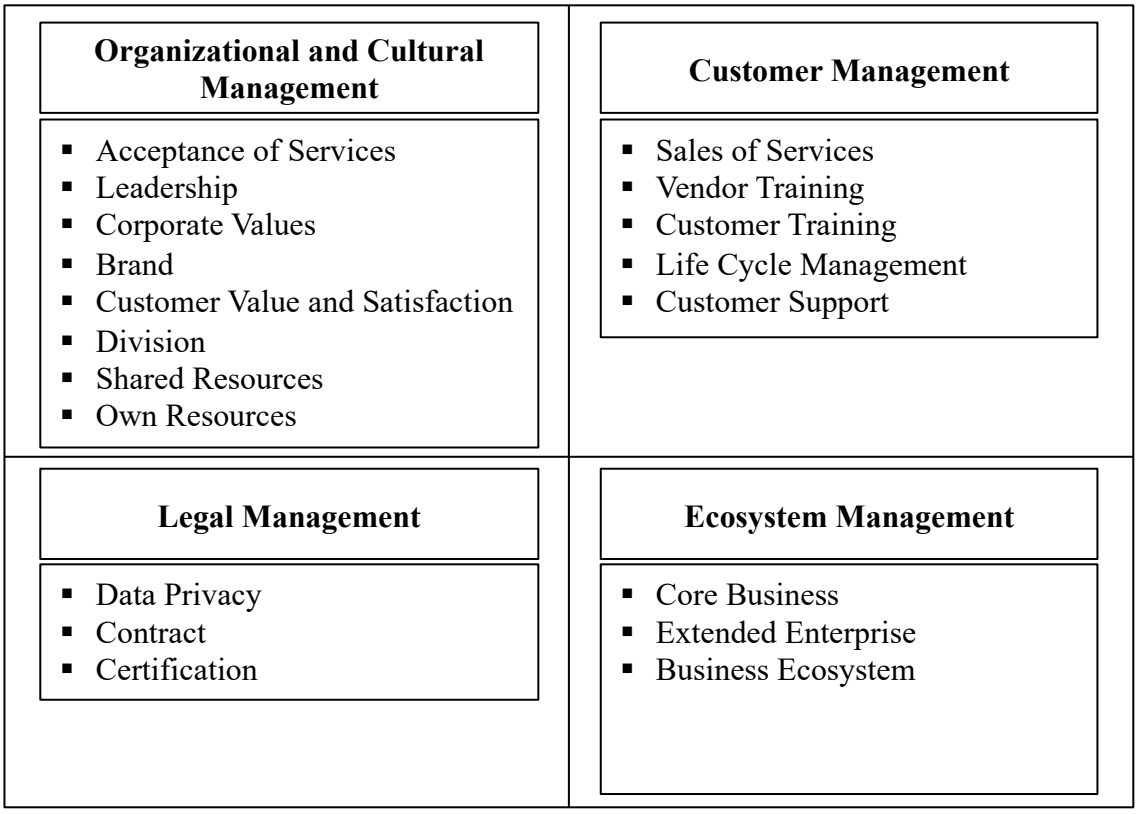

Figure 17: Summary of Key Innovation Dimensions

Case studies indicate that servitization efforts involve various business model elements, necessitating a more granular approach, as suggested by Kindström and Kowalkowski (2014). Further, it is equally clear that additional critical elements are involved, including those not previously identified or emphasized in research (e.g. legal aspects). The cases show a branched value proposition addressing customer groups which could not have been reached and addressed under legacy business models (e.g. second-hand customers in the construction machinery case). Evidently, meeting these new customer groups and service needs requires capabilities and resources in the business model in order to create a sustainable customer value proposition. All the case study companies had to develop a direct customer contact approach for their services, including a license model, online store, ensuring data protection requirements, entering into necessary cooperation as well as further developing their culture. The following section discusses the four dimensions of customer management, organizational and cultural management, ecosystem management and legal management, highlighting their significance in the servitization process as evidenced across the case study companies.

8.1.1 Customer Management Dimension

Customer management occurs as one of four key dimensions in the case study evaluation. While traditionally an important function, in the context of the transition to an effective service-based business model this takes on additional significance and a new dynamic requiring several (new/additional) processes and resources. The data show that four areas are particularly noteworthy and contribute to the overall understanding of the business model change in servitization, including Sales of Services and Salesperson Training (I), the Customer Training (II), Life Cycle Management and New Revenue Streams (III) and

the Customer Support (IV). Figure 18 gives an overview of the four areas and the key insights that will be discussed in detail below.

I: Sales of Services and Salesperson Training

Selling services is fundamentally different to selling physical products. However, in B2B business the sales representative of the legacy products business remains the crucial driver when it comes to selling the services. The cases report long-established relationships between the salesperson and the customer, with trust as a key success factor for the selling of services. Therefore, companies need to build on their existing touchpoints and enable the sales team to successfully address the services individually as related to customer needs. Due to the possibility of modular services, the salesperson requires more time for

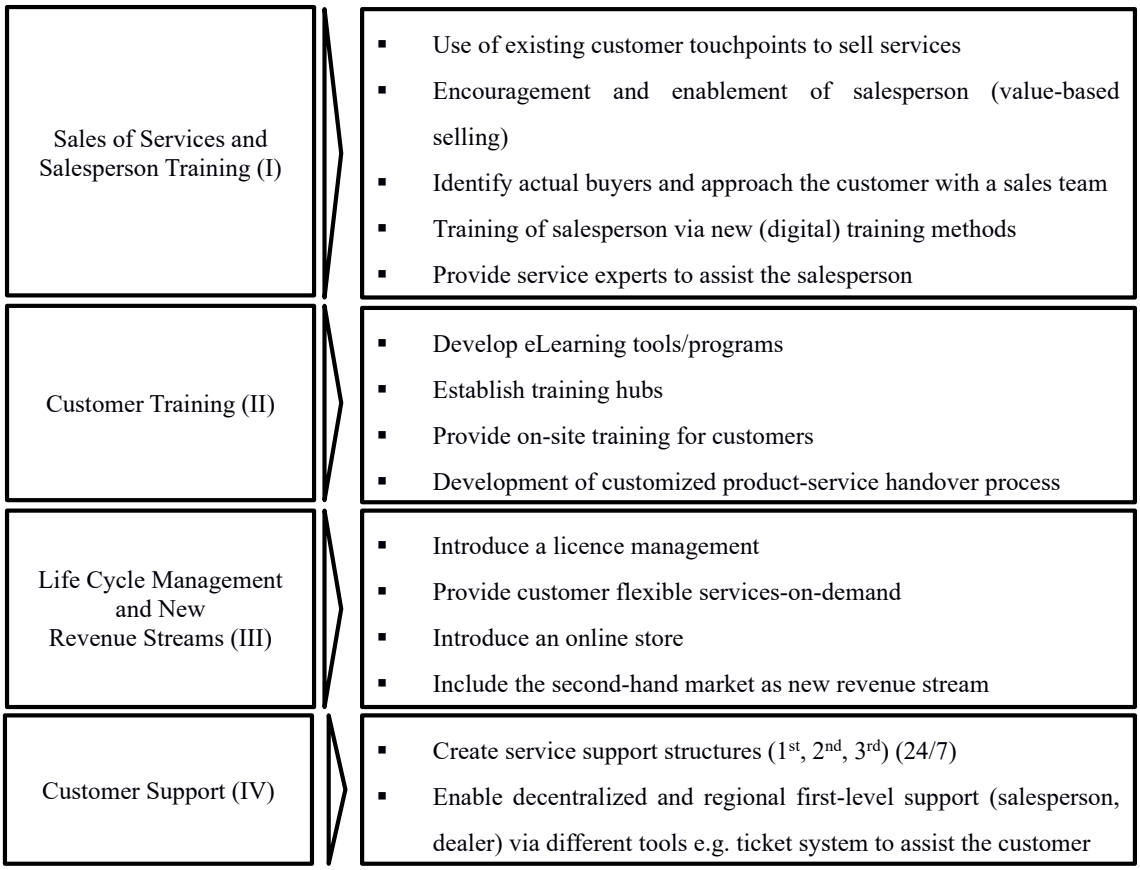

Figure 18: Summary of Key Insights into Customer Management

preparation and to find out what might be useful for the customer. An in-depth knowledge of the customers' processes, fleet, and business in general is important. In contrast to the physical business where machines are sold by technical data directly between salesperson and the buying department, services also need to address the user of the machine (e.g. on the building site or logistician) directly in order to discuss areas of application of the service and convey the value of the service. A change in thinking had to take place from function-based selling to value-based selling. As services are more complex and are closely linked to the customers' IT systems and processes, different departments and roles are involved in the selling process to discuss legal questions, interfaces, data sources and formats, etc. As was exemplified in the construction machinery case, there is a tendency to build up a specialized service team for selling services as it takes on the character of a long-term project then a one-time short sales talk. A key enabler for successfully selling services is salesperson training and knowledge of the possibilities of the services. A promising approach is training-on-the job with specialists from a dedicated service department to support the salesperson in the sales pitch. But it is not only the salesperson that requires training for new services, but, critically, the customer and direct user now also requires training. Statistics from the construction machinery case show that a large number of customers were not using even the most basic services such as remote-machine monitoring, as they were unfamiliar with its function and capability (*"[...] the feedback we have received indicates that a relatively small group of users fully utilizes the complete range of features and constantly requests additional functionalities, saying that certain features would be great for further analysis. However, the majority of users make use of only a very limited part of the functionality, and they do so irregularly, primarily for occasional evaluations"* Interview 3L; *"[...] and interestingly, we see a significant*

divergence between sold and activated licenses, with a 30% difference" Interview 3L). From the salesperson's standpoint this is also problematic as data-based services are like a virtuous circle i.e. they become more valuable and effective the more data that is collected, that is why companies are interested in having as many customers engage with it as possible. Companies often establish auxiliary integrative services, such as e-trainings, on-site trainings, or training hubs. Notable was the requirement for a dedicated additional training and service introduction step in the handover process, as detailed in the agricultural technology and construction machinery cases. After a certain period when the first data were collected, another short training takes place to train the user how to get the most out of the service. In this context, Case A identified the potential to integrate external training centers as a new customer group by offering training for its services. The company developed and now sells educational software to training centers (comparable to a driving school) as a new revenue stream. Additionally, it already trains site planners and crane operators during their training period using its services.

The literature has already identified training as an important element in the service business model, but the processes have not been discussed in detail. Pomirleanu et al. (2016, p. 133) argue that *"[…] training is an organizational practice directed at providing the employees with the opportunity to enhance their knowledge, ability and skill levels"*. In the context of the transition from traditional business models, it is often the case that salespeople are not enabled to understand and communicate the value of the services, and the competences are missing on the sales side, including knowledge about rudimentary benefits of a service (Kindström and Kowalkowski, 2009; Kindström et al., 2015; Grubic and Peppard, 2016). This can have a negative impact, reducing the personal

motivation to sell the service, meaning that the focus remains solely on the product (Perminova-Harikoski et al., 2015). Kindström et al. (2015) already identified reward systems and educational programs, among others, as enablers for selling services. However, the literature does not a give comprehensive answer on how to address the challenge. The company case studies in the present research reveal two new processual elements to overcome this. Basic trainings for the salespersons, as similarly discovered by Kindström et al. (2015), give the salespersons and other involved persons the basic understanding, but rarely lead to the desired success, as the construction machinery case reveals. The salesperson requires additional, complementary experts with key competences in the background whom they can rely on as soon as services become important for the customer and questions occur, which cannot be answered by the salesperson themselves. While the conveyor technology case relies on the product management department as a shared resource and adds further responsibilities such as internal training to the daily business, the construction machinery case has already established a dedicated department, which was created purely for these service purposes. Additionally, they train and enable their staff via a "training-on-the-job" approach, serving to gradually reduce the inhibition of the salesperson to offer complex services. At this point, the strong company values and loyalty of employees also helps to sell the services. As soon as the hurdle of knowledge has been overcome with the strong and agile supporting service department in the background, salespeople can fully concentrate on the company values whereby the customer is the focus and must always be supported, as highlighted several times in the interviews. Secondly, the agricultural technology case and conveyor technology case established a yearly based reward model for their indirect sales model, based on subsidiaries, which demonstrably increased sales. The yearly bonus

of every salesperson can be increased the more services they sell. This can also be enforced, as was the case for the agricultural technology company by promoting an approach whereby services must be made tangible not only to the customer, but also to employees and especially the salespeople (see Simons, 1991). Therefore, every demonstration machine is equipped with the service technology for training purposes to first convince the salesperson and then to present the value to the customer (Simons, 1991).

The above-mentioned project-based selling of services has not been considered in the literature so far. The construction machinery case reports from a project-based selling approach with no standardized approach or framework. Moreover, an individual specification sheet with details, for example about interfaces between IT systems, what data are needed, who are the users, what or who are the partners etc., is needed as soon as the initial and superficial negotiations are finished. Companies need to establish additional resources and processes to guarantee that all involved roles (product/service department, legal department, IT department, etc.) can successfully finalize the contract and specifications of service delivery and maintenance in the context of a new service-based provision.

II: Customer Training

The cases also show that the initial use of services at all levels and, equally, their full use for value, can only be guaranteed by customer training, which is more critical than product training and often requires ongoing additional training. In a rare acknowledgement of the need for customer training, Kindström and colleagues highlight

that the *"[…] customer must be able to use the service correctly, to realize its full value potential"* (2015, p. 382), something already considered as important in the delivery process (Kindström and Kowalkowski, 2009) and post-deployment phase (Tuli et al., 2007) without going into detail on what the training processes can look like, although the importance of training is already highlighted in the literature as it spurs the use of services by the end-user (Perminova-Harikoski et al., 2015). In this context Perminova-Harikoski et al. (2015) mention that the most effective training is conducted directly with customer or with the suppliers in a real environment in contrast to theoretical training. The construction machinery and agriculture cases have established a sophisticated concept of different training opportunities and established training hubs or offer eLearning tools for simpler or basic services and on-site training for complex and specific jobs-to-be-done. Another purposeful approach was established by the agricultural technology company, which developed a handover process for the product, thereby creating a dedicated step within the process especially for services. They realized that one-time training is not sufficient on its own, so that further training takes place after a certain period of time. All this highlights that the introduction of new business model elements is necessary, but not sufficient on its own. Attention needs to be directed to the people and their critical roles (Collings and Mellahi, 2009), underpinning how the new service value proposition is realized.

III: Life Cycle Management and New Revenue Streams

More than technical machines, services are dependent on a working ecosystem and ongoing close contact with the supplier. With respect to the customer management, license management, services-on-demand, online store, and the second-hand market

occurred as relevant elements of the business model transition. These ensure, that customers can use and manage the services-on-demand whenever they want. All the main case study companies have introduced a license model already known from the software industry to ensure that a service and its software are allowed to be used either free of charge or for a fee, all the while ensuring that terms of use are accepted. The companies developed an online store that enables the customer to activate the services, which provide not only the direct customer the possibility of using the services, but also their indirect customers as well as customers in the second-hand market. For example, in the construction machinery case a large number of their direct customers are leasing companies, and their customers are then able to use the services by registering directly with the focal company. The agricultural technology case affirmed that they do not know the customers in the second-hand market. The online store also enables the use of services for the second-hand market and creates an additional revenue stream for the manufacturer.

Licenses are rarely mentioned in the business models and servitization literature. Gebauer et al. (2020a) relate licenses to the profit equation schemes and additionally mention freemium and subscription as possible payment approaches. Kowalkowski et al. (2014) argue that services generate additional revenues based on fees for sensors installed on the machine and the subscription fee. However, the experience of all the case studies reveals that a license model (often synonymous with subscription) is much more than just a payment model. The companies introduced a license model that is similar to that of the software industry, which is also the technical and legal enabler for the customer to use services, regardless of whether they pay a fee at regular intervals or have a trial for a

certain period of time. As soon as the trial license expires or the user cancels the booking, the license to use the service ends and is switched off.

