Introduction to Smart Service Design

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Abstract This chapter examines the question of the contribution of smart services for companies and the implications this has for the management of these business models. The chapter starts by outlining the different terminology used to describe smart services and introduces a business-driven view on the digitalization strategy of a company. The characteristic features of digital business models are explained as well as their implications for the management of smart service organizations.

1 Introduction

In 2011, the German economy proclaimed, in a way, its own fourth industrial revolution, the *Industrie 4.0*. This terminological description of the developments around the digital transformation of the industry is mainly the result of two future-oriented projects by acatech (Kagermann et al. 2013, 2015). By coining the term *Smart Service World,* these projects addressed the question of future-oriented business models for digital platforms. Since then, many industrial sectors have seen an expansion and professionalization of customer-targeted digital activities. In addition to the classical service business, which has become a central profit and revenue driver for many industrial companies over the past 20 years, these companies are now expanding their range of services to include digital offerings. This chapter examines the question of what strategic contribution smart services can make for companies and what implications this has for the management of these business models.

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2 What Are Smart Services?

For a better understanding, this chapter begins with a description of the characteristics of *smart services*. Smart services are services which aggregate and process data stemming from digitally networked physical objects (so-called smart products) and generate added value based on this data. This added value can be, for example, the intelligent control, adaptation, and optimization of smart product functions. However, the collected data can also be used for other purposes (DIN 2019). In science and practice, numerous terms are used partly synonymously, partly in differentiation with changing meanings. These terms include remote services, Internet-based services, digital services, and databased services. Table 1 shows how the three most commonly used terms differ.

To better understand this book, an overview of the characteristic features of smart services is necessary. Data is the central resource of smart service business models. Access to this data is therefore of crucial importance in the development of the business model. The fact that this data originates from networked physical objects, for example digitally connectable production plants, determines the use cases. Another characteristic of smart services is thinking in platform business models.

Smart services are also characterized by thinking in platform employment models. The smart service provider often tries to take on a manufacturer-neutral position regarding the smart product that provides the basis for the service. There are several reasons for this. On the one hand, the smart service providers try to address the largest possible installed base of machines and systems. On the other hand, the positioning often also serves the purpose of occupying a dominant role in the digital ecosystem of the value chain. This is the reason why, for example,

Table 1 Typical features of different terms for digital services (Husmann 2020)

	Product-related services	IT-based services	Smart services
Interaction form during service provision	Physically	Physically	Digitally
Type of service provision	Physically	On-premise	On-demand
Scalability	Low	Low	High
Connectivity	None	Via the customer's internal network	Via Internet to the provider
Service type	Descriptive	Descriptive	Predictive/prescriptive
Origin of the data/reference object	Single physical product	Single physical product	Multi-vendor products/entire value chain
Example	On-site repair	On-site condition monitoring	Self-optimization of production

machine tool manufacturers also connect machines from competing manufacturers on their digital platforms.

A third essential characteristic of smart services is the fact that they aim to make databased predictive and prescriptive statements and offer services that are based on these statements. This characteristic is often referred to as the smartness of digital services.

3 Smart Services as Part of a Digitalization Strategy

From a strategic point of view, smart services can have different meanings for a company and take on several roles within a company strategy. In order to define these roles, companies need to decide on their digitalization strategy. It is important to note that a digitalization strategy in the context of this chapter is primarily a business strategy and not a technology one. In order to define a clear focus for it, companies must understand the underlying digital technologies (cloud & edge, big data, etc.). However, understanding possible new business models, their mechanisms, and possible effects on one's own value creation system as well as the market in which the company is located plays an even more decisive role. Based on the assumption that the company in question is not a new start-up but a company that already pursues existing business activities apart from a possible smart service offering, the typical components and roles of smart services within the company's digitalization strategy can be distinguished as illustrated in Fig. 1.

