Chapter 11
Servitization as an Innovation Process: Identifying the Needs for Change

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Abstract In the past, innovation efforts in industry were focused on tangible product innovations. Debating the topic of servitization has led to an expanded view of innovation. Intangible product innovations are an opportunity to complement innovation strategies. However, the practices and tools that facilitate creating tangible innovations have failed for intangible innovations. Therefore, many manufacturers hesitate to develop new services or Product Service Systems (PSS). With this background, this chapter presents a concept for managing a systematic innovation process with respect to specific challenges of intangible innovations. This managerial innovation model is based on case studies of servitizing manufacturing industries. The insights derived from actively applying industrial servitization processes were bundled into a generic procedure. The presentation of this generic procedure is organised into five sections: After an introduction, the second section provides a literature summary on service innovations in industrial firms. Then, we present the challenges of servitization processes identified in case studies and characterise the new innovation model.

11.1 Introduction

In the past, manufacturers in industrialised countries were intensely focused on research and development to create product innovations. Competing with high-technology products was ubiquitously regarded as a promising means to address the challenges of globalised markets. 'High-tech' and 'innovation' became buzz words for both industrialists and politicians.

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However, innovation research has shown that this constrained definition of innovation can omit innovation opportunities. Tapping the full potential of innovation requires a more comprehensive view of innovation issues. Innovative manufacturing processes and intangible innovations, such as innovative service offers, are as important as innovative products.

In marketing literature, this shift from a logic focused on the exchange of goods to a new logic focused on intangible resources, such as the co-creation of value and relationships, has been well characterised by Vargo and Lusch (2004). Their appeal to formulate a new service-dominant logic for marketing, in which service provisions rather than goods is fundamental to economic exchange, was a major contribution to recent research.

However, manufacturers have hesitated to utilise this new paradigm. For many reasons, only a limited number of manufacturers have focused on developing innovative services (see Schröter et al. 2008; Lay and Schröter 2006). First, industrial firms are concerned about the significant financial risks of developing innovative services and Product Service Systems (PSS). Firms often doubt the costs and benefits of new service offers (see Lay and Schröter 2006). Second, the development of new services is not comparable to the development of new technical products (see e.g., Lerch 2011a, b). Product innovations are usually triggered by research and development (R&D) activities, while the need for new, customer-oriented solutions is mostly driven by the market or even single customers (see e.g., Lay et al. 2009a, b). Therefore, the tools and the knowledge gained from developing innovative products cannot be applied to the new challenge of creating innovative services.

Therefore, this chapter presents a generic and systematic concept for generating innovative services and Product Service Systems. This concept has managerial implications for manufacturers and aims to support industrial companies in developing new, customer-oriented solutions in the most suitable manner.

The presentation of this concept is organised into five sections: The next section is an overview about service innovation processes in industrial firms based on the existing literature. The third section presents eight generic challenges for service innovation processes that have been identified in cooperation with servitizing companies through recent research projects. In the fourth section, we derive a model process for creating customer-oriented solutions meeting the challenges introduced in the third section. The last section concludes and summarises the findings.

11.2 Service Innovations in Manufacturing Firms: Towards an Autonomous Innovation Management for Services

The relevance of service innovations in manufacturing industries has recently been discussed in the literature. As Velamuri et al. (2011) declared, the perspective of innovation should be regarded as its own pillar in servitization research. As one of

eight streams of servitization research, the authors state that the so-called "innovation view" has its own questions of principles and also significantly influences servitization research.

Following an extensive literature review, the innovation view contains two subgroups: "innovation management" (1) and the "transition" (2) of industrial firms into service providers (see Velamuri et al. 2011).

The first sub-group, which addresses the topic of innovation management, contains publications working out innovation processes for product-related services or service-enhanced firms (see Gann and Salter 2000). Other publications develop integrated solutions for manufacturers by incorporating the customer within the innovation process (see e.g., Brax and Jonsson 2009; Windahl and Lakemond 2006). Generally, the authors of this sub-group agree that the innovation management of industrial services must be distinguished from product innovation management and requires new methods and tools for practical solutions (compare with Velamuri et al. 2011).