The analysis of the interviews revealed two relevant elements of a working machine-based service, which are on the one hand the sensors and telematic module, and on the other an active license. The licenses are managed within the focal company and require simple customer processes of activation or cancellation of the service portfolio. A decisive IT system directly accessible to the customer is the online store, which, after registration, enables them to manage (book, cancel, …) the available services. Here, too, the literature does not show many findings besides the insight that the online store is a direct distribution channel (Hacklin et al., 2018), something also confirmed by the results of the analysis. Experience from across the case study companies indicates that establishing an online store is a crucial part in changing the profit formula from services for *free* (where licenses for the service can be given along with the machine) to services for *fee* model (where customers must pay for the use of the service). While all the main companies introduced the online store, making a decisive change was particularly challenging for the conveyor technology and agricultural technology cases as they have an indirect sales model for their physical machines. With the introduction of these services, they changed to a hybrid sales model and now sell services directly to the customer via the online store. The switch to a direct sales model is a necessity in the service business in order to be able to control the services at all levels (e.g. from a legal perspective with regard to data protection, or to enable services for the customer on demand). The need for a direct sales model has received very little attention in the literature to date. Kindström and Kowalkowski (2014), for example, highlight the need

for a direct customer interface as *"[...] it becomes difficult to develop the relationship and succeed with new services*" (p. 104) but do not consider the need for organizational and technical changes to manage the services.

With these changes the companies are now able to address new customer groups in a pragmatic way, especially in a platform model where customers can choose what they need, regardless of whether they need machines, machines and services, or only services not only from the owner of the platform, but also from all stakeholders, which are linked to the platform (e.g. competitors, value-adding companies). The online store in combination with the license model also gives the case study companies the possibility of opening up to new markets (e.g. the construction machinery case and its second-hand market). while data are used internally for product improvement (Grubic, 2018) (Internal Target Group), to understand the products' usage (Rabetino et al. 2017; Teece, 2017) or in the case of the construction machinery company to create fundamental new markets (e.g. driving-school simulator or site planning software), the services can now also be sold to second-hand market customers as well as to the customers' customer (see Figure 19). To date, neither of the additional options for revenue streams have been adequately highlighted in the literature. Both groups can be considered as an indirect customer group. The direct customers have to create reports, e.g. on the usage of machines, damage reports, or the suitability of their physical products for authorities and they had to do it manually before they had the chance to use different data sources like machine data, user data, and other data to create detailed reports. In addition, rental services are simplified for the OEMs' direct customers, but this now also opens access to the customers' customers downstream, as they pay the rental for the physical product to the rental company, while

services must be booked directly with the manufacturer on their online store. The conveyor case also argues that the second-hand market is now becoming to them. while in the product business the machine and customer were only visible to them as long as the machine belonged to the first owner, the other owners were not transparent. Due to services and the registration and booking in the supplier's online store, the company now knows the subsequent owners for additional revenue streams, and also for learning purposes. Researchers are already calling for a closer look at this aspect of indirect experience. Dube and Helkkula (2015) note in their paper "Service experiences beyond the direct use" that the value of indirect experience is not to be underestimated and that *"[…] indirect value experiences are a relevant part of value co-creation processes"* (2015, p. 24). Although the research focuses on smartphone apps, the indirect customer and experience play a decisive role in the case study companies So, with the help of the data, the case companies are able to not only satisfy the direct target group, but also to reach the indirect customer group and their customer's customers (see Figure 19).

Finally, with the introduction of a license model and the online store services, the introduction of on-demand (also known as pay-per-use) services is enabled. All the main cases give the customer the option to pay for the services on a yearly basis and runtime and recently also on an on-demand basis. The agricultural technology case highlights the need for on-demand services as their customers are using some services only once a year at harvest time. But also, the other case study companies report services offered on-demand to the customer and they can book and cancel the desired service whenever they want to. This development of flexible payment options in servitization contributes to Gebauer et al.'s (2017) research of pay-per-use as a service. The analysis of the cases

shows that services bookable on-demand can be more attractive to the customer. This is even more important for customers who rent out their machines and the intended use may vary, depending on the customer. Another enabler is the modular portfolio, as the analysis revealed. The more fine-grained the portfolio is and customers being able to choose exactly the service they need at the time, the more reasonable the on-demand option must be. Additionally, this also guarantees a consistent revenue stream, including during economic turbulence, when new machines cannot be purchased due to cost savings, but services are booked to maintain the operation.

IV: Customer Support

Supporting the customer in case of troubleshooting or any other issue was also already essential for products. When it comes to services, the structures are different and more complex, as the interviewees reported. Traditionally, the subsidiary or the salesperson is the first point of contact for any questions. However different structures are required for services, especially in an indirect sales model and a complex platform, with different partners and other involved ecosystems. In this scenario, other value adding or enabling

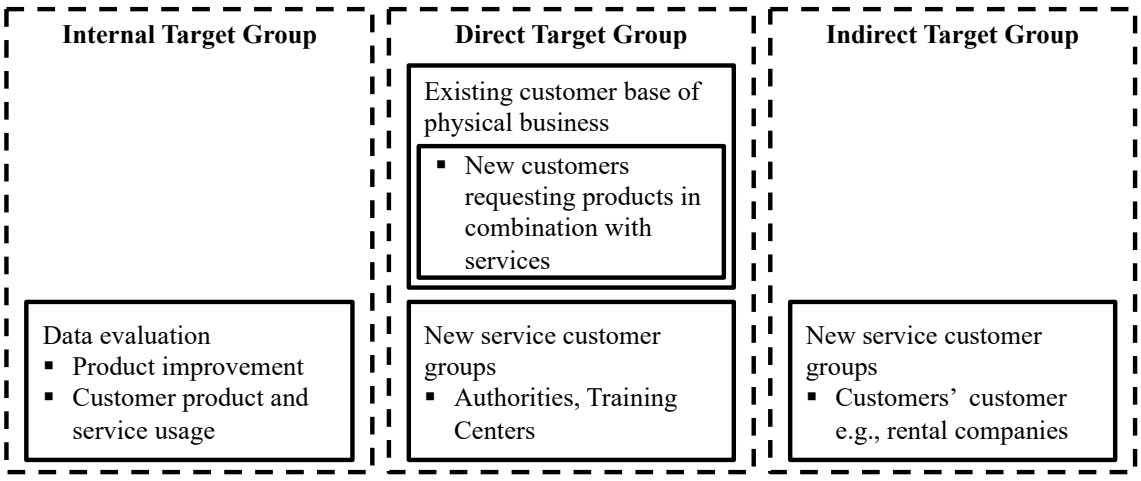

Figure 19: Target Customer Groups

services can cause issues, e.g. the enabling connectivity and mobile network operators. As already discussed, the conveyor technology and agricultural technology cases had an indirect sales model and changed to a hybrid sales model with direct sales of services. In this case, the salesperson or subsidiary often does not know the reasons behind the issues and must refer directly to the manufacturer for troubleshooting.

Limited attention has been directed to these aspects of customer support, which emerged as a new element in the case study companies Research to date has identified that 24/7 support is a relevant provision in service-based business models (Visnjic et al., 2016; Forkmann et al., 2017; Hasselblatt et al., 2018; Raja et al., 2018). Evidently different levels of support are required to ensure a fast and effective solution to customer issues. The case companies were required to introduce a first-, second-, and partially third-level support, with a regional first-level support being as close to the customer as possible for basic issues, followed by a second-level support at the focal company for complex issues. Third-level support is in the form of the direct developers of services who provide in-depth knowledge in problem solving. The reason for a decentralized support structure based on the experiences of the construction machinery case is the already mentioned proximity to the customer as well as the linguistic advantages. The change of the support structure requires additional training, especially for the local (first level) support, which had not been fully implemented in all cases by the end of the interview program. Different tools were developed by the conveyor technology and agricultural technology cases – for example, a ticket system, where contact persons of the customer can create tickets and receive an answer in the shortest possible time from the next level support. Additionally, the agricultural technology case developed a tool for their dealers to monitor the

customers' machines and services in case of any failure so that the dealer knows exactly the relevant information about the machines and services including their error messages. In parallel, the companies offer a service hotline for their customers but the required resources in the second- and third-level support are not fully established. The key contribution of "customer support" includes a level support structure supported by different tools, especially for the first-level support close to the customer (ticket tool, information tool). Companies should take into account that the first-level support needs to be regional and decentralized. The case study companies clearly show the significance of the customer relations dimensions including sales and customer training, life cycle management, and customer support. A further critical dimension was organizational/cultural, as explored below, and its contribution to how to separate the critical service department from the legacy business model, as well as how to overcome the cultural barrier in servitization.

8.1.2 Organizational Design and Cultural Management Dimension

The second dimension is the organizational design and cultural management, capturing how companies have structured themselves for the hybrid value proposition in terms of the use of their own resources solely for services and shared resources responsible for the product business, as well as for service business. In this context, cultural management is discussed as a factor that has a vital influence within the organization. In this dimension, the case study companies revealed decisive changes in the (I) Division and Resources as well as (II) Cultural Changes in Servitization. Figure 20 summarizes the key insights on the dimension and the discussed contributions.

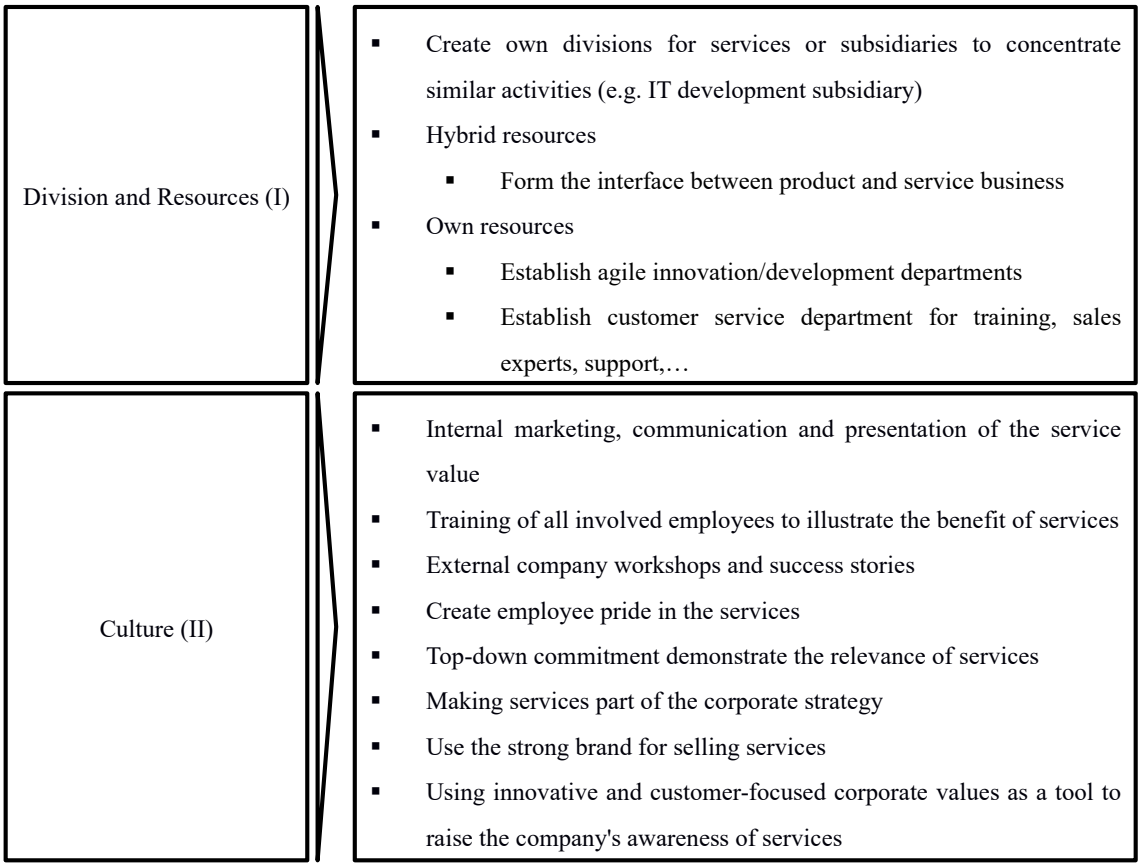

Figure 20: Summary Key Insights into Organization and Culture Management

I: Division and Resources

The case study companies all have global imprints and are market leaders in a number of areas of their product-based business. As most of their services are based on their product business, they have decided not to establish a spin-off but rather have built their own agile divisions within the organization. These range from individual departments (e.g. product/service management or service specialist for support in the construction machinery case) up to own organizations, which are responsible, for example, for the software development tasks (e.g. in the agricultural technology case).

The literature has discussed the separation of new ventures. Some researchers advocate the separation of the new business model in a spin-off, favoring the introduction of the new business model as an autonomous unit (Christensen and Raynor, 2003), whereas others suggest its integration in the focal company (Brown and Eisenhardt, 1997). The separation thesis gives the new venture the freedom to build up processes alongside the legacy business but to align with the requirements of the new value proposition (Charitou and Markides, 2012) with a fundamentally different value chain (Porter 1980, 1996) and company structure (Christensen, 1997). Govindarajan and Trimble (2005, 2010) recommend an approach in between and make a compelling case for maintaining some degree of integration, because full isolation will tend to minimize any strategic benefit that the innovative activity might glean from its association with the legacy business. The cases in this study largely follow this approach, as the services have emerged from the products and depend very much on them, with no option to either separate the processes and resources completely from the legacy business, or to integrate fully without a certain separation of processes and resources. Kowalkowski et al. (2017) recognized the

organizational ambidexterity of services in product-centric firms, later reaffirmed by Kohtamäki et al. (2020) who identified four paradoxes between efficient product-based business and a modular customer-oriented service business model in parallel. Additionally, nine coping practices were elaborated. Following the call for further research in managing dual business models (Markides, 2013), the cases contribute to the recent research of Kohtamäki et al. (2020). While these authors have identified the paradox of organizing for product and service integration vs. separated service and product organizations and the coping practices cross-boundary personnel as well as cross-boundary routines, the cases of this research contribute further to unpacking how they cope with the ambidexterity associated with the specific paradox. All the cases established certain service departments as their own service resources, especially for product management, training and support management (service specialists for sales, second-/third-level support) of the service portfolio as identified by Kindström and Kowalkowski (2014).

In contrast to the literature and the recommendation to spin-off of service development units, all the main case study companies established or acquired IT (software/hardware) development companies as subsidiaries with close interfaces not only to the service business but also to the product business. In other words, the companies bundle the development activities not based on services or products but based on topic-specific aspects, and in this case, IT-activities. Urbach et al. (2019) has identified the significance of capability in agile development in IT, which is also confirmed by the cases. Particularly when it comes to the development of services, all main cases mention different development cycles reaffirming the work Dmitrijeva et al. (2022) who noted key tensions

between the different cycles. The case study companies indicate that products go through a multi-year development process, whereas services are sometimes developed within months, or are subject to continuous development. A merger of the cycles therefore makes sense, not only in terms of resources, but also in terms of the simplified processes. This reduces efforts in coordination and results in a perfect match between product and corresponding service. The agricultural technology case additionally acquired a software company responsible for a pure software value proposition similarly to the conveyor technology case with an IT department at the parent company. Agile IT development also required changes in the departments within the company, the most pronounced of which can be seen in the conveyor technology company where development and operations (DevOps) teams were established. This is something mentioned by Urbach et al. (2019) as a recent development in IT but has not been considered thus far in the business model literature. Due to outsourced IT, the conveyor technology case saw the need to establish the DevOps team with developers from IT and employees close to the market for a target- and customer-oriented development of new services that do not overlook the prospective customer benefits. A digital campus was therefore founded for designing new services concepts or strategies.

II: Cultural Changes in Servitization

The cultural aspect of servitization appears in the interviews as one key challenge and barrier for successful transformation to a solution provider. All of the cases were product-oriented since their foundation decades ago, with employees having built up an intense sense of pride in and loyalty to the product. The introduction of services was judged as something non-tangible and therefore was not taken seriously by most employees. Middle

managers therefore had to make a great effort to convince their colleagues, as well as the management board, of the necessity of services as an additional value for their customers and corporate growth. Researchers agree that business model innovation in general (Hock et al. 2016), and the introduction of services in particular, have an impact on the organizational culture (Gebauer et al., 2005, Palo et al., 2019), one that is mentioned as a key barrier to business model innovation in general (Friedrich von den Eichen et al., 2015) and the successful introduction of services (Oliva and Kallenberg, 2003; Fang et al., 2008; Finne et al., 2013; Bashir et al., 2020). Although culture is often not considered as a business model element, Kindström and Kowalkowski (2014) highlight it as a critical enabler for servitization. Further research on the business model and its innovation subsequently took more account of culture (e.g. Hock et al., 2016; Bashir and Verma, 2019; Bashir et al., 2020). However, most papers mention the organizational culture as a barrier but do not discuss what capabilities are needed to successfully drive the change. Achtenhagen et al. (2013) detailed the value creation process and identified the critical capabilities of communication, disclosure of service strategies, and involvement in decisions that help to overcome the cultural barrier and encourage employees to get involved in services. Additionally, clear leadership also supports the commitment of employees. Kindström and Kowalkowski (2014) also explore the cultural aspect, considered as part of a multidimensional business model perspective. A more recent paper from Tronvoll et al. (2020) confirms the product–service balancing act and highlights the significance of customer focus for successful service development.