The illustration shows that first of all, smart services can be used for internal improvement. Although the focus of this is often on customer processes or contact points, the actual goal of using smart services is often linked to a cost reduction for the company providing the service. Although the range of smart service technologies is used for this purpose, this is not a business model transformation. Typical goals of the use of smart service technologies for internal optimization purposes are the reduction of throughput times or quality improvement. A typical example is the offer of an online portal for ordering spare parts with digitally integrated order processing. Here, a wide range of potential can be leveraged by using smart services and additional competitive advantages can be generated. The demand for spare parts can be predicted precisely due to the improved data

Fig. 1 Levels of a digitalization strategy

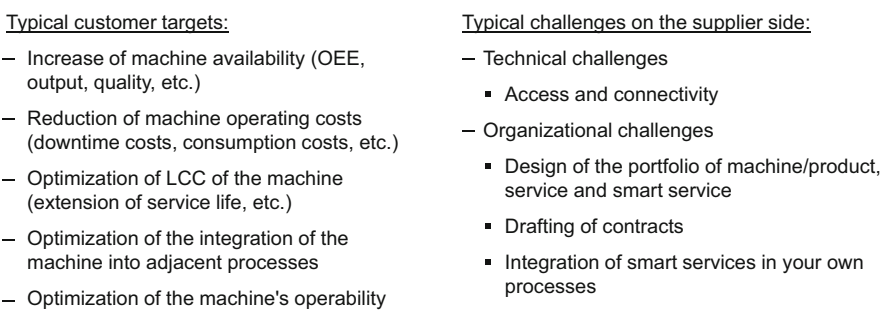

Fig. 2 Customer goals and provider challenges when complementing existing business areas with smart services

availability for example, and, based on this, warehouse inventory can be optimized. However, the actual business model, selling spare parts, does not change. Likewise, the use of smart services is usually not charged directly to the customer in the form of a revenue model.

A second level of a digitalization strategy can be the expansion of existing business areas. Especially in the everyday practice of industrial companies, it can often be observed that existing product and service offerings are expanded by digital offerings. Because of these additional services, the customer receives an added value on top of the use of the product or the existing service. Although digital services often generate additional revenue for the provider, the focus is not on building the most profitable smart service business possible. Rather, the smart services support the existing product and service business. Further provider goals are the increase of customer loyalty and the generation of data providing information about the customer's product use, which, in return, can be used for further development. Figure 2 summarizes the typical goals customers and service providers have in mind when deciding to include smart services in their existing portfolio.

A typical example for these kinds of smart services in an industrial context are networked machines and plants, the data of which is used for quality improvements or machine failure prediction. This is often achieved with the help of additional smart services, which are offered by the plant manufacturer based on IoT technologies via a digital channel (web-based dashboard or app). From a provider's point of view, there are more challenges to overcome than just the development of specific smart services because, for example, the new digital service offerings always need to be considered as part of a portfolio in combination with already existing products and services. Service bundles are often put together to provide the customer not only with individual digital services, but a combination of physical and digital ones.

A third digitalization strategy level is the development of new business areas, separated from the existing product and service business. This business strategy focuses on the creation of an independent, profitable smart services business. Independence in this context means that it does not have to be subordinated to an existing product or service business. From a supplier's point of view, this strategy element

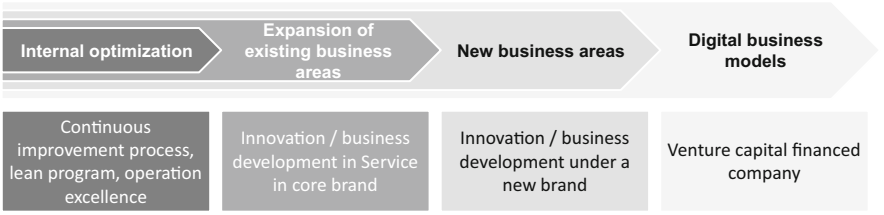

Fig. 3 Typical models for implementing elements of a digitalization strategy

also serves as an opportunity for diversification. In the same way, the knowledge of customer needs in one's own ecosystem can be used to realize additional customer added value in addition to the classic core business. One example for this is the company 365farmnet. It is a subsidiary of the agricultural machinery manufacturer CLAAS, but operates independently on the market. The focus of 365farmnet's range of services is not the digitally networked agricultural machine, but rather the provision of digital solutions for farm management. Customers can purchase these without having to own a CLAAS agricultural machine.

The fourth level of a digitalization strategy can be considered as a specialization of the previously mentioned third one. Its business strategy is aimed at gaining access to digital control points in ecosystems with highly scalable business models based on smart services, and, consequently, gaining a dominant position on the market. This is usually achieved in combination with platform business models. The special features of this strategy are explained in the following section of this chapter on digital business models.