The second sub-group, the transition of manufacturers into solution providers, is a traditional field and addresses one of the principle questions of servitization research. Those publications focus on alternative service strategies for successful transitions of industrial firms and develop solutions for the challenges encountered during those changes (compare e.g., the works of Matthyssens and Vandebempt 2010; Gebauer et al. 2008; Matthyssens and Vandenbempt 2008; Penttinen and Palmer 2007; Oliva and Kallenberg 2003 or More 2001). Following the basic assumption of these works, industrial companies are transitioning from pure manufacturers to solution providers with individual client-oriented product-service bundles (see Gebauer 2004). During that process of transformation, companies face internal and external resistance that must be overcome (compare to Velamuri et al. 2011).

In terms of these sub-groups, this chapter follows the frame conditions and the principle questions of the innovation management literature, sharing the basic assumptions and opinions of these publications, which are that innovation processes of novel services or Product Service Systems should be regarded as a unique research subject. Due to these assumptions, some approaches already exist in the literature that suggest alternative processes for developing Product Service Systems (PSS). A substantial overview of the existing concepts is presented by Weißfloch (2013).

Aurich et al. (2010) present three general processes for developing PSS. The linear model (1) includes different stages, with each step building on the previous step, and is adequate for less complex services. The iterative model (2) includes loops and feedbacks and is used for more complex services. The so-called "Prototyping-model" (3) describes a very rapid development process and is improved by its initial applications. Consequently, for each service type, a specific development process can be chosen.

Other concepts, developed independently from one another, are described by Schröter et al. (2008), Maussang et al. (2008), van Halen et al. (2005), Emmrich (2005), and Morelli (2002), among others. Most approaches focus on generating

new ideas and the development process, but neglect the stages of implementation (see Weißfloch 2013). Furthermore, some authors argue that products and services must be developed simultaneously and that the development process for products and services should be merged (see e.g., Spath and Demuß 2003).

Consequently, a number of new service development processes for industrial companies already exist; however, they are fitted to a specific type of service in terms of complexity and concentrate on the integrated development of products and services. Finally, an innovation process that can be used for simple services as well as for complex PSS and can be developed autonomously and independently from a technical product and used with already existing products has yet to be described.

Discussion in the literature shows that service innovations in manufacturing industries should be regarded as an autonomous research topic that is not comparable to product innovations or innovations in service industries. Furthermore, some theoretical approaches for developing new services already exist. However, these processes concentrate on specific service types and emphasise the integrated development of products and services. Consequently, a service innovation model suited to all types of industrial services, from very simple services to highly complex PSS, that is independently applicable from the product is still missing from the literature.

11.3 Eight Challenges to Mastering the Service Innovation Process in Manufacturing Firms

In recent years, we have directly observed several efforts by manufacturers targeted towards servitization. Our role in these projects was to both analyse and assist the companies. Table 11.1 presents the characteristics of these projects.

Based on these projects, we have learned that servitization efforts by manufacturing companies face several challenges. We identified eight aspects that are crucial to the success of servitization projects:

Customer orientation The impulse to develop new services or PSSs may be developed by customer co-creation or by market research techniques (see e.g., Witell et al. 2011; Lerch 2011a). Particularly complex PSSs are triggered by single customers who are often very important clients. In this case, the provider must develop a highly individualised customer-oriented solution. The effort to develop such a PSS is often not foreseeable, and success is ambiguous. Usually, this is the first challenge for manufacturers entering the field of servitization. The issue of how to use and acquire customer knowledge to improve servitization in industrial firms has proven to be a very important challenge.

Market analysis A second aspect from the market is the emerging need of entire customer groups. In this case, customers should be segmented by their deficits. Then, the PSS-market potential of each customer must be estimated. The result of this market analysis is a prioritised list for exploring the different service markets.

Table 11.1 Empirical background for identifying challenges in service innovation projects

Involved Manufacturer(s)	Type of developed PSS (in terms of Tukker 2004)	Customer sectors
Robot manufacturers	Result-oriented PSS; Use-oriented PSS; Product-oriented PSS	Producers of complex products and small batch sizes (Metal goods, wooden products, aluminium parts)
Manufacturers of assembly systems	Result-oriented PSS	Automotive and aerospace industry, pharmaceutical and chemical industry
Manufacturers of compressors and pneumatic systems	Result-oriented PSS; Use-oriented PSS	Energy-intensive companies (e.g., Automotive industry, food industry, machinery and equipment)
Machine tool builders	Result-oriented PSS; Use-oriented PSS	Manufacturers of high-tech products and large-scale production (e.g., Automotive industry, automotive suppliers)
Manufacturer of large-scale plants	Product-oriented PSS; Result-oriented PSS	Manufacturers in process industries (e.g., Minerals and mining)

A procedure for identifying key customers in service markets as an input for developing service strategies is widely unknown among manufacturing companies.