The current research confirms the findings of this recent work and contributes with additional insights highlighting customer culture as a decisive success factor for

servitization. The case study companies report a cautious attitude and distrust on the part of the customers towards services due to transparency concerns of their processes and data. Cultural change must also extend to customer communication and management to foster openness toward services and build trust in anonymized data storage and processing. The interface with the customer, whether that is the salesperson or a branch office, can provide security here and promote a cultural change for the customer. The strong brand from the product business is also used to support the acceptance of services on the customer side. Within the focal company the cultural change can be driven by success stories, external speakers, and by demonstrating to employees how useful and important services are. This can also awaken pride in the innovation and services, which was one key enabler in Case A. Many employees have worked for the company for many years, even decades, resulting in great pride in the product, pride that must also be aroused in the context of services. In addition to the training for employees, they also have the opportunity to experience the services and learn and see the added value they bring, reinforcing the findings related to training discussed previously. Case A also changed from the recruitment of skilled workers from the same industry to hiring skilled workers from digital fields. Such diversification of talent inputs is known to be important in softening entrenched cultures (Schneider et al., 2013). Along with new processes for cultural change, interviews indicated that corporate values helped support the acceptance of services. Companies like Case A, with values completely focused on customer benefit, seemed to accept services more easily, as every activity is aligned with the customers' job-to-be-done, thereby confirming the findings of Tronvoll et al. (2020). Accordingly, customer centricity is anchored in the corporate values. Finally, the top-down commitment to services and anchoring in a long-term strategy has a great impact on

cultural change. The construction machinery case has even changed its overall strategy statement from being a product supplier to a solution provider, demonstrating the high value placed on services in corporate policy and thereby promoting cultural change. In addition to organizational and cultural challenges, the introduction of data-driven services also entails legal challenges that arose in the course of the introduction and further development of the services. The key contribution to the existing body of literature is discussed below.

8.1.3 Legal Management Dimension

To date, considerations of data privacy and resulting implications for the business model have largely been absent from research. Figure 21 summarizes the three key categories as well as noteworthy lessons learnt related to legal management. Some researchers report new legal skills associated with services (e.g. Weigel and Hadwich, 2018), but do not

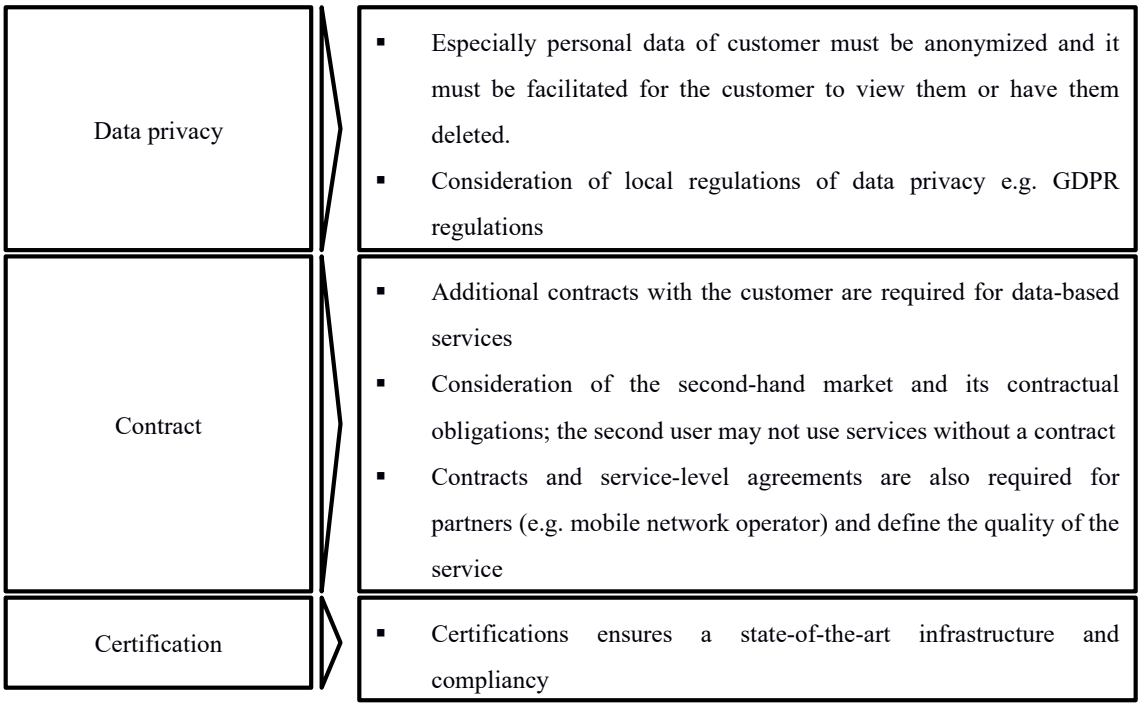

Figure 21: Summary of Key Insights into Legal Management

elaborate upon these further. Others point out that data security plays a vital role in new service businesses and should be further investigated (Frank et al., 2019) as they have a major impact on cooperation and networks (Hasselblatt et al., 2018; Favoretto et al., 2022). Porter and Heppelmann (2014) hinted early on that data privacy and capabilities to ensure a secure concept of data management allowing for different data categories would be significant, something still not yet reflected in research emphasis. This research indicates that service business models are threatened when data privacy and management regulations are not appropriately considered. As matured services use not only machine data but also other data categories, including customer data or process data, they are subject to special protection, for example under the GDPR. This jeopardizes services that do not take the regulation into account when developing new services or do not change existing services. This need for adaptation was reported in one case and had to be adapted at short notice before the GDPR came into force. Data could therefore no longer be used to its full extent and new standards had to be taken into account with regard to data protection and the obligation to notify authorities in the case of customer data leakage. This results in additional effort to establish IT-related processes and resources to comply with the new standards and establish relevant IT-interfaces with the authorities. But it was not only IT-related resources that had to be developed. As the demand and uncertainty of privacy data topics have drastically increased, all three case study companies established new roles in the legal department (e.g. Data Protection Officer) to explicitly take care of these issues. Therefore, an ongoing exchange with local law firms was required to obtain the local conditions in each respective market. The new roles are also responsible for communication and training, especially for employees related to the existing value propositions, but also in what needs to be considered for the new service value

propositions. Additionally, great effort must be expended on the IT-side to ensure the encryption of data and establish processes for the deletion of the data, should the customer demand. An additional consideration is that as previously inaccessible target groups (e.g. tenant of a leasing company, second-hand market) can be reached with the data business, the company has to ensure that the data of the previous user cannot be viewed. This was highlighted by all cases and several activities are required not only technically (registration/deregistration of customer, activation/deactivation of SIM card in the product relevant for sending and receiving data) but the preconditions must be stated in the contract and designed in such a way that all service-related accounts have to be disabled or the sale of the machine must be reported to the OEM in order to prevent any data abuse. The assurance of the internal processes regarding data protection are ensured in the construction machinery and conveyor technology case by certifications and accreditations. This ensures a legally compliant and contemporary standard of data and emergency management in case of system abuse. Both companies highlight the need to work with external institutions to increase their customers' trust.

Likewise, the literature has not considered the challenges of the OEM's service offering and its registration in the respective target market. The data indicates that legal conditions in target markets must be continuously monitored, either by the company's own employees or through consulting partners. Legal requirements can reach so far that local subsidiaries in the target market have to be established to be allowed to offer the telemetry-based services. This is not only important for selling the service initially in a market, but also to ensure maintaining the functionality wherever the customer uses the service. In contrast to the product, which can be used worldwide, a service is restricted

and legally bound by local regulations. Therefore, a company must ensure the legal compliance of data-based services also in the customers' target markets. The monitoring of the local legal conditions based on the experiences of the construction machinery and agricultural technology cases, creates a new task for the entities in the target markets, and resources (employees, financial) must be made available to comply with the legal requirements. The conveyor technology case with its affiliation to a parent company reports similar legal issues but uses the central organization and capabilities of the parent company for this purpose.

Another key aspect evident from the cases and similarly underexplored in the literature is the complex contractual matters when selling a product equipped with sensors and connectivity as data is basically sent and requires the acceptance of the customer. The companies had to establish resources and processes to comply with the legal basis in their markets and develop an additional contract and *Terms and Conditions* or *Terms of Use* that the customer must sign off from, in addition to the contract concerning the machine itself. The cases report that these additional service-related contracts include sections concerning the already addressed obligations of the customer in case of a sale, what data are transferred but also the data protection standards. When it comes to these sections of the contract, the construction machinery and conveyor technology cases report that although own contracts and data privacy sections were designed in their contracts, the customer prefers to use self-created contracts that better meet their needs in terms of data security and data sovereignty. This entails further audits and processes to ensure that the OEM does not sign contracts with sections that endanger their own interest. Additionally, they have to ensure that there is a certain standard across all contracts between the OEM

and its customers to ensure standardized processes and rules for the service internally. Otherwise, for example, data encryption, data management internally or externally etc. would have to be managed in a customized fashion with great impact on the overall business case.

Finally, the construction machinery case mentioned service level agreements (SLAs) between the OEM and mobile network operator (MNO) as being a crucial agreement to maintain the service. As services intervene deeply in the customer's operation (Oliva and Kallenberg, 2003) the OEM has the responsibility for a reliable operation of the service. As the operations also depend on key players like the mobile network operator, service level agreements *"[…] define, clarify, and set the expected service level"* (Parish, 1997, p. 287). Weigel and Hadwich (2018, p. 257) identified the SLA as a success factor for servitization, arguing that it is *"[…] essential for service networks due to the intangibility of services and the accordingly difficult control of the services provided by* [the] *partner firm"*. This was also identified by the construction machinery case, albeit still lacking sufficient implementation between the partners in the ecosystem. This shows the negotiating disadvantage between the machine manufacturer and the mobile communications operator, which is due to the relatively small number of connected machines. Compared to the high usage rate of, for example, private individuals through smartphones, the machine manufacturers provide less of a financial gain but rather promote the image of the mobile communication provider through its cooperation with a well-known manufacturer.

This all plays a part in transparency and ensuring the trust of customers in engaging with this new service value proposition and equally provides additional comfort for employees who are already anxious about the change and the organization skill set to deliver upon it. While legal management is omnipresent in all business, it is embedded in terms and conditions as part of product management, while becoming more front and centre and requiring active management in the context of the transition to service provision. The legal challenges also go hand in hand with the expansion of the ecosystem, which is detailed in the following section.

8.1.4 Ecosystem Management Dimension

The last dimension summarizes resources and processes relevant for ecosystem management. The analysis of the cases results in different categories adapted from Moore (1993) and Heikkilä and Kuivaniemi (2012) of (I) Core Business; (II) Extended Enterprise; and (III) Business Ecosystem. Figure 22 summarizes the key insights into the ecosystem management and highlights the lessons learned from the cases.

The services offered by the cases are beyond the core business and require new technology, cooperation within the existing ecosystem, and also new ecosystems. Accordingly, all cases had to profoundly adapt their ecosystem. In addition, new collaborations have emerged internally (e.g. in the company group) or externally to equip the machines with sensors for sending data via the Internet and enable an even better customer experience for existing customers or expand the customer base and segments. Kindström and Kowalkowski (2014) already highlighted the value network as a relevant business model element and its resources of distributor network, customer interface,

specialist supplier base, and influencer relationships. Basically, with rare exceptions, companies are not in the fortunate position of being able to develop and manage the IoT self-sufficiently rather than relying on an ecosystem of different stakeholders (Paiola and Gebauer, 2020) as the case studies also show. However, the case analysis makes clear that, on the one hand, a more comprehensive view of the ecosystem is required but also that a fine-grained view of the network is necessary, as changes were needed in different areas of the business model, which also opened up opportunities for revenue streams or strategic partnerships. The above-mentioned three layers of Heikkilä and Kuivaniemi's

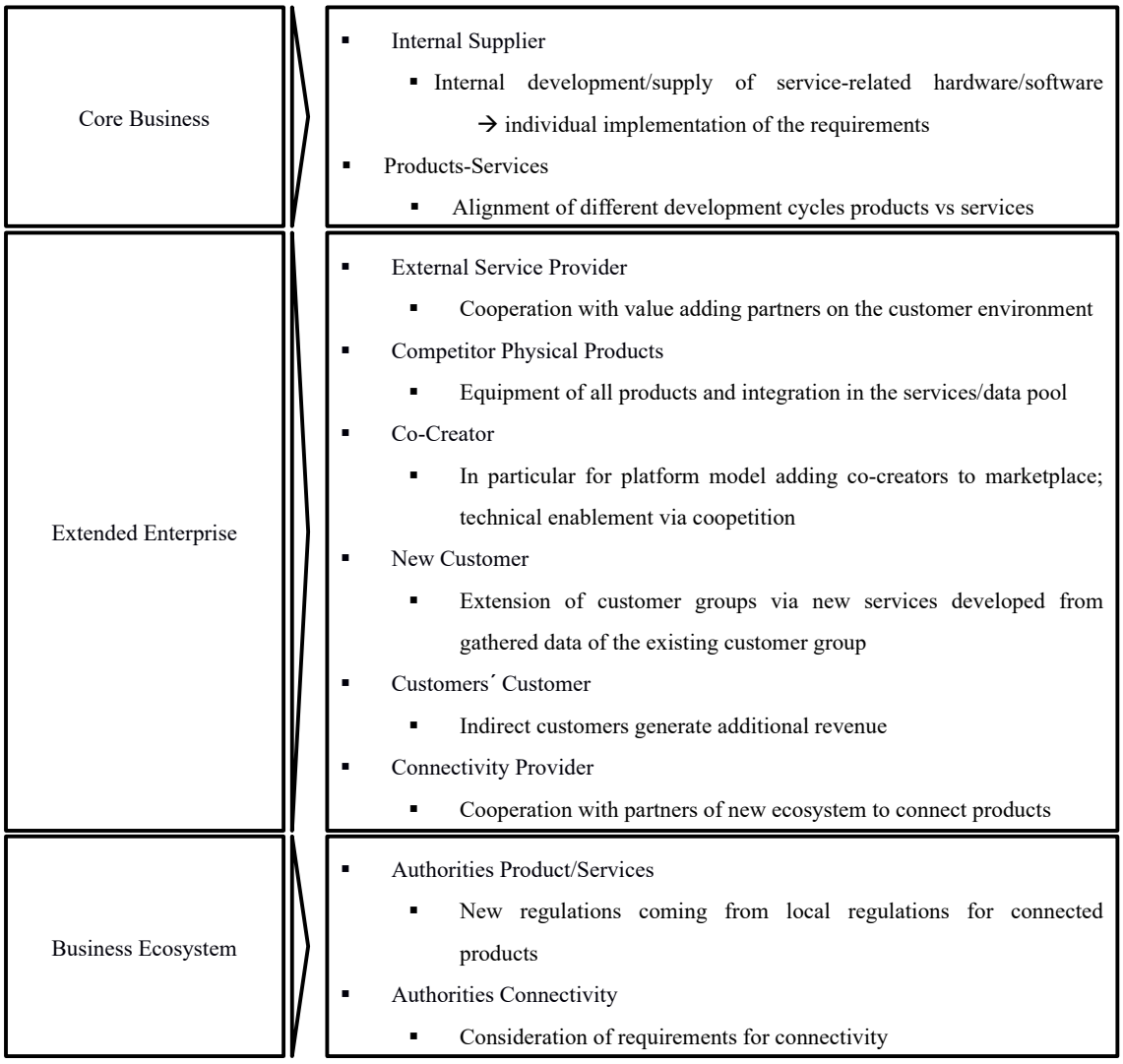

Figure 22: Summary of Key Insights Business Ecosystem

(2012) approach help to generate this more detailed view and elaborate the contribution. In this context, Adner's (2012, 2017) thoughts of risks in the ecosystem, as well as the ecosystem as a structure, are considered as reflecting the need for further research in relationships and cooperation beyond the borders of the focal form, with explorations of how interdependencies influence the value creation and delivery in new businesses becoming increasingly important in digital business (Adner, 2017; Jacobides et al., 2018; Lanzolla and Markides, 2021).