With regard to the digitalization strategy and the role of smart services, it is important to point out that the various areas of application typically determine the way in which companies implement the services. Figure 3 illustrates the typical models for implementing the elements of a digitalization strategy. While programs and organizational mechanisms for the optimization of the company's own processes often already exist, the company must consider new forms of financing for the usually very risky introduction of digital business models. Likewise, the strategic level often determines the type of service offering from the very beginning. For example, smart services that are offered as a supplement to existing products and services are usually placed on the market with the same brand name and are connected tightly to the existing business in terms of the organizational structure. When smart services are offered with the aim of moving into entirely new business areas that are independent of the existing product and service business, however, they often receive a new brand name or are made part of a new legal entity.

4 Digital Business Models

The term *digital business models* is used widely and often in many different ways in the context of digitization. This inflationary use means that it is usually unclear, both in practice and in science, which special features characterize these business models. A frequently used terminology approximation emphasizes the technologies that are used to implement the business model (Meinhardt and Popp 2018). Business models are often described as digital if they provide databased services for the customer, have a digital customer interface, or simply rely on digitalized processes. However, the characteristic features, especially the often disruptive character of digital business models, are not emphasized by this definition. This is why the following part of this chapter presents the characteristic features of digital business models. Once these are explained, it becomes clear why the development and management of these business models presents companies with very special challenges.

In order to understand digital business models, it is useful to illustrate what their strategic goals are first, completely independent of the technology used. Figure 4 presents these goals and their interdependencies. There are two aspects that need to be emphasized at this point. Digital business models are successful on the market mainly because of two key competitive advantages: scalability and forecasting ability. It is the strategic task of the digital business model management to achieve these competitive advantages. Although both can also be desirable for companies with a classic tangible assets business model, they can reach so-far unknown extents when digital technologies and entirely digital services are involved. Scalability means that the company is able to roll out new services to a large number of users within a very short time. Among other things, this requires a short-cycle release capability, which in turn can be achieved if the business model is designed to be as independent as possible and does not rely on physical assets. Forecasting capability means gaining unique insights from (mass)data and using them to achieve superior performance and added value for the customer. For this purpose, it is necessary to obtain access to this data both technically and contractually. Crucial basic requirements for achieving these characteristics are a networked infrastructure consisting of networked users, networked physical assets, and working in digital ecosystems with open interfaces.

Fig. 4 Interdependencies of digital business models

4.1 Scalability

From the beginning, digital business models aim to adopt a dominant market position in order to control or even change market mechanisms. To accomplish this, it is necessary that a critical mass of a relevant target market obtains the services of a company—as quickly as possible. Right from the start, digital business models are designed in such a way that a large number of customers can use the services as quickly as possible. Many examples from the B2C sector have shown that even short-term profit targets are often subordinated to this goal. All available capital is invested in growth and innovation, often over a period of several years. With the infrastructure that is available in the B2C sector today, which means smartphones connected via the Internet, there is the unprecedented possibility of reaching many hundreds of millions of potential users with new services and business ideas within a very short time. Users are often already registered with a customer account and payment data, so that the administrative effort is minimal. Within minutes, new apps can be downloaded, tested, and deleted again. A well-known statistic shows the scalability of apps by comparing the time required until a technology or product reaches 50 million users. While inventions such as the personal computer or mobile phone still needed 14 or 12 years to reach this number, the Pokemon Go App, for example, only needed 19 days (Desjardins 2018). In the B2C area, the mass distribution of smartphones provides the relevant infrastructure of networked people for the scalability of digital business models. At the same time, it can be observed that more and more machines, systems, and objects are being networked. This includes cars or machine tools as well as trackable logistics objects (e.g., containers) or measuring stations that collect and send data in an agricultural field for months without an external power supply. This so-called *Internet of Things* benefits from steadily decreasing costs for data acquisition and networking technology and decreasing electricity requirements for networking. If the element of the connected human is added to this concept, one can refer to it as the so-called *Internet of Everything*.