Servitization strategy After identifying the customer's needs, a suitable service strategy must be developed. A service strategy combines various aspects, such as the service offer or value proposition, which are part of the strategic management of a company. The strategic management decision requires answering the following question: Which service offerings will be implemented and which ones will be discarded? If the PSS is implemented, manufacturers must design a PSS that is able to exhaust the remaining potential of the pure product (see e.g., Kowalkowski et al. 2012; Hakanen and Jakkola 2012). The strategy is highly important to the long-range success of a new service offer.

Sourcing and supply chain management Depending on the strategic decision, the value proposition should be translated into a business concept that can create value for both the provider and the customer. Due to their nature, PSSs are not comparable to classical product-related services; therefore, the roles between provider and customer must be totally redesigned (see e.g., Kowalkowski et al. 2013; Morelli 2006). As a result, an internal feasibility study should identify the activities that can be conducted in-house, those that can be conducted by external parties and those that can be conducted by customers. If neither the provider nor the customer can manage a special element of the PSS, a third party must be involved. Finally, the question arises about which activities should be outsourced versus insourced, as well as how to manage the supply chain (see e.g., the morphological box of Lay et al. 2009a, b).

Processes and interfaces A widely discussed topic in servitization literature is the redesign of processes, organisational structures and interfaces. An initial question for servitized firms is the organisational structure of the service department. For example, Rainfurth (2003) highlighted the specific advantages of

different types of organisational structures for offering services. Additionally, internal and external processes must be renewed for the associated responsibilities and implementation of individual activities (see e.g., Biege et al. 2012). Furthermore, new interfaces within and between firms must be designed. Due to the servitization of firms, the nature of interfaces is changing and the processes are becoming increasingly complex.

Management accounting Often, complex services have highly uncertain turnovers and costs. To offer new services, it is essential to implement a management accounting system that takes into account the special features of a PSS. The literature describes methods for calculating the costs and benefits, including Life Cycle Costing (LCC) and Total Cost of Ownership (TCO) (see e.g., Lay and Radermacher 2005), which also may be used as pricing instruments, in addition to other methods that are based on multi-criteria analysis (as e.g., Weißfloch 2013; Mattes et al. 2013). Moreover, there are approaches that use the Balanced Scorecard (BSC) (e.g., Kinkel 2003) or Function Point Analysis (FPA) (e.g., Lerch and Gotsch 2013) for accounting services on a company level. However, as the literature emphasises, the implementation of PSSs has significant risks, and decisions are made under uncertainty.

Product adaptations The implementation of new services may lead to adaptations of the technical product. Consequently, this stage of the model focuses on the technical business environment of industrial firms relative to adapting the core products. As Weissenberger-Eibl and Biege (2010) already noted, the implementation of new services, and particularly PSSs, requires adaptations of the physical product. Depending on the type of service, there are different adaptation strategies and requirements for the product's design (see Biege 2011). The challenge is identifying the most appropriate ways to design the physical assets used in the PSS.

Human resources Finally, implementing complex PSSs highly impacts the manufacturing staff. Change is required not only of the technical equipment, processes and organisational structures but also among employee's key skills and qualifications (compare to Jung Erceg 2005). Whereas engineers and technicians of pure manufacturers are focused highly on the physical product, the service staff of a solution provider must develop more customer-oriented skills. This concern particularly includes the appropriate handling of customers from the beginning to the end of the product life cycle. Consequently, the question arises: what are the suitable competency profiles and new key skills of technicians and engineers?

11.4 Process Model for Service Innovations in Manufacturing Companies

The fourth section presents a generic process model for generating and implementing innovative services in manufacturing companies based on the eight challenges introduced above. This process covers simple product-related services

as well as complex PSSs and is applicable to both new and existing, diffused products. The presented procedure contains a generic structure with different stages and may be adapted for individual cases.

The basic structure of this procedure has been described by Schröter et al. (2008) and has been continuously adapted and improved over various research projects and studies. This ideal type of innovation process evolved as part of the common development of PSSs with various manufacturers from different industrial sectors. Therefore, this model is based on the experiences of several case studies from five research projects conducted during the last years and bundled into a generic approach.