Considering the cases' core business and physical products, the enabling technology of data-based services are the installed sensors and additional equipment required for collecting and sending data to a back end. The advantage for the case companies is the size of their business and, ideally as the structure of Case A shows, a company group consisting of various industrial sectors. Hence, much of the needed equipment can be developed or sourced internally. Since much, but not everything, can be developed in-house, a part must still be sourced from outside the group and these suppliers become new key partners for the core business and technology suppliers for the new product–service business (Paiola et al., 2022).

The extended enterprise includes customers, complementors, second-layer suppliers, and standard-setting bodies (Heikkilä and Kuivaniemi, 2012). This investigation extends findings through a more fine-grained view in this context. A particular contribution is made by the findings that companies should pay attention to connecting competitors' products, expanding customer groups, connectivity providers, and co-creators. The existing body of literature has so far insufficiently considered these elements of

development. According to the data, the relevance for the OEMs in also connecting competitors' physical products became highly significant. The literature designates this phenomenon as "horizontalization" (Bundschuh and Dezvane, 2003) but relates it more to the general skills of maintaining a competitors' products as a service contract as discussed by several researchers (e.g. Perminova-Harikosk et al., 2015). In the given context of servitization, Paiola and Gebauer (2020) highlight the capabilities needed to manage competitors' products but do expand further. Here it should be emphasized that companies not only benefit from another revenue stream of selling the physical hardware to connect with competitors' products, but also through collecting data from these products and enriching the overall data pool for more accurate services. The customer also benefits from a service across the overall fleet, which might lead to an increased lock-in effect.

The second take away from the extended enterprise refers to the expanded customer groups. Notably, the construction machinery case saw the opportunity to create new digital offerings for customer groups not previously served, such as driving schools. This kind of value proposition goes far beyond conventional consulting services (Tuli et al., 2007) for existing customers and creates additional revenue streams. Also, in this category the additional revenue stream is established from indirect customer groups (Dube and Helkkula, 2015) mentioned above, which has not yet been considered in the literature. As a third element in this circle, the co-creators are to be emphasized, and they contribute significantly to the delivered customer value. The cases must rely on companies and technologies with whom they have no direct influence but rather have to partner in order to provide the customer a more advanced service or establish technology

standards in the industry. With reference to the former, the construction machinery case established a partnership with another player on the building site to connect their systems with the proprietary system and sell the whole product and service in a “one face to the customer” relationship. The latter point refers to the lack of standards and the efforts of companies to develop or adapt to them, especially when it comes to a marketplace, which would not work without universally applicable technical standards across all participants. The weak point of standardization was addressed, e.g. by the agricultural technology company who recently started a cooperation with a direct competitor to set a standard of data transmission between both companies. Both points have so far been considered only rudimentarily in this context. Jacobides et al. (2018) have taken up this issue and describe technical standards as an essential part of an ecosystem and platform development. In addition, Teece (2014) highlight the necessity for standards and management in an ecosystem. The results of the case studies confirm the researchers’ findings and add that standards and collaboration with others lead to a strategic advantage in the development of a platform ecosystem. This finding also provides evidence to answer a question identified by Hasselblatt et al. (2018) in the case analysis of who can take on the role of the leading ecosystem provider. A precondition for the connected services is the connectivity and the mobile network, which is provided by the mobile network providers. The fundamentally new actors in the digitalization (Sjödin et al., 2022) and servitization of the case companies are also to be assigned to the extended enterprise as the intersection with the new ecosystem. Companies need to pay special attention to these actors, as connected services are dependent on mobile data communication. In this context, Adner’s (2010) co-innovation comes into play. However, in this instance, the case studies are subordinate and have a weak negotiating position vis-à-vis the mobile network operators.

The cases reported from a monitoring of trends in the telecommunication ecosystem and must equip or retrofit their products accordingly in order to be compatible with new transmission technologies in the long term (e.g. shutdown of the 3G network). This point has been largely disregarded in the literature but for the case study companies it serves as an elementary building block for success and quality, not only concerning trends in the ecosystem but also the SLA mentioned in the legal management dimension section. Finally, the new customer group as well as customers' customers belong to the extended ecosystem and are listed here for the sake of completeness. A description of these two groups has already been given in the section above (see 8.1.1).

Finally, the outermost layer represents the business ecosystem and actors in this layer coming from the case study companies are authorities for both the new product–service business and the connectivity itself. As per Heikkilä and Kuivaniemi (2012, p. 20) these actors *"[...] are perhaps not directly involved in the business operations [...] but may have a significant effect on the success of the business"*. The construction machinery and conveyor technology cases in particular highlight authorities as a significant new decision-maker in the ecosystem of servitization with regard to granting the permission to offer services at all levels in the corresponding target market. This outer layer, and its two take aways from the cases, has not yet been considered in the literature but has a great impact on connected services. Companies need to strategically expand their ecosystem while considering regulatory authorities, particularly for data-based services and data exchange via mobile networks in collaboration with mobile network providers.

8.2 Evolutionary Innovation Process of Service Business Model

Teece (2017) highlighted that the survival of the business model requires adaptability to ongoing changes. The ongoing changes are clearly evident in all cases. This section deals with the research question of how the business model innovation is successfully incubated and scaled. To discuss this question sufficiently, the findings from the previous content section 8.1 must be included, as well as the context question of why firms come to undertake such initiatives, in order to obtain a complete picture of the evolutionary development. The findings highlight evolutionary changes as a necessity for the case companies to remain competitive. Different factors triggered the evolutionary process catalyzing the case organizations to introduce radical services and adapt their business model, not only with respect to a few elements, as implied by the definition of business model innovation (Lindgardt et al., 2009; Bieger and Krys, 2011), but fundamentally in its structure as aptly reported by an interviewee, who explains that almost everything (processes and resources) is linked to the new business model (Interview 1S). Coming from a pure physical product business model with incremental services (e.g. maintenance contracts), radical service innovation requires an extension and minor innovation of the legacy business model as the first step. From that point, the business model innovation evolves over time to the point where it becomes a hybrid or two parallel business models, as described by Palo et al. (2019, p. 486) with *"[…] one existing and dominant; one emerging"*. The case study analysis shows that introducing radical service innovation in parallel to a legacy product-based business model requires time and profound organizational change to implement the new value propositions. In contrast to physical value propositions and s-curve innovation (Foster, 1986; Christensen, 1997), which often undermine incremental updates until the next leap in technological innovation occurs, the

case companies instead appear to go through an ongoing evolutionary process that continuously expands the service portfolio and adds new features. This requires ongoing adaptations in the organizational structure, the activity system, as well as the ecosystem.

With regard to the business model innovation, the key insights from the cases are that companies pass through four fundamental and distinguishable phases of (I) technological enablement, (II) monetization and strategy alignment, (III) service growth, and (IV) platform strategy to achieve the current evolutionary stage of servitization. Furthermore, it turns out that every phase of the evolutionary process was triggered by inner and outer contextual factors. The second notable insight refers to the content and the fact that the servitization process does not fully establish all the innovation dimensions and their factors at once, as discussed in the preceding section. Rather the dimensions are developed to varying degrees throughout the entire evolutionary process, influenced by the contextual forces at play. Interestingly, it was also clear that, at the beginning of the servitization, most of the activities are located in the legacy business model. A separate

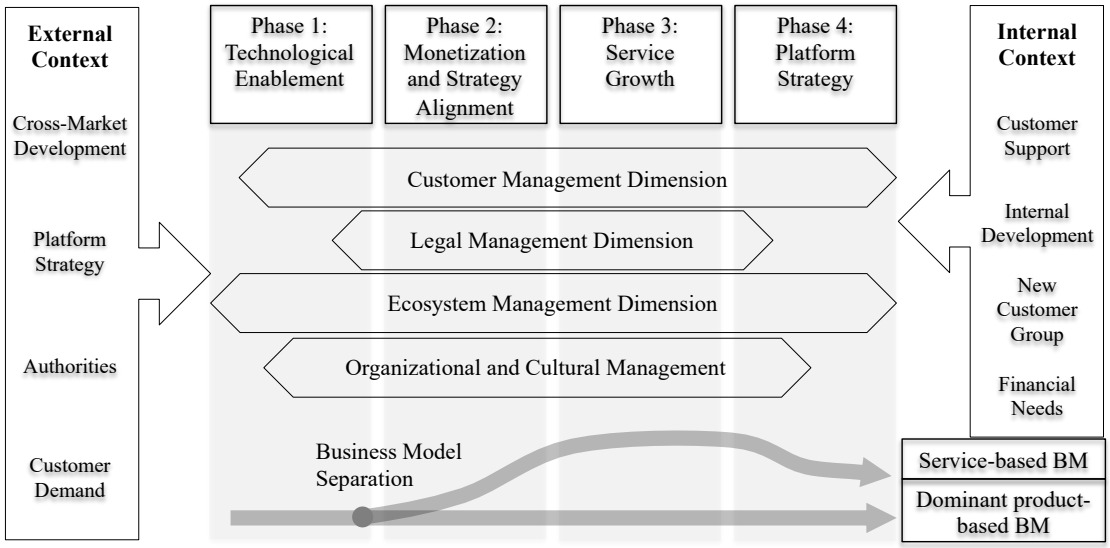

Figure 23: Evolutionary Servitization Road Map

service business model emerges, which becomes increasingly distinct from the product business until they converge again in the final phase (see Figure 23). Consequently, the discussion of the evolutionary innovation process draws together the findings from the content discussion and examines what contextual forces influence which innovation dimension and lead to the four evolutionary stages of servitization.

The findings that business models evolve over time is not new. The literature already provides insights into the business model innovation process (Wirtz and Daiser, 2017) and highlighting that business models undergo a continuous development process (Chesbrough and Rosenbloom, 2002; Demil and Lecocq, 2010; Gebauer et al., 2020a; Paiola et al., 2022). This research aligns with Demil and Lecocq (2010) and their dynamic perspective of business model evolution as *"[…] a fine-tuning process involving voluntary and emergent changes in and between permanently linked core components"* (2010, p. 227) so that it *"[…] has to be thought of as sequences that encompass intertwined determined and emergent changes affecting core components or their elements"* (2010, p. 240). This is also true for this research, with particular consideration noted of the contextual drivers illustrating how the four introduced phases emerge, and each phase shows a further degree of evolution of the business model and the corporate strategy. This observation of a staged innovation process is in line with findings in other research projects (Khanagha et al., 2014; Baines et al., 2020; Paiola et al., 2022). However, they show no consensus on how the organization and the business model evolve over time by including both the context and content perspective.

Academic research has already conducted initial studies in evolution models and spawned the first approaches in the context of Industry 4.0 and servitization (Frank et al., 2019; Baines et al., 2020; Budler et al., 2021; Tian et al., 2022). Although Martinez et al. (2017) argue servitization is an intuitive and unstructured process, the case study analyses by contrast illuminate that the innovation process follows an orderly structure to a certain degree, one with slightly differing degrees of emphasis within the four phases. This is especially the case in the context of the first stage, with an appreciation for the different initial conditions of each company – e.g. the direct sales approach of the construction machinery case vs the indirect sales approach of the conveyor technology case. Nevertheless, clear demarcations between the phases can be observed. In the beginning, the cases first had to enable the organization for data-driven services from a cultural and technological perspective. A clear characteristic of the second monetization phase is the strategic change and commitment to services and the change to services directly offered and charged to the customer. This is a company-internal precondition across all cases to finance further development and the extension of services. The third service growth phase is characterized by additional services and also cooperation with stakeholders to offer more advanced and connected services across different products and platforms, as the agricultural technology case shows through a cooperation with accessory equipment or the construction machinery case with value-added supplier on the building site. Finally, the latest phase of the platform strategy consists of patterns that come to light as the companies organize themselves to build the company's own platforms that other stakeholders can connect with in the future regardless of whether they want to sell products or services. Similar approaches can be found in the literature, e.g. by Palo et al. (2019) and their research on an emerging business model in parallel, patterns of business

model innovation in the context of the IoT (Markfort et al., 2022), and evolutionary stages of the business model (Baines et al., 2020; Paiola et al., 2022). Baines et al. (2020, p. 3) has also adopted the context, content, and process approach, and argues that *"[...] organisational change occurs as an interplay between the context, process and content."*. These researchers also identified four stages of exploration, engagement, expansion, and exploitation in order to achieve a certain business model evolution stage. Secondly, they found that customer pull, technology push and value network positioning as external context factors, as well as organizational readiness and organizational commitment as internal contextual factors, influence the transformation process, something equally echoed in the current research.

However, it also becomes apparent that further forces are relevant in the service process as Figure 23 depicts. Paiola et al. (2022) likewise identified phases in the servitization process and refer to these as inception, experimentation, and replication. Each of the three stages includes a certain structure of the business model with its strategy, components, and organizational structure. The researchers highlight that the success of servitization is dependent on the existing business model resources, as well as the top management commitment, which helps to use synergies between the existing and new business model and at the same time separate resources to the necessary degree. The findings also show the dependence and use of external technological suppliers, which contribute to the focal companies' learning process. Finally, the customers play a decisive role in the evolution of the service business as they trigger the innovation, and this supports previous research on this topic (e.g. Foss and Saebi, 2017; Sjodin et al., 2020). The identified key papers reflect the relevance of further research and indicate that the steps identified in the present

project are broadly in the same direction, but the given context provides further insight into the innovation journey. In particular, the data show that the cases and their business models are subject to an ongoing process of developing the business model further and are consistent with the existing body of literature (e.g. Christensen and Overdorf, 2000; Kindström 2010) and also confirm the significance of phased innovation (e.g. Paiola et al., 2022). It is to be emphasized that the case analyses revealed the four evolutionary phases, starting from the introduction of the enabling technology through to a profound platform provider. Manufacturing companies and the corresponding ecosystem (e.g. customers) seldom have the necessary infrastructure or the processes or capabilities upfront to offer services, as an overview of different readiness factors by Paiola and Gebauer (2020) discusses. The data reveal how the cases have developed further within each phase to achieve the business model readiness driven by contextual factors. In the case of the agricultural technology company, for example, the services were only introduced as a result of these internal forces or, in general, the services were expanded as a result of the external forces of the customer demand for more integrated services beyond pure machine data, through further data. In contrast to Baines et al. (2020) and the identified phases of exploration, engagement, expansion, and exploitation, the phases of the evolutionary servitization road map expand the macro-level perspective and put the fundamental servitization process in the center of consideration. The following section discusses the four phases in greater detail, including what contextual forces are particularly prominent as well as how the innovation dimension and its factors are of importance in the respective phase.

8.2.1 Contextual and Content Implications of the Four Phases of Evolutionary Business Model Innovation

The evolutionary process of servitization in the case companies is a complex organizational reality. It commenced on the basis of project-based inwards or outwards directed service value proposition for individual target markets in the first phase, moving on to an enterprise- and ecosystem-spanning revolution with a profound strategy realignment in the fourth phase, aiming to further expand the market position in the long term. In doing so, the companies show a gradual implementation of service-related resources and processes in the existing business model as a reaction or proactive response to contextual forces. Only then are pure service-related resources with their own processes established, resulting in a hybrid business model rather than a product-intentioned one that also generates services. The four identified phases represent not only business model innovation stages, but rather an ecosystem spanning the further development of the servitization. A mere innovation of the business model is not enough to develop the services to the next quality level. The case studies demonstrate that the service concept is subject to continuous evolution contingent on both internal strategic decisions and equally contextual forces (e.g. new guidelines from the authorities). Importantly, the research indicates that contextual forces change over time and lead to an ongoing further development of the servitization. Basically, the companies show two types of behavior in response to the changing context. First, the cases act proactively (see Markides, 2006; Witz et al., 2016) in certain circumstances (internal context) – for example, by adapting their strategy to gain a strategic advantage (e.g. cooperation with partners on the building site). Second, the companies have to react based on external forces (context) e.g. a changed legal framework described in the literature as a business model evolution (Saebi

et al., 2017). Both patterns of innovation and evolution can be recognized in the cases and occur during the four phases with the effect that the servitization is constantly evolving. In sum, the case analyses disclose cross-market development, platform strategy, authorities, and customers demand as external contextual forces, and customer support, internal development, new customer group, and financial needs as internal contextual forces.