However, scalability is not only a consequence of allocating capital to growth-promoting measures. Instead, scalability also requires very short innovation cycles in order to convert identified customer needs into new or improved services at high frequency and to deliver these to the user in the form of new functions. This potential of the feature, known as release capability, is especially present in the digital world. Physical products or rather their physical properties and functions can often only be adapted or changed after the customer's purchase with considerable effort—if at all. In any case, it is often associated with very unpleasant side effects for the customer. Software is subject to these restrictions to a much lesser extent. New functions or adjustments can be rolled out automatically at the push of a button. Web-based services do not even need updates, which can be perceived as annoying, for example in the case of app updates on smartphones. Further requirements for a high scalability are:

- *Independence from physical assets:* Digital business models are usually not limited to individual manufacturers of physical assets, but try to offer comprehensive services.
- *Independence from physical resources:* In order to achieve scalability of the service provision, digital business models also rely on independence from physical resources. Required resources are purchased as a service from third parties (e.g., cloud infrastructure) only to the extent that is necessary to provide the service.
- *Independence from regional restrictions:* Even though the actual market launch of digital business models often means that several regions are conquered one after the other, digital business models are not limited by language or other regional specifics.
- *Easy access for customers:* Companies that pursue a digital business model make it as easy as possible for their customers to access their services. This concerns organizational, legal, or financial hurdles as well as usability.

4.2 Forecasting Ability

In terms of actual performance, the ability to forecast represents the central competitive advantage of digital business models. This is where the actual added value for the customer is created. Due to digital networking, the amount of data generated and available doubles approximately every 12 months. With the help of this data and steadily decreasing costs for storage space and computer performance, more and more use cases for the use of this data are becoming economically interesting. This progress is accompanied by a permanent further development and automation of the procedures of machine learning and artificial intelligence.

Digital business models generate added value from data for customers in many different ways. Creation of added value can range from the possibility of comparing several options for action (e.g., provider comparison portals), to the aggregation and visualization of data (e.g., IoT platforms), to the automation of actions and transactions (e.g., P2P lending portals). Technologically, this usually requires a software-defined data platform that can aggregate and manage data from different sources and make it available for analysis. If data originating from the physical world is used, digital business models also need to answer the question of how this data can be generated technically and economically. Finally, data access must also be ensured both organizationally and, above all, contractually. There are two ways for companies to gain access to mass data. Direct data transactions are one option, which means the data providing customer receives a direct service promise based on this data in return. Another option is to use data that is the by-product of another service provision. In this case, the customer does not explicitly receive added value in return for his data, but obtains another service first. In the B2C context, end customers often still allow the use of their data by simply agreeing to the general terms and conditions of a provider of a free service. In the B2B sector, however,

most companies are very much aware of the issue of access and use of their data and attach importance to clear contractual regulations.

5 The Challenge of Managing Smart Services

The described characteristics of smart services and digital business models result in specific challenges for their management. They also explain why the development and provision of smart services and the adoption of digital business models are associated with great changes, especially for established companies with a traditional business model.

- *Radical customer focus:* Although customer orientation is, in principle, a core characteristic of any good corporate management, smart services require a completely new and in-depth approach to the customer. It is no longer enough to only understand the technical challenges the customers are facing. It is much more important to understand processes and procedures as well as the needs, experiences, and preferences of individuals in detail in order to be successful with smart services.
- *Thinking in ecosystems:* To understand the market and customer situation as well as the company's own service provision, it is necessary to think in ecosystem patterns. Ecosystems are often designed specifically for digital business models. These can be, for example, partner companies of the smart service provider, which extend the scope of services or use the provider's customer access.
- *Short-cycle innovation:* In order to be successful with smart services, it is necessary to translate customer needs into new services and to introduce them to the market with a high frequency. This requires early involvement of the customer and the early testing of new services together, as well as thinking in minimum viable services. This means that the service development is initially limited to core functions and those services that are of interest to the customer. They are introduced to the market first. Afterward, the range of functions and services is expanded gradually, based on initial market experience.
- *Importance of the market launch:* Just like customer orientation, the ability to successfully manage the market launch can be an advantage for any company. In the case of smart services, however, two special features give special significance to the market launch. First, due to the mostly agile development approach and thinking in minimum viable services, the market launch takes place at a very early stage in the development and product life cycle. Whereas the market introduction processes for classic business models are often designed with a specific launch date in mind and are subject to a linear process, it is advisable to take on an agile approach for the market introduction of smart services. Second, with smart services, the transaction numbers per customer are often relatively low, at least at the beginning of the customer relationship. This, together with the digital nature of the underlying business models, often makes it necessary to rely

on new (digital) forms of marketing and distribution in order to keep the costs of customer acquisition in reasonable proportion.

Overall, it becomes clear that the use of smart services and the transition towards digital business models are accompanied by numerous potentials and monetary profit prospects, but also at the same time pose a number of great challenges for companies. To overcome these hurdles, it is necessary to agree to restructurings and work on competence expansions to ensure successful smart service management.

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