The evolution of this model, the identification of necessary changes, the implied assumptions behind the individual steps and the theoretical underpinnings are presented here. As already discussed in the literature, the impulse to develop new services is often triggered by customers and is therefore demand-driven (see e.g., Witell et al. 2011; Lay et al. 2009a, b). The same experience was observed in the case studies about the process of PSS-development. Therefore, we assume that the innovation processes for PSSs are not comparable to R&D-driven innovation processes, but may be opposite to R&D-driven processes.

Furthermore, the case studies highlight that a novel business concept, in terms of a PSS, should be regarded under a systemic point of view. This means the development of new product-service bundles cannot be accomplished successfully by a single business area. Instead, various skills are needed because such an innovation affects different parts of an enterprise. The systemic nature of those PSS-models has been described in the literature (see e.g., Morelli 2006) and should always be regarded for PSS-development.

Furthermore, we realise that an integrated perspective consisting of external market needs and internal resources is absolutely necessary for a successful PSS-development. Therefore, the presented innovation process combines both perspectives: market needs and market potentials, as well as the allocation of resources and the adaption of processes. Due to these major findings, highlighted by the conducted case studies and supported by the literature, the managerial service innovation model is based on the following three principles:

- Novel PSSs are systemic innovations, affect various parts of a company, and can be broken down into different stages, which may be conducted sequentially or iteratively.
- Novel PSSs are mostly demand-driven; therefore, we imply that the dominant innovation process for PSSs is reverse.
- Successfully developing a new PSS requires an integrated perspective that combines external market needs and internal resource allocations.

The approach should be understood as a guideline for industrial companies, with managerial implications, tools and instruments for individual stages. The basic structure is shown in Fig. 11.1.

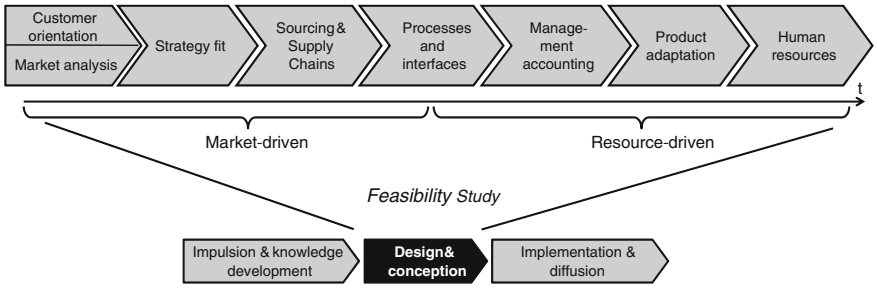

Fig. 11.1 Generic model for the development of PSS (*Source* own illustration)

The approach is embedded into the overall innovation process, starting with the idea for a new business concept and ending with the implementation of a service or a PSS-demonstrator. Each stage requires various skills within an industrial company to address the eight challenges that have been identified.

As already described, the process may be run sequentially or iteratively. As the case studies show, the stages are followed more sequentially for less complex services, and the entire process is completed more quickly because some stages can be omitted. In contrast, for more complex services, the stages are followed more iteratively and the entire process requires more time. Consequently, this process is self-regulated by the complexity of the service.

Finally, the question arises: How should companies use this process model and how can they implement the results? As case studies demonstrate, it is helpful to involve employees from the different departments associated with a PSS-development. Employees should be drawn from marketing, product development, human resources, accounting, legal, company management and customer service. The working group, or project team, should include five to ten people participating in the design and conception stage of the PSS.

During this stage, an efficient working style is achieved by completing several workshops conducted by either internal or external experts. In our case studies, the workshops lasted between one-half day and one full day and were conducted every two to three weeks. The appropriate people were consulted according to the workshop topic. The workshop concept has the advantages of being a strong, continuous process that involves all company segments, recognises errors early, and provides an innovative working environment.

Implementing the results of the workshops occurs during the next stage, which is the implementation and diffusion phase. The findings collected from the workshops should be recorded for developing a PSS-demonstrator. The implementation and diffusion stage is driven mainly by customer service and is connected to other departments through feedback loops. Consequently, this first demonstrator is improved if it is ready for a marketable application.

11.5 Conclusion and Outlook

In recent years, innovation research increasingly broadened the focus of analysis from tangible towards intangible innovations. As a result of this shift, service innovations have attracted greater attention and are relevant competitive factors among manufacturers. However, the diffusion of service innovations in manufacturing industries reflects only part of their value for competitiveness. A lack of adequate tools for managing servitization processes has