The stakeholders (employees, customers, partners) in general occurring as an influencing variable along the innovation pathway significantly determine the course of the servitization in two ways. First, the technological development has a key role among all those involved in building up the required infrastructure for data-based services in the beginning – for example sensors on the product – and also later on in the process for advanced and comprehensive services in cooperation with other value-added providers, as in case of the construction machinery company. Second, the technological development in other ecosystems has an impact on the focal business. As the offered services are reliant on mobile data, the technological development of the new telecommunication ecosystem can determine the success or failure of an entire business model when the compatibility of installed hardware in the field is no longer guaranteed (e.g. shutdown of the 3G mobile radio standard) (see co-innovation and adaptation chain risk (Adner, 2012)). Additionally, servitization also requires the soft factors of corporate culture and human resource management (Homburg et al., 2003), which are not only valid for the focal company. The cases also report a required cultural change of their customers, especially when it comes to data security concerns or the confidence in service (Kowalkowski et al. 2017). Similarly, partnerships require a culture and understanding of

values that have led to complications, especially in the case where there is no common understanding of cultural values, as one of the companies shows. Thus, it turns out that the early involvement of intrinsically motivated employees predominantly determines the course and speed of innovations.

8.2.2 Technological Enablement Phase

The two categories of contextual forces occur without identifiable sequence in all four evolutionary phases. In the first technological enablement phase, a proactive and reactive innovation were initiated by the desire to fulfil a customer (internal and external) need based on data that are not yet relevant to a new revenue stream. It is very apparent from the interviews that the companies required these isolated triggers identified by intrinsically motivated employees. Without these assertive employees, the foundation for innovation would not have been laid (Burgelman, 1983). It should be emphasized that based on this decisive step, which was not initiated by the management but by the operational areas, services are gradually gaining recognition within the company and already gaining importance. It is remarkable, that the monetization of services was not the decisive point for the introduction of the services and was only later considered relevant. This enabling phase, inspired by a technological enabler for business model innovation (Bashir et al., 2020) or smart solutions (Kohtamäki et al., 2022), is driven by the contextual factor of newly identified customer value propositions. *In line with Baines et al.'s (2020) focus on the exploration phase*, as well as Paiola et al. (2022) and the inception phase, the technological enablement phase is the first introduction of data-driven services on a small scale. It is important to emphasize that the contextual force can be a value proposition for both sides – the internal one to learn more about the own

physical products (Williams, 2007) as well as for direct customer value propositions. A key insight is the intrinsically motivated employees from the operating business, who identified the need and are responsible for the start of the servitization (e.g. employees of the conveyor technology case who identified the customer's need in one target market). Their assertiveness and persuasiveness Compared to product business and internal marketing, their assertiveness and persuasiveness to show the need and benefits is what makes success possible for the service business and for further development of the date-driven infrastructure. These intrinsically motivated employees are key to innovation (Coelho et al., 2011) and are in all cases located in the operative business and thus initiated the development bottom-up. In addition, they have decisively driven forward cultural change and act in accordance with corporate values that place a clear focus on the customer, especially in the construction machinery case. It is well known that cultural readiness and the corporate values accompany the power of innovation (Palmer and Kaplan, 2007) and it turned out that corporate values focusing on customer satisfaction and innovativeness favor the impetus for development, especially in this phase. These intrinsically motivated employees override all internal concerns as cultural barriers (Barquet et al., 2013) and drive the implementation and further development forward. The primary data show that the main challenge is related to the as of yet rigid product-based business model, which has focused purely on products for decades with proven resources and processes. This includes already known barriers such as cultural barriers (Friedrich von Eichen et al., 2015), organizational and cognitive barriers (Foss and Saebi, 2016), technological barriers (Lopez et al., 2019), and ecosystem barriers (Wessel and Christensen, 2012). Notable in this phase is that key employees had the challenge of standing up to the cultural hurdle and doing some persuasion work. It was

not until later in the process that the commitment of top management and anchoring in the corporate strategy came about.

Additionally, this processual evolution step is accompanied by the finding that the customer dimension is of central importance, especially for a direct customer value proposition, but needs to be managed with few resources and less commitment of the top-management due to the low financial relevance/impact/consequences at this stage. With these small financial resources, technological development must be driven forward or technologies procured, e.g. sensors to be able to collect the data and furthermore downstream IT equipment and processes for preparing the data. Depending on the basic data services, this phase already lays the foundation for the foray into a previously unknown ecosystem in the mobile communications industry, which enables the focal company to receive and, later in the process, send data. With these developments and learning processes known from other first steps of servitization (Dmitrijeva et al., 2022), companies move on to the next process of the Monetization and Strategy Alignment phase.

8.2.3 Monetization and Strategy Alignment Phase

The monetization and strategy alignment phase represents an evolutionary step with a clear strategy and focus on customer-paid services. This strategic orientation entails decisive steps in other elements of the innovation dimensions, in particular contractual capabilities, own service resources, and management of different actors in the ecosystem. It is known from the different case study organizations, that the first phase was a largely unstructured start in servitization, with no strategic plan and services had to first prove themselves in the organization (see e.g. Baines et al., 2020). However, the evolutionary

process would end without the introduction of a sustainable revenue stream for services. Hence, the data and identified forces allow the containment in a monetization and strategy phase to further optimize and add new services but therefore require an appropriate budget. Consequently, these services are now seen in a different context and as part of the company's strategy, which contributes to the company's sales and can thus serve further customer needs through new developments. The evolutionary stage of services and the business model benefits in this phase stem from top-down manager support in contrast to the previous phase. The attention of the services within the company and anchored in the corporate strategy drives the cultural change as one of the most challenging aspects in servitization (Kapoor et al., 2021). The internal contextual key forces of this phase are the financial needs to continue the servitization process, as well as the external force of customer demands for the data-driven service. In contrast to the previous technological enabling phase, with its largely free services or services with long test periods, the internal pressure requires a change from services-for-free to services-for-fee and entails several incremental and radical business model innovations (Witell and Löfgren, 2013). As an additional contribution to Paiolas et al.'s (2022) and Baines et al.'s (2020) evolutionary phase, companies need to ensure that services justify a paid revenue stream, especially in terms of reliability, as the provider takes accountability for the customer's process (Kujala et al., 2010). The contextual forces are responsible for a further expansion of the business model and entail changes in all four innovation dimensions. Similarly to Paiola et al. (2022), this phase requires profound changes in customer-related resources and processes. Consequently, activities to manage services in front of the customer need to be established and in the first-place mechanisms to activate or deactivate a service. Another key characteristic of this phase is the establishment of both employee and customer training

in services, as well as the design of a direct customer sales model as a prerequisite for data-based services and a centralized data pool. The more data available from customers and various sources, the more the quality of services beyond pure machine data will benefit, the basis of which must now be created with the data pool. An additional contribution to the existing body of the staged innovation process literature is the extension of the ecosystem of smart solutions, and partnering with another ecosystem of mobile network operators, which entails dependency on co-innovations (Adner, 2012). New technologies like global system for mobile (GSM) communication modules and processes for data transmission are required to manage the interplay with the new method of data collection and its various technological and processual elements. The literature so far provides little information on how the legal aspects go hand in hand with digitalization from a processual perspective; these were previously considered rudimentary (Porter and Heppelmann 2014; Weigel and Hadwich, 2018). Hence, this stage of the evolutionary servitization road map requires the establishment of reliable and manageable partnerships with contributors of the existing and new ecosystem as a precondition for upcoming phases and the further expansion of the service portfolio. In terms of the broad roll-out of services, the consideration of legal aspects – for example, additional data protection contracts with customers – is key to being compliant in the target markets and needs to be taken into account in the further evolutionary process.

From a strategic and organizational structure perspective it became clear that companies in this phase must step into semi-structural ambidexterity (Markides, 2013; Gebauer et al., 2017) via partly separating service-related resources and activities from the dominant business model while at the same time creating necessary links between both business

models where necessary and useful (Markides and Charitou, 2004). In this phase, the two business models and structural ambidexterity begin to branch off with their own resources for the service business model, but are closely connected to the product-based business model. In line with Paiola et al. (2022) this phase still does not lead to a spin-off of the service unit. Moreover, explicit service departments (e.g. the product management department) need to be established at this point to manage customer-related tasks as well to coordinate the technological readiness of services. The understanding of the focal companies' own ecosystem is a precondition for a service strategy (Gebauer, 2008) and is achieved through the learning from the technological enablement phase. These experiences and the strong external contextual force of customer demands leads to an anchored service strategy as part of the overall company's goals. The companies thus move from this phase into the next service growth phase with sufficient resources and the support of top management in the form of a service strategy.

8.2.4 Service Growth Phase

The third contextual change which develops the service business further is mainly triggered by the progressive maturity and acceptance of Industry 4.0 in the ecosystem. Expanding the service portfolio and the development of increasingly extensive services with multiple data sources also entail further authority rules. Companies must adhere to security regulations, data sovereignty requirements, and service offer registration processes in target markets through relevant national organizations, as observed in specific cases (e.g. Frank et al., 2019; Hasselblat et al., 2018). This trigger was used, particularly in Case A, as an instrument to improve the customers' trust in digital services via external agencies for certifications in data security, as trust in the digitalization is key

for services in this context (Tronvoll et al., 2020). However, other contextual forces were also seen to drive the business model development in this phase. The data show that the companies' customers are now accustomed to data services and explicitly request them. Forces such as insights from other markets, or the market demands themselves, make further innovation of the business model necessary. However, the achieved technological and processual degree of innovation also makes it possible to serve new customer groups. In sum, this phase shows a large external influence with contextual triggers outside the focal company. The service growth phase, in line with Baines et al.'s (2020) expansion phase, adds decisive insights into the business model configuration for this phase, and expands the service portfolio of the focal companies in advanced services that use a variety of different types of data sources for processing, ultimately serving previously unfulfilled customer value propositions. This evolutionary phase is mainly triggered by external forces and the demand on the customer side for new, more advanced services, which is now possible to fulfil through the technical, processual, and cultural foundations laid in the first two phases. The customer pull (Baines et al., 2020) or demand pull (Frank et al., 2019) is also due to the fact that the market-side also perceives the advantages of services and experiences a cultural change. Additionally, other markets accomplish servitization and thereby exert pressure on the target market. But internal contextual aspects also trigger the third evolutionary phase and the possibility of opening up new customer groups (indirect customers) and additional revenue streams (see Figure 19).

From a content perspective, the second phase paves the way for companies to expand their service portfolio in this third phase but requires profound changes in all four innovation dimensions. The key finding from the organizational and cultural dimension

refers to the ambidexterity capabilities, and technological spin-offs – either through the acquisition of software companies or within the group – are now necessary to manage the increased requirements for hardware or software. In contrast to previous research (Chesbrough and Rosenbloom, 2002), the organizations do not fully separate the service business from the legacy business. Moreover, they bundle all software and related hardware development activities from the product-based and the service-based business model in the spin-off. This is also due to the different development approaches, which need to be agile, and requirements or changes must be able to be implemented quickly in line with findings from Huikkola et al. (2022) for service businesses. A further finding in this evolutionary phase and the organizational dimension is also the establishment of other service-related departments and appears that a specialized service and support department helps to overcome the tensions (Tóth et al., 2022) in sharing resources between product and service departments at the same time, e.g. in sales, and supports the unfolding of the service business. The ecosystem dimension also continues to develop driven by the customer demands and in-depth services that cover customers' processes even more effectively. Cooperation with other actors to fulfil these services increases the requirements for ecosystem orchestration and the management of different involved actors (Iriarte et al., 2023). While Paiola et al. (2022) consider ecosystem actors as technological contributors in the replication phase to overcome gaps in the development, the capabilities in this dimension add insights into the processes to orchestrate and synchronize the values of actors, who contribute to the overall value proposition with partial services. It appears that the values of the partners do not necessarily match their own values. As a result, the partner's own values suffer and have an impact on service provision (e.g. the partner's quality standards may be lower).

8.2.5 Platform Strategy Phase

Baines et al. (2020) describe the exploitation phase as a company-wide transformation for advanced services. The phase of this study goes one step further based on the gathered data and confirms the evolution of digital servitization into smart solutions as advanced product- service-software systems and the resulting platform business models (Kohtamäki et al., 2022) for shared technologies (Perks et al., 2017). The contextual trigger for this phase is the idea of a platform provider, and indirectly, to meet the customer's desire to be able to offer everything from a single source in a single system since global trends in other markets show this off (e.g. Iansiti and Lakhani, 2020). This gives the platform operator a significant strategic advantage. As a result, all user value propositions are handled via the company's own systems and an enormous lock-in effect is achieved. Hence, the case study companies show a strong focus on a new strategic orientation driven by the attempt to establish platforms through cooperation with different stakeholders. From a cultural and organizational dimension perspective it is worth noting the opening of the company's own barriers to data exchange and the effort made to achieve certain technical standards in the ecosystem that facilitate the networking of devices and other data sources. A key adaptation in the business model resulting from the customer management dimension is the modularity of the services (Kapoor et al., 2022), and the companies have already paved the way in the previous phase with a clearly structured portfolio and services delimited from each other so as to give the customer the opportunity to book only what they need. Additionally, the payment model has been adapted across the companies to on-demand, which also accommodates the customer and gives them flexibility (Zheng et al., 2018). This is especially important for companies whose services are seasonal, as the agricultural technology case shows, but also for rental

companies and their customers who book the product-services only for a certain period of time. From an ecosystem management dimension, the technical enabler across the ecosystem for platforms is a certain technical standard that enables the systems to communicate with each other regardless of who the manufacturer or complementor is. The case study companies have already started with the cooperation of direct competitors to define these standards. Kapoor et al. (2022) stated that a close cooperation between actors in the ecosystem is crucial for platforms. Standardization and modularization in this context are described in the literature as a modular design development of products or services that are compatible with standardized interfaces (Broekhuis et al., 2017). The case companies demonstrate that interface and data standards have been neglected since the beginning of sensor integration, and cultural barriers have prevented cooperation with the competitor in the respective industry. Although initial efforts and first agreements on certain standards have taken place, the establishment of a platform requires a comprehensive agreement across all stakeholders to offer the customer the full benefit of a platform and is the key task in the platform strategy phase.

In conclusion, this chapter has brought together case evidence to explore the necessary changes in servitization from a business model perspective and reveals adaptations in the four dimensions of organization and culture management, customer management, ecosystem management, and legal management. The latter section provided a deeper dive into the how of the transition, in particular by outlining four distinct phases, namely technological enablement, monetization and strategy alignment, service growth, and platform strategy.

CHAPTER 9: CONCLUSION

9.1 Introduction and Contribution

Manufacturing companies often face strong competition in the product-based business and have found a way to differentiate themselves from the competition by expanding their range of services (Raddats et al., 2019; Baines et al., 2020). However, the addition of radical and digital services through new technologies and the resulting necessary business model innovation and organizational transformation is a major challenge for many companies and continues to be an area of research that receives a great deal of attention in the academic community. Driven by the literature's call to further explore these challenges of servitization (e.g. Budler et al., 2021) and business model innovation in the context of data-based services as well as Industry 4.0 as an emerging trend in industry (Frank et al., 2019), the research question of how traditional product-oriented companies reinvent themselves and launch radical service innovations was formulated.

A qualitative and interview-based research method was considered most suitable to address this research question (Eisenhardt, 1989; Edmondson and McManus, 2007; Eisenhardt and Graebner, 2007). Based on detailed case studies, this study identified key areas of change (content), what caused this change (context), and how the companies have developed since the start of the servitization transformation (process). The research was based on recognized approaches from the literature in order to provide a research framework for exploring and extending existing findings. Johnson's (2010) business model approach was therefore used as a foundation, as well as other supporting models

from the ecosystem literature, to provide a solid research framework revealing and exploring patterns of servitization behavior.

The analysis of the companies revealed a variety of changes in the business model, which can be condensed into four key innovation dimensions from the firm boundary perspective of the resource-based view and contribute to the advancement of existing research on servitization. First of all, adjustments need to be made to the business model that affect both organizational and cultural aspects. The adjustments in this dimension mean that digital innovations have the necessary freedom to develop, which is necessary not least due to the different cultures between products (legacy) and services (emerging). This also enables the company to flexibly address the characteristics of the services, which have significantly more agile development and update cycles compared to physical products. The second innovation dimension deals with elements that are related to the customer. The data suggest that services, for example, require extensive training both within the company and on the customer side. This dimension also addresses various mechanisms that affect the revenue model and enable the company to generate revenue with services in the first place. The third dimension, on the other hand, has arisen from various legal aspects and therefore addresses the challenge of what implications a service offering has for the business model and the legal framework that is required in order to be allowed to offer a service at all. As these requirements are mostly external in nature, this dimension is closely linked to the last dimension of the ecosystem. This shows that the partner environment grows through digital services and is managed by the company itself. In conclusion, these insights have implications for fundamental business concepts and contribute to understanding the core mechanisms of the economy for servitizing

companies. It has been shown that the servitization process, and especially the cultural transformation, is supported by clear and actively lived corporate values. Furthermore, the customer remains the central focus of value creation, regardless of whether it is a product or a service. These insights also contribute to expanding the horizon of traditional business concepts by highlighting business model elements that do not directly contribute to solution creation. Notable among these are elements such as customer training, which is essential for enabling customers to use services effectively, and the necessity of a direct sales and support channel. Unlike physical products, this cannot be managed through distributors but requires centralized control. Additionally, new collaborations are essential to offer IoT-based services in the first place or to enhance the service concept, making it even more comprehensive for the customer.

The analysis of the data obtained has also provided an insight into the evolution of servitization and how the company has transformed over time. It was discovered that the companies were not in a position to introduce far-reaching services in a short space of time, but that they had to change gradually. This resulted in the evolutionary phases of technological enablement, monetization and strategy alignment, service growth, and platform strategy, each representing an evolutionary stage and gradually preparing companies for increasingly extensive services. These four phases are triggered by contextual internal and external forces that continuously drive companies to develop further. It has also been shown that the four dimensions develop within these phases and are characterized to varying degrees. The four phases are equally valid for all the companies examined in the main study but vary in terms of the contextual forces and the characteristics of the key innovation dimensions, particularly in the first phase. It is

noteworthy, however, that the transformation content of the companies becomes more and more similar over the four phases and the variations in key resources and key processes within the business model decrease. Within the first phase, companies lay the foundations for the first data-based services and build up the infrastructure, while the second phase already shows clear steps towards establishing a monetary business model. This is also reflected in the corporate strategy, which no longer considers services to be merely a marginal phenomenon and an add-on to its own products. The third phase is characterized by strong service growth, while the fourth phase shows a clear trend towards a platform strategy, with companies attempting to offer customers a comprehensive value proposition by means of their own products and services, but also by integrating other ecosystem players and combining their offerings on the platform.

The gained insights contribute significantly to the existing body of literature. It has already been recognized in previous studies that the business model elements are affected in the servitization process (Kindström, 2010) but need to be explored further in the context of new technologies, such as the IoT (Kohtamäki et al., 2019). The four identified innovation dimensions and their characteristics thus contribute to an understanding of how digital servitization affects the business model. Kindstöm and Kowalkowsi's (2014) research had already revealed which elements are fundamentally influenced by servitization. The findings from the present research fundamentally expand the understanding, as elements in digital servitization have been discovered and no correlation with the business model concept has yet been drawn in the literature (e.g. the licence model or the process of customer training).

The analyses have also shown that the perspective must be extended beyond the boundaries of the company in order to accurately describe digital servitization. The integration of digital technologies to create value for customers can no longer be provided by a single company and requires other players in the entire ecosystem who are indirectly or directly involved in the value creation process (Iriarte et al., 2023). The results thus confirm findings that consider the horizontal structuring of companies to be relevant and describe the formation of service networks (Gebauer et al., 2013). With the help of Moore's (1993) and Heikkilä and Kuivaniemi's (2012) ecosystem approach, it was possible to characterize the ecosystem and uncover the interfaces with the company's own business model. The results show which actors are involved in the ecosystem and how they interact with the company's own business model, as well as the associated challenges. The results thus contribute significantly to a more holistic understanding, as demanded by the current servitization and ecosystem literature (e.g. Snihur and Markman, 2023).

Finally, the evolutionary development of companies is addressed. Little research has been done in the literature to date on how companies develop as a result of digital servitization. The four phases identified extend the findings of previous research of process models (e.g. Paiola et al., 2022), and in particular the approach by Baines et al. (2020), which is limited to the interplay of contextual triggers and the innovation process. The analysis is thus extended to the interplay of content, context, and process and clearly shows how various internal and external contextual factors drive the evolutionary process and how the four developed key innovation dimensions develop within the phases. A further contribution to the existing literature is made by findings

on how companies outsource or integrate processes and resources. The analyses show that, for the most part, companies initially draw on existing resources within the product-based business model. As the process progresses, however, the service business increasingly separates itself from this with its own resources and processes, while the platform strategy is ultimately responsible for convergence again. These findings extend Paiola et al. 's (2022) analyses of integration vs separation and show how the organization adapts structurally over time.

9.2 Limitations and Future Research

The study of business model innovation and its evolution in the context of servitization has several limitations but it also provides a foundation for further research. First, due to the nature of the chosen qualitative research methodology, the data collection draws on an in-depth investigation of a small sample and semi-structured interviews. The case companies are among the market leaders worldwide in their respective industries, with a global network either through their own national companies or dealers. Hence, the detailed empirical insights are not generally transferable to other companies or other industries, although analytical generalization is possible via the content areas and phased model. The data were collected from three companies in the main investigation and one supporting case, all acting in the business-to-business sector in the three industries of agriculture, construction machinery, conveyor. Further research should examine in a broad-based investigation with more examples whether the triggers and innovation dimensions for the phases derived from the data are also applicable. Likewise, this research study has exclusively relied on qualitative methods, specifically case studies and interviews. For future research, there is potential to explore this

research question further using other methods, such as ethnography, which enables deep, context-specific insights and captures real behaviors.

Second, the industries are considered traditional, with players who have built up their position in the market over decades. Over this long period of time, processes have developed strongly and are tailored to a pure product culture. The research shows that one of the main drivers of service sales is the established and trusting relationship between the salesperson and customer. This often involves an emotional commitment to the product or the manufacturer. Further research could explore industries that are not characterized by the emotional connection between user and manufacturer, examining how customer touchpoints can develop within this service segment. In addition, this could generate further insights into how traditional industries can also develop efficiently.

Third, this research has allowed a broad view of a whole picture to explain the evolutionary servitization process of established companies. The objective of the study was to uncover patterns in the innovation process, and it revealed a phased process accompanied by different triggers. In addition, it was possible to identify elements of the business model that are of crucial importance for further expanding the service business model. The individual elements were clustered so that four dimensions emerged. Further studies should examine in detail these dimensions as well as the phases in the given context of data-based services. The data highlight that these dimensions are of vital relevance, but are still not developed to full satisfaction, in general, and especially in the fourth platform strategy phase, as is the case in the product business. The experience of the companies and the data collected are limited due to the timeliness of the last phase.

Further research could examine the four dimensions and their development within the platform strategy, particularly in relation to sustained performance implications and long-term benefits.

Fourth, artificial intelligence (AI) has advanced to a level where it has recently gained immense significance in the industry. It is therefore expected to have a substantial impact on business models and their innovation in the context of servitization. Initial studies, such as those by Sjödin et al. (2023) or Naeem et al. (2024), have already explored this topic, highlighting AI dynamic capabilities capacities and in relation to circular business model innovation and servitization.

Finally, the study includes the ecosystem perspective as this emerged as a crucial element in the innovations process and changed fundamentally in the service-based business model. The research is limited in its detailed understanding of precisely how cooperation evolves between and across different stakeholders. For example, the interviewees reported that there are missing service level agreements between the focal company and mobile network operators. Further research could explore how quality standards are established within the ecosystem across different actors.

9.3 Managerial Implications

The topic of business model innovation in the context of servitization is still highly relevant in the literature and the results of different research projects gives managers valuable insights into how corporate development can be managed. The interview program has identified pitfalls and best practices of how the case studies evolved their

business model further from the introduction of data-driven services to advanced product-service business models, which are currently in the evolutionary stage of developing a platform business model. Practical implications derived from the research insights suggest that organizations tend to develop in phases, and managers may benefit from segmenting steps toward each subsequent phase as part of the servitization process. Specifically, managers must pay attention to both internal and external forces that affect the company and which can serve as drivers of evolution. However, the data also show that the drivers can encounter resistance within the company. Particularly noteworthy here is the cultural transformation a company must undergo for servitization (see also Kapoor et al., 2021). Although the start of servitization has its roots in individual departments and intrinsically motivated employees, it is unlikely that this cultural change will create penetration through employees at the operative level alone, as it may have its roots in individual departments. Rather, it requires in the further evolutionary course a strong commitment from the top management to spread and communicate throughout the company. The skills of the driving employees should therefore include strong soft skills, in particular communication and enthusiasm (Hoch and Brad, 2021) to constantly advance the company as it evolves through the phases. Although the internal and external forces require further development in the servitization, services are not yet superior to products in terms of revenue and a continuous impetus of intrinsically motivated employees is needed for the cultural change. Moreover, managers may benefit from leveraging the properties of data-based services as supporting factors in the company's development through its evolutionary phases. Data can be used to get to know the customer and the company's own products better, it provides a constant source of income even in bad economic times and develops a lock-

in effect (Fehrer et al., 2018) for the customer and, in general, it helps the company to generate a strategic advantage through these services (Hasselblatt et al., 2018).

From a business model perspective, the managers can take advantage of some best practices from the four dimensions. Due to the nature of data-based services and the much shorter development and life cycles, it makes sense to separate IT-related functions from product-based business, which has a twofold effect. First, managers can quickly build the service mindset for the relevant development function, and second, centralize all development-related functions within the company to avoid a scattered IT landscape or a different look and feel presented to the customer. The indirect sales approach and its inclusion in service development and subsequent customer support proved to be a challenge for managers. Practitioners should therefore involve the national subsidiaries and dealers in the servitization process at an early stage and not leave them out, as they remain the direct contact with the customer even with service value propositions. Services require a close customer proximity to the parent company due to the IT processes (e.g. online store, data storage, and processing for the services themselves) but as services are still mainly based on physical products, the dealers with their sales staff are still the main sellers and thus the driving force for marketing. Creating an understanding of the relevance of services, early training, supporting tools or, if necessary, expert help to strengthen acceptance and to provide sales with services as an additional sales argument for purchasing the products. Outside the managers' direct field of vision is the new ecosystem and the risks that go with it. Two topics stand out in particular. As soon as a company proceeds beyond the development phase of pure machine data and further data – in particular, personal data – is used for new value propositions, the use of sensitive

data must be handled in accordance with local data protection laws. Second, manufacturing companies are not used to being dependent on yet another ecosystem and for example, technological changes that could have an impact on their own service provision. Given these dependencies, managers may need to evaluate the allocation of additional resources (e.g., development of new hardware, employees dedicated to retrofit solutions) to ensure the long-term maintenance of services and timely adaptation to technological changes within the ecosystem. Executives may benefit from adopting a holistic perspective, viewing the business model as an activity system and recognizing that changes within it can influence other interconnected elements.

In conclusion, although this study exclusively focused on the three industries – agriculture, conveyor, and machinery – the findings have the potential to be applicable to other industries. The concepts of Industry 4.0 and servitization are not industry-specific, as they are driven by similar factors and challenges, as evidenced in the literature. Therefore, the key insights from managers highlighted in this study may also be relevant for other industries facing comparable transformation processes.

9.4 Summary

The thesis entitled "Service-based Business Model Innovation in Product-based Firms – A Comparative Study" contributes to research on the challenges companies face with digitalization and the success factors that emerge from this. The qualitative research approach and the detailed analysis of case studies have produced four key innovation dimensions and four evolutionary phases that describe the company’s transformation from the perspective of the business model. The existing literature is still in its infancy in

the context of digital servitization, so the call for further analysis was followed up and many new insights were gained. However, it must be noted in conclusion that these findings are based on a small number of case studies and their validity must be proven through further and broader research. Although a more holistic approach to explaining servitization was chosen through the tripartite perspective of context, content and process, this approach cannot address all elements of transformation, and various directions for further research were identified that could contribute to this research.

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Appendix A: Examples of Similar Case-Based Dissertations

Authors	Context
Donovan, 2020	Servitization and dynamic capabilities in the context of sustainability
Xin, 2020	Evaluation of servitization strategies and derivation of how business model resources can be optimally designed
Jovanovic, 2018	Analysis of tensions between service business model a product business model
Rasmussen, 2018	Unfolding of business model innovation activities, where they take place and roles of organizational design
Halecker, 2016	Business model innovation using system thinking and action case studies
Taran, 2011	Risks in the business model innovation process and how it can be embedded in the process
Kowalkowski, 2008	How to organize the firm for the development and production of services as well as what the requirements on the service processes are

Appendix B: Industrial Crane Company Supporting Case

The case study report of the supporting case in the industrial cranes segment aims to introduce an overview of the company, which successfully implemented rule-breaking service innovations in its traditional roots of business. Hence, this company is most appropriate for testing the developed conceptual framework in the business model innovation context and the formulated research question of the PhD project, as the business structures and the environment are old-fashioned, and its roots are originated from decades ago. Within these fossilized structures, companies in the crane industry must reinvent themselves to stay competitive, in particular in countries with higher labour costs. The case, as a highly successful company in its industries, offers two different radical service innovations to date.

The company is one of the leading suppliers of lifting equipment. The roots of the traditional company date back to 1910, although the company in its current form was spun off and reorganized in the early 1990s. The company is based in a city in Finland wherefrom all strategic decisions are made to steer the company to the top of the global market. A large network of locations all over the world ensures the success of the company and employs more than 7,500 people (Industrial Crane Case Annual Report, 2022).

Analyses of the Brand, its Customers and Competitors

The industrial crane company had grown to one of the biggest and leading providers of lifting solutions since its foundation. To date, the company is represented in more than 10 countries with production facilities and sells its products and services in 50 countries (Industrial Crane Case Annual Report, 2022). Over time, the company grew into an innovation company and identified several potential markets for physical products. Based on the market leader strategy, the company acquired several competitors in existing markets over the years, as well as other companies, in order to enter new markets with similar and new products. The corporate strategy enables the company to foster the global market share and gain new skills, which supports the development of new products and services (Industrial Crane Case Annual Report, 2022). The strategy also includes a radical change in the company's innovation structures, which will lead from local, product-based innovation activities to a global innovation organization. (Industrial Crane Case Annual Report, 2022).

The company's market position is based not only on its product range, but also on the various services it offers. One of the first and most important services introduced decades ago is the maintenance service. To date, the company is able to offer a wide spread of add-on services for its products as well as standalone services also based on its acquisitions of product and service companies in the respective business area and countries. The continuous sales growth as well as the progressive market penetration also leads to an almost constant increase in the number of employees in order to serve the markets and sectors. However, it should be borne in mind that this steep rise is based on

their various physical product offerings as opposed to a comparatively small number of service offerings. In general, it is assumed that the services offer great potential for the future (Industrial Crane Case Annual Report, 2022).

The industrial crane industry is an old-fashioned industry with tough structures. Most of the established companies within this industry started their business 100 years ago. The “job-to-be-done” has not changed dramatically since the invention of the crane in the sixth century and the focus is still on lifting heavy loads. What has certainly changed is the technology of the cranes, their various specialized areas of application, and thus the design on the physical level as well as the spread of "lean thinking"[5] coupled with globalization and the Internet age. Based on these influencing factors, cranes have been consistently tailored to customer requirements in various industries and combine the characteristics of safety, reliability, and optimized productivity (Industrial Crane Case Annual Report, 2022). In addition, market pressure constantly increases and fosters the already mentioned aspects to offer unique and high-quality products in a competitive environment. The devices and service solutions are offered in this market environment, which consists of well-known competitors and also well-known customers in the various sectors on both sides. The company wanted to further expand its position as market leader in the lifting equipment sector (Industrial Crane Case Annual Report, 2009), and also, the company needed to expand its global network in order to successfully implement services, particularly in maintenance matters. This strategy has helped the group to build

[5] “Lean Thinking” is based on the Toyota Production System (TPS) introduced by Toyota in 1937 and the diffusion in other industries and companies starting in 1980s. Part of the TPS is, for example, the reduction of any waste, including resources like time and money.

up an extensive network of branches in almost 50 countries, resulting in 600 locations (Industrial Crane Case Annual Report, 2022).

Since the spin-off in 1994, the company has been very dynamic and innovative. In order to communicate its strategy appropriately, the brand strategy has also been adapted. In 2006, the company adapted its logo, identity, and brand promise to emphasize the new era of business that was fundamentally shaping the global lifting business and to define the main objective of the strategy to be the best service provider in the industry (Industrial Crane Case Annual Report, 2006). Customers can purchase solutions offered by power brands only from distributors and independent crane builders. Master brand products can be purchased directly from the company.

In addition to these dissemination strategies for emerging and industrialized countries, the company defines three important initiatives for 2013. The industrial Internet, well-known from General Electric Co's initiatives for the previous two years (Maddox, 2013), is in the case company's focus and belongs to the key strategic initiatives at the time. The industrial Internet strategy is already noticeable in the products, as they are connected to the Internet and, hence, are fully controlled online. The company defines the strategy and the industrial Internet as intelligent machines and as a contribution to the transparency of machine availability and condition. The development of networking machines with the Internet should improve productivity and safety. The second initiative is to penetrate the emerging markets in the mid-market segment by *"[…] developing ´mid-market` products with high quality but lower price points […]"* (Industrial Crane Case Annual Report, 2013, p. 11). While the brand strategy is clearly defined and has been in place for several years,

the company has recently had to reassess its market strategy. In 2013, the company had to admit that it would be giving away an important market share if it continued with its admittedly successful high-quality premium portfolio (Industrial Crane Case Annual Report, 2013, p. 9), as was the focus and main strategy a few years earlier (Industrial Crane Case Annual Report, 2003, p. 24). The mid-market segment was not as penetrated by customized offerings, resulting in a lower market share in this particular market. Based on this realization, the company management decided to focus particularly on the emerging markets and make major investments to develop customer solutions for the needs of the mid-market segment. (Industrial Crane Case Annual Report, 2013, p. 9). Finally, another initiative was launched, which helps the company to optimize processes in existing structures as well as modernize key resources – and, in particular, the information system. The top management expects a lower cost level as well as an increased productivity (Industrial Crane Case Annual Report, 2013, p. 6).

The strategic initiatives can only be implemented by an established culture in the company formed by visions, missions, and values. For this reason, the company's three cultural pillars have been fundamentally adapted in recent years. In 2005, the mission was formulated and the intention clearly articulated (*"We are not just lifting things, but entire businesses"*, Industrial Crane Case Annual Report, 2006, p. 5). Five years later, the vision was fundamentally adapted. The lifting supplier's long-term vision in the past was leading the industry and being a benchmark. *"We want to be the undisputed leader of the lifting industry, and a benchmark for business performance and customer service"* Industrial Crane Case Annual Report, 2010, p. 10). In 2011, the vision was changed in order to drive forward the development of products and services and the goal of differentiation from the

competition (*"We know in real time how millions of lifting devices and machine tools perform. We use this knowledge around the clock to make our customers' operations safer and more productive"*, Industrial Crane Case Annual Report, 2011, p. 6). Finally, the case defined its values, which are anchored in the company's structure. These values have not been changed in the history since their definition and are still valid:

Trust in people

We want to be known for having good people

Total service commitment

We want to be known for always keeping our promises

Sustained profitability

We want to be recognized as a financially sound company

Analysis based on the Three Dimensions of Context, Content, and Process

The company focuses on the strategy of becoming a service-oriented company, especially in the area of maintenance services. Apart from this strategy, the company also introduced remote and warehouse management, which requires more than just an extensive network of well-trained employees. The two services belong to the category of industrial Internet products/services, one of the strategic initiatives of the company, which means that they are predominantly based on IT technology and can be considered as enabling technology in the ecosystem.

Concerning the company's definition of the industrial Internet, machines need to be intelligent and enable a real-time visibility of processes and machine conditions (Industrial Crane Case Annual Report, 2013). These two points are covered by the services introduced for cranes and forklifts and the warehouse management service. Both services offer unique customer benefits to set them apart from the competition. The warehouse management service value proposition is the furthermost model from the company's core business and is defined as material flow proposition. The customer's inconvenience of picking up parts from a warehouse, for example, is therefore realized by the warehouse management service. An essential part of this value proposition is the just-in-time delivery of the required parts to the right place. The slogan for the new service summarizes the benefits of CVP by explaining that the warehouse management service *"[…] can be used for storing hundreds or even thousands of different components and it allows real-time information on parts to be shared via a portal linking supply chain partners"* (Industrial Crane Case Annual Report, 2013, p. 7). In short, the company is responsible for the customer's logistics throughout the supply chain, which makes the implementation effort high, but also has a high customer benefit. A similar customer benefit can be seen in fleet management services, which also reduce non-value-adding tasks on the customer side by increasing the transparency of conditions and making processes more convenient and faster (Industrial Crane Case Annual Report, 2011). Furthermore, the customer knows exactly where the machines are and what was the working hour, which makes planning and, for example, accounting easier. Both services are triggered by different factors of competition, changed culture, chance for new options, and close to this fact, the possibility of increasing the barriers to customer churn.

Although the company has a constant market share and a broad product range, it faces strong competition in the overall product market and especially in maintenance services from small local companies or the customers themselves. The company acquired several competitors in different markets for the purpose of expanding skills, but also to increase their market share and minimize competition in the corresponding markets. To overcome the general issue of competition, the company developed two customer value propositions, which are based on an activity system of well-defined key processes and resources to span a defence system and place hurdles in the way of potential rivals. The interview with the Service Director, in particular, revealed the fact that the customer's way of doing business and monitoring their business has changed fundamentally. People are used to applying technical devices like smartphones, tablet PCs, or any other supporting gadgets in their private life to be up to date in real time. Similar behaviour can be observed in business and the next generation managers, who have grown up with the technology, want to use the technology to receive information whenever necessary, and be well networked in case of any problems that may occur with service staff or other responsible partners in the business. Based on the changed culture, which is not only anchored in the individual employees but also in the company structure, the need for this type of service innovation was identified in this company, which goes beyond traditional warranty and maintenance services and fulfils the customer requirement of continuous data collection and an overview of the business. The company maintains a close relationship with its customers and has recognized the opportunities for new service business. Following the definition of open innovation, the company is expanding its internal R&D department with additional knowledge and defines the new service value propositions in cooperation with their customers (especially lead customers at the

beginning) to achieve the best possible result for both parties. In the case of the warehouse management service, the company was able to define the services due to their own experience in product-based business and the related difficulties. So, they know exactly how to reduce the difficulties without the need to understand in detail the customer's processes. The final reason for the design of radical service innovations is related to the increasing competition in the lifting markets. Services are often based on a certain network and processes on the supplier side. Also, the need for information flow is greater, which results in a closer contact with the customer. These facts often raise the dependence of the customer, as he/she needs to invest a certain amount of work to start the service. When the service is implemented and running, it involves major outlay to change the business partner due to the high investment on both sides, not to mention the learning process of the case, which makes the company a best partner with unrivalled knowledge of the customer's processes.

The company was investing a huge amount of money in their new service strategy and vision. Building around the vision the company established the two customer value propositions based on the already mentioned key drivers. The question now is why these services represent radical innovations for the company and what has changed for the company in the way it conducts its business. First of all, the general and updated contractual structure of the case must be emphasized for further examination of the issue. The company's core business was selling lifting solutions for the last 50 years. Pretty early in their business they also started the maintenance business, which is sold in care contracts (equipment sales and separate service agreements). Since 2008, two new contract levels had to be implemented and extend their service offering in an innovative

way. The commitment contract level includes a performance commitment. Additionally, the company introduced the complete contract level and focusing on operational responsibility. The focus of the case study report is on the second type of contract, commitment contracts. On this level the warehouse management service and the fleet management services are sold as a performance commitment. Starting with a closer look at the warehouse management service, the case had to change the business resources and processes to serve the new value proposition. The business model of the warehouse management service focuses on the customer's processes, in particular the conveyor technology processes. The profit formula, or more specifically the revenue model, is formulated as monthly for the customer value proposition and is sold as a package that includes hardware, software, and services. The rate of the monthly fee depends on the size of the warehouse management service. In order to achieve this customer value proposition, several resources and processes need to be adapted in the company's business model. In addition, this value proposition shows an immediately apparent contextual ambidextrous structure (Markides, 2013), as it is only partially implemented in the whole company. The main separation is in the R&D team, which is responsible for developing new services, and the sales department, specifically the single salespeople in the different regions. Other departments are directly influenced by the new service value proposition and are not outsourced or separated from the legacy business model. This means, especially the employees (who are part of the key resources; see conceptual framework and Johnson's (2010) business model) must address both types of value propositions: the product and the service. Several other resources had to be adapted, especially with regard to technology skills. These changes were necessary due to the nature of the service business and fulfil the value proposition of a continuous flow of

information. The company now carries a greater responsibility with regard to customer processes compared to product selling businesses, which needs a limited knowledge of the organization and processes in the traditional selling business. These kinds of services are based on a value proposition formulated as a guarantee of immediate availability of information and/or physical products (parts). Delays cause cost-intensive downtime for the company and must be avoided by carefully and reliably setting up the business model.

These adjustments to key resources also apply to the fleet management system. To this end, the service unit has adopted a proactive approach to reduce uncertainty for the customer. Resources are also deployed to ensure the collection of reliable and sufficient information. Therefore, technological innovations such as sensors are implemented into the system and also influence the ecosystem in terms of partners and suppliers.

The Process Dimension

The industrial cranes company had to undergo a transformation, which is still in progress, to hone their new service models. In order to fulfil the value proposition in the two new contract levels of commitment and complete contracts, the company has practised and learned for the last five to six years until they were able to introduce the services in 2012 to 2014 (the fleet management services were introduced in 2008/09). In contrast to a physical product innovation, this long period reflects the difficult and intensive path it is necessary to take in learning how to offer and articulate service value propositions.

The general service business, including the connected fleet management system, requires some clearly visible adjustments at the level of the business model. For these service offers the adaptation and careful alignment of key resources and processes is even more critical, as they are totally integrated in the legacy care contract level (and, hence, the product-based business). The challenging issues are to separate the tasks while nevertheless offering all values as conveniently as possible for the customer. If, for example, the service packages are sold separately from the crane sales by a service unit within the company, this can lead to additional work for the customer, e.g. when concluding contracts. The general service unit therefore implemented a different culture in terms of a proactive customer approach in all of their contract levels. This means that they try to offer help before the customer has to take the initiative, e.g. for maintenance work or emergency calls due to machine damage. The benefit on the company side is the decrease in support calls, which leads to a better action plan for the company. A key prerequisite for achieving this proactive approach is information. Therefore, the company had to establish a special relationship of trust with its customers in order to implement the system for an automatic flow of information, which also means that the customer may have to disclose sensitive business information. In this service area, there is a close connection to the old business, as the service depends on a physical product such as a crane or a truck. In concrete terms, this means that products require a certain amount of physical adaptation to enable the transfer of information via sensors and interfaces. This has already been implemented in the product-based business model, and today all machines are ready for the extended service offerings if the customer agrees.

In addition, several adjustments were made to fleet management, particularly to the IT systems. The sales tools, contract management, and invoicing require a comprehensive adaptation of processes, as the traditional contracts were based on a pre-planned, recurring approach. The commitment contracts are rather individual solutions and also depend on the degree of use by the customer. The sales process of the warehouse management service is fundamentally different, as the seller must formulate the value proposition in relation to the evaluated customer problems and needs. A special tool was developed specifically for this non-trivial and critical task in the business model in order to evaluate customer processes and needs and to argue the right value. The conversation with the Head of the Warehouse Management service revealed that communicating the customer value is a challenging task.

Appendix C: Fields of Action for Organization and Culture

Table 7: Fields of Action for Organization and Culture

Aggregated Dimension (Key Dimension)	**Second Order (Success Category)**	**First Order (Success Factor)**	**Results from the Case Study**
Culture	Internal Acceptance of Services (Employees)	Internal Marketing, Communication and Presentation of the Service Value	• Ongoing presentations and visualization of the use of services to both directions, the leadership management and the single employee
		Training and Internal Support	• Employee training of the value and usage of each service; make services a part of the daily business and build awareness; assist employees in case they have any questions or issues
		External Presenters	• External service experts for service presentations to different target groups, e.g. leadership meetings to build awareness of the necessity of digitization
		External Company Workshops and Success Stories	• Use the knowledge of other companies in different industries who already implement these kinds of services to learn from them and use their success stories
		Employee Pride	• Develop and increase the employees' pride in services similarly to the products via transparency and demonstration of the different possibilities of services

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Results from the Case Study
	Leadership	Top-Down Commitment	• Commitment of leadership board/CEO in order to enable resources for services as well as lead by example and communicate the relevance of services
		Change of Overall Division Strategy	• Make services part of the corporate strategy • Formulate new vision/mission
	Corporate Values		• Anchored and practiced values of the overall business help to focus on customer value in all aspects (outside perspective) and not focus on, for example, possibilities of the development (inside out)
	Brand		• Use the premium brand from the physical business model • Maintain the strong brand also in a service business and value proposition conducted by different partners in the ecosystem
	Focus on Customer Value and Satisfaction		• Every activity (development, customizing, training,…) has to focus on customer value not only on benefit (see also corporate values)
Organization	Division		• Summarize the services in an own department/subsidiary and separate them organizationally from the legacy business model and its processes
	Shared resources	Generate/Divide Employee's Resources for Products and Services	• In a hybrid business model not all functions or roles need to be performed by the company's own service staff due to the close connection to the physical business model. Hence, a hybrid workforce needs to be nominated

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Results from the Case Study
			with skills in both business models
		Process Optimization	• Dedicated department to optimize the processes of the whole business including physical and service business model
	Own resources	Key Service Experts	• The company's own service experts with full focus on service's needs to be created to operate the service business model (e.g. product management, training, sales department,…) • Hiring employees with high affinity with IT/services e.g. from other industries with a focus on services
		Development Department	• Establishing agile development processes for shorter and more flexible development cycle • Early involvement of test customers to test and increase the ease of usage of the service • Create an IT-focused department for market readiness, roll-out and operational maintenance
		Customer Service	• Establish a customer service department for o Customer support and troubleshooting o Training of salespersons o Activation/sale of service licenses for sold service packages
		Customer Training	• Establish a training department and training hubs/centers • Training documents, performance of training courses

Table 8: Fields of Action for Customer Approach

Aggregated Dimension (Key Dimension)	**Second Order (Success Category)**	**First Order (Success Factor)**	**Lessons Learned from the Case Study**
Customer Management	Sales of Services	Sales Pitch	• Same salespersons for products and services due to the long-established relationship • Use the single touchpoint and trust between the customer and salesperson to sell services • Services require a more complex preparation for the salesperson due to individuality of the service itself and adaptable design for the individual customer needs • Challenge to address the user and not only the purchaser due to the change from function-based selling (based on pure requirements and specifications) to value-based selling
		Specification of the Service Delivery	• Services can be individually tailored based on customer needs and the existing environment • Different departments and roles from the customer as well as the company are required in the sales and definition phase to define the requirements
	Salesperson Training	Specialized Service Team	• Establish a service team for selling different services • Enable agile and quick resources within the team for the salespersons for • Online salesperson training • Individual presentation of the quote based on the identified customer needs • Queries of salespersons during sales pitch • Also responsible for sold service without customer registration (outbound)

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Lessons Learned from the Case Study
		Encouragement	• Training-on-the-job with service specialists encourages the salesperson team to actively promote services and reduce the cultural barrier due to individual support • Company culture does currently not allow service KPIs and fully relies on the strong values to support customers
	Customer training	eLearning	• Establish new media training methods to train customers all over the world
		Training Hubs	• Build training hubs to train customers directly at a company training center • Be as close to the customers as possible for trainings
		On site	• Not all customers are able to come to a training hub or require a specific training on site • Adaptation of pricing structure to enable on-site trainings for complex services
		New customer groups	• Address new customer groups on the upstream side of the value chain to generate additional revenue on the one hand and train potential customers on the case services and products already in the training period on the other
	Life Cycle Management	License Management	• Establish licenses (right for the customer to use a service) to manage a flexible profit model based on runtimes and rights of use

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Lessons Learned from the Case Study
		Services-on-Demand	• When service portfolio increases, customer needs can be further considered and services will be offered only when customers need them (concerning service itself and runtime e.g. 1 month)
		Online Store	• User-friendly booking, cancellation, or any other management of the service is essential and enabled by an online store
		Second-Hand Market	• Due to licenses and the ongoing touchpoints with the company the second-hand market also becomes more and more the focus of the business and can generate additional profit streams

	Customer support	Support Model	• Establish a first- and second-level model for services
			  ○ First level is the contact center to solve basic issues
			  ○ Second level to solve serious problems

		Salesperson	• The salesperson is often the first point of contact and, due to the relationship with its customers, is still also an important point of contact for services

Table 9: Fields of Action Ecosystem Management

Aggregated Dimension (Key Dimension)	**Second Order (Success Category)**	**First Order (Success Factor)**	**Lessons Learned from the Case Study**
Ecosystem Management	Core Business	Internal Supplier	• The group covers most of the required hardware • Direct communication possible between subsidiaries without language or cultural barriers • Access to all sensors, control units, and parameters for an extensive data usage and quality for an unsurpassed service value proposition

		Core Resources Products-Services	• Connect physical products via different sensors to enable hybrid business model
			• Due to the nature of physical products the development cycles are much longer compared to service (software and data-based)
			  o Align product and service development cycles via agile process in the service business model
			  o Develop a hybrid development process to define early product-driven milestones for service hardware, but allow puffer for the fast-moving service value propositions enabled by software
			  o Establish software release cycles to enable e.g. updates of machine software and also bring new software functions quickly to the market

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Lessons Learned from the Case Study
	Extended Enterprise	External Service Provider	• Add external service provider to the service business model to enhance the value proposition • Establish new cooperation to add hardware/software beyond the key competence of the focal firm • Connect the hardware/software to the company's own system to enrich data/functions for the customer and make the use of all services as easy as possible • Essential cooperation in front of the customer needs to be aligned carefully to meet the same standards and processes of the own company. Negative experiences with partners are transferred or attributed to the own company • Cooperation has to be aligned to meet the standards of the own company in e.g. quality, availability, service, and support
		Competitor Physical Products	• The customer's fleet normally consists of different brands, which need to be connected as well to create added value and reduce the acceptance of services • Implement as many sensors/data points as possible although it might not be possible to create the same value as is possible with own machines

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Lessons Learned from the Case Study
		Co-Creator	The complexity of services in data-based value propositions benefit from an interwoven construct of different players and make comprehensive service value propositions possible. Key is to cover as many value-added services as possible in a "one-face-to-the customer" approach to reduce complexity for customers • Establish a platform (marketplace) to connect different players via the focal company system with the customers • Instead of competing with other players on the market, try to cooperate and align them with the marketplace for a win-win solution
		Customers	• New customer groups can be provided with pure service offers based on the experiences and learnings from the data of the product-service business
		Customers' Customer	• The service business model with its resources and process enables the OEM to reach downstream customers with services and generate additional revenue streams

		Connectivity Provider	The enabling technology in the service business is the connectivity provider to send data over the air between machine to machine and/or customer. The ecosystem of the connectivity provider is totally different to the company's ecosystem, which requires new capabilities within the company • Monitor developments in the new connectivity ecosystem and trends like sunset of network standards like 3G (connectivity hardware in the machines might use the standard and won't be able to communicate any more in case of a sunset); new technologies to improve services e.g. from a scheduled data transmission to real-time transmission • Due to legal, profit, and customer requirements the connectivity (SIM cards) needs to be managed e.g. to activate the connectivity as soon as a service is booked (license bought by the customer), or deactivated in the case where a machine has been sold to another customer, who has to accept certain legal requirements for using these kinds of service. Therefore, the companies are using a SIM management platform of the partnering telecommunication provider and have established the processes to manage the SIM cards • Services and the connectivity must be designed to also work abroad and not only in the target country, in case the machine is used somewhere else (network coverage needs to be considered, roaming also needs to be considered in the pricing model)

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Lessons Learned from the Case Study
			• Also, the connectivity ecosystem entails new legal requirements for offering data-based services • Depending on the country, the OEM has to register for offering data-based services via network operators (e.g. buy yearly licenses which allow the OEM to offer the service)
	Business Ecosystem	Authorities Product/Services	Authorities, or at least the legal disciplines, change for services and other/additional requirements must be fulfilled for services: • Regional data standards have to be met, which might require local solutions, e.g. in China it is not allowed to send data abroad • In some countries the OEM must ensure that local authorities must be informed of any usage of the machine of their customers for the reason of misuse • In a data-driven service business, the OEM must consider data protection regulations (e.g. GDPR in Europe), which requires customization of the contract, data usage, data storage, data anonymization and internal access to customer data.
		Authorities' Connectivity	Connectivity brings its own legislation to the new service-based business model. The OEM needs to register with the corresponding target market as a provider with connectivity-based solutions

Table 10: Field of Action Legal Management

Aggregated Dimension (Key Dimension)	Second Order (Success Category)	First Order (Success Factor)	Results from the Case Study
Legal Management	Data Privacy	Data Classes	• Digital services gather data from multiple sources to create value propositions of the highest quality. These gathered data can be categorized into different groups, e.g. machine data, process data, personal data, order data. Two data groups have to be handled with care o Personal data are regulated more and more depending on the country (in Europe see GDPR) and gaps in the system or software entailing data thefts are associated with high penalty costs o Process data also have to be treated with utmost care and only the administrator of the OEM's IT has insight into these data (besides the customer themselves)
	Contract	Selling of a Connected Machine	• Connectivity and software-based value propositions based on machines require a registration and deregistration (acceptance of Terms and Conditions). The owner of a connected machine has to sign a contract that forces the customer to deregister in the case of the machine being sold (to suspend/deactivate the SIM card, for example)
	Certification	Highest standards of processes and IT systems as well as data protection contracts	• Be certified for processes and IT systems to prove to customers the highest standards in the service business • The external partners shall also support how contracts have to be formulated • In certain countries, authorities prescribe yearly certifications of telematic modules

Appendix D: Informed Consent Form

DUBLIN CITY UNIVERSITY

Informed Consent Form

I. Research Study Title

Research Title: Service-based Business Model Innovation in Product-based Firms – A Comparative Study

Department: Dublin City University Business School

Researcher: Holger Benad, holger.benad2@mail.dcu.ie

Supervisor: Prof. Brian Harney (DCU), Prof. Brian Leavy (DCU), Prof. Dr Carsten Rennhak (Universität der Bundeswehr München, Germany)

II. Information

- This research investigates new approaches of service business model innovation in established product-oriented companies and considers factors of business ecosystem.
- All data collected will be treated completely confidentially. Pseudonyms will be used to protect your identity, and to ensure that you will remain anonymous. All collected data will be held under lock and key in my office until the project has been completed. No other people will have access to the data. Findings may be included as part of article submissions to journals and conferences.
- You are under no obligation to participate in this research. If you choose to participate, you may withdraw **at any stage** with absolutely no repercussions.

III. Please complete the following (Circle Yes or No for each question)

Please complete the following (Circle Yes or No for each question)

Have you read or had read to you the Plain Language Statement?	*Yes/No*
Do you understand the information provided?	*Yes/No*

8.12.2023

Have you had an opportunity to ask questions and discuss this study? *Yes/No*

Have you received satisfactory answers to all your questions? *Yes/No*

Are you aware that your interview will be recorded? *Yes/No*

I have read and understood the information in this form. My questions and concerns have been answered by the researchers, and I have a copy of this consent form. Therefore, I consent to take part in this research project.

Participant's Signature: _____

Name in Block Capitals: _____

Witness: _____

Date: _____

Appendix E: List of Questions

Basic information	
Company	
Interview partner	
Position	
Date	
Time	

Section 1: Business Model Elements
1. What is the new customer value proposition (CVP) and how will your CVP be defined (in case of early stage of introduction)? 2. What was the trigger for the introduction of the new service? 3. Do competitors offer a similar CVP and how does/did it influence your own CVP? - Who are your competitors in the legacy product-based model and are there competitors in the new one? 4. Which departments had to be established / split for the new service business? - Skills and technologies - Which processes on the customers' side had to be learned/understood? 5. Which tasks/departments are redundant on the customer side due to your new service (e.g. resource planning department etc.)? 6. Is there a change in the (corporate) culture (both, customer (e.g. buyer behavior of leasing products) and your company concerning e.g. adhocracy culture such as company structure, flexibility, values, employee behavior, climate (take risks in a safe environment and foster independent thinking), processes (like

"innovation funnels"), spontaneity, as well as employee behavior against a service business model etc.?

7. Are the same employees involved in both the product offer/ department and the service offer / department?
   - Where are the commonalties e.g. a senior management team, but single subordinated units are independent?
   - How is the service business organized concerning the responsibilities, etc.?
8. How has the communication between your company and your customers been changed (e.g. one contact person for all interests)?
   - Who is responsible for all service questions and customer contacts?
   - Is/are this/these employee(s) responsible for contracting, technical questions, ongoing planning, etc.?
   - Is the responsible person able to talk to every involved department on the customer side?
9. How has the cost structure been changed for the new CVP (e.g. fixed costs)?
   - What are the major fixed costs and variable costs?
   - Are there economies of scale?
   - Are there economies of scope based on your three-part offer (care-, commitment-, complete contracts), especially concerning resources (e.g. employee) and are there different structures in managing these three contracts?
10. Can you describe in general lines the process of the two business models from receipt of order to delivery (in terms of the ongoing service and the process after the first delivery)?
    - Where do the processes differ most in the two business models e.g. customer relationship…?
11. The brand *company* is known for high-quality products in the agricultural technology machinery industry. Do you think your brand is also responsible for the success of the service business model or do you have to steer the brand to a new service-based "meaning"?

Section 2: Business Model Ecosystem

1. Were there new skills (e.g. regarding financing or technology) <u>acquired</u> to deliver the CVP? (already answered in the first interview: customer interface, technology, other skills)
   - How has the customer interface been adapted?
   - Which skills must be learned in detail?
   - Did you have to develop only new (information) technology skills or also processes, routines, etc.?
2. Did you have to enter a strategic alliance to deliver the CVP?

- Did you manage the skill hurdles on your own or must enter alliances with, for example, conveyor technology partners, IT companies, hardware companies, bank for financing?

3. Has your position changed in the value chain and have new customer groups evolved?
   - You are collecting detailed data of your tool's usage, the customer's processes, how your customer works, etc. What are you going to do with the data, e.g. in terms of selling consulting as you become a "process specialist" etc.?
4. How have the distribution channels been changed during the introduction to the growth phase and compared to the legacy product-based offering?
5. Are there any enabling technologies or new complementary products (complementors) relevant for your new CVP, such as the Internet, other certain technologies, or additional offers by other companies, which have made it possible to offer your service?
6. Who are the new actors in your service business model? (like trade associations, labor unions, stakeholders, government agencies and other regulatory bodies, investors/shareholders, competing organizations that have shared product and service attributes etc.)
7. How has the market changed since the introduction of the service (e.g. new competitors/followers, new technologies to deliver the service in a better way, new partners, or has the company increased their competencies etc.)?
8. Is your, or will your new service (be) a platform for third-party implementations (e.g. software extensions by other companies to link systems…)?
   - …or are you planning to offer a "best practice" platform?
9. How do environmental aspects influence your new service (e.g. as mentioned in the annual report, fuel consumption and vehicle emissions…)?
   - Are you working together with, for example, environmental agencies, research partners, etc.? (see also Section 2; Question 6)
10. Has your vision, mission, values, etc. changed in your service business or were they the reason for developing new service business models?
11. How have legal aspects influenced your service business (e.g. registration of service in countries, GDPR, data usage, …)?

Section 3: Management Process of Service Implementation

1. Do you have an internal R&D department for such new services and is it originally structured for rudimentary innovations?
2. What was the first (second, etc.) step in the service model implementation phase after the CVP definition?

3. How is your service and product business now organized? (see also Section 1: Question
   - What about the responsibilities for the different business models and tasks?
   - Are there common responsibilities for both models or are they totally separated?
   - Where are interfaces between the service and product model (e.g. sales)?
4. If there are new players in your service business, what were/are the risks, hurdles, etc.?
5. Was the service model tested in a certain environment
   - with a certain company
   - in a certain country
   - with certain partners?
6. Was there a testing phase with a key customer? What were the problems you faced in this time and how did you manage them?
   - The question refers to internal company-based problems as well as problems your customers had/have in adapting to your service
7. What problems occurred in the restructuring process from a product-based to a service-based business model?
   - How did you restructure responsibilities?
   - Does your focus change regarding employee recruitment (e.g. regarding innovativeness)?
   - Did the company's values change and how did you manage this?
   - How did/do you communicate the service innovation within the focal company (employees, stakeholder, etc.), e.g. to motivate?
8. What potential for optimization could you identify over time in processes, resources, and service design and what are the "lessons learned"?
9. Has a service level agreement process been established also the degree of maturity?
10. What are the responsibilities for support?
11. How is testing and quality management developed?
12. Who is the business owner of the services?
13. What are the success factors for the services in general?

Appendix F: Case Comparison

	Case Study A	Case Study B	Case Study C
Contextual Drivers And Phases	**Technological Enablement:** Hybrid approach focusing on maintenance support, indirect customer value proposition, early adoption of IoT and telematics, gradual shift towards service-oriented business. **Monetization & Strategy Alignment:** Financial needs (from services for free to services for fee) and market pressure, Competitor-driven adaptation, increased investment in digital services. **Service Growth:** Authorities and opportunity for new customer groups, further expansion into subscription-based services, integration with customer operations. **Platform Strategy:** Development of a digital platform to consolidate service offerings and customer interactions.	**Technological Enablement:** Service development initiated at local levels, focus on automation and predictive maintenance, decentralized service development. **Monetization & Strategy Alignment:** High customer demand for connected services, internal resistance to change. **Service Growth:** Gradual integration of digital services with legacy business, need for service centralization. **Platform Strategy:** Initial efforts to establish a service marketplace, challenges in data standardization.	**Technological Enablement:** Initially focused on internal learning, strong emphasis on internal data collection, leveraging existing assets for new services. **Monetization & Strategy Alignment:** Financial needs and authority pressure, Delayed entry into servitization, reactive strategy in response to market trends. **Service Growth:** Shift from physical product sales to hybrid service models, leveraging digital twin technology. **Platform Strategy:** Collaboration with competitors to define industry-wide standards, focus on ecosystem development.

	Case Study A	Case Study B	Case Study C
Organizational & Cultural Management	Clear separation of service division from traditional business. Strong leadership commitment to servitization. Cultural transformation towards service-centricity. Focus on training and internal acceptance of services among employees.	Cross-brand innovation center to leverage synergies across the corporate group. Reliance on existing sales structures for service integration. Incremental cultural adaptation rather than radical change. Challenges in aligning service mindset with traditional manufacturing culture.	Spin-off of digital service units to enhance focus and agility. Initial leadership skepticism towards service transition, later adopting a customer-centric approach. Stronger alignment of digital services with core business over time. Gradual development of a service-oriented corporate culture.
Customer Management	Extensive sales and customer training programs. Dedicated service management department with digital tools. Development of an online store for self-service subscription management. Proactive customer engagement strategies, including service feedback loops.	Decentralized sales support with region-specific service offerings. Training programs focused on both technical and sales teams. Integration of services into existing customer interaction channels. Challenges in standardizing service offerings across global markets.	Transition from indirect to direct sales in service segments. Use of digital channels to enhance customer engagement. Implementation of lifecycle-based service models. Emerging focus on customer-driven service innovation.
Ecosystem Management	Strong vertical integration with in-house technology development. Cooperation with competitors for industry-wide service standardization. Creation of an open marketplace for service and data exchange. Efforts to drive interoperability between different service providers.	Limited internal development capabilities, reliance on external partners. Focus on strategic alliances for technology and service co-development. Integration of third-party service providers into customer offerings. Challenges in maintaining consistency across partner-based services.	Collaboration with competitors to create unified data-sharing frameworks. Dependence on external connectivity providers for data transmission. Investments in cross-industry partnerships to expand service reach. Exploration of new business models beyond traditional product sales.

	Case Study A	Case Study B	Case Study C
Legal Management	Dedicated legal compliance teams to oversee data protection and service contracts. Strict access control mechanisms for customer and operational data. Investment in certification processes for market-specific regulatory approvals. Proactive legal risk assessment and mitigation strategies.	Primary focus on GDPR compliance and regional data protection laws. Use of external legal advisors to ensure contract compliance. Decentralized approach to data governance, varying by market. Ongoing adaptation to evolving digital service regulations.	Dedicated internal data protection officer for service-related compliance. Implementation of strict customer data access policies. Complex regulatory navigation for cross-border service offerings. Market-specific legal registration processes for digital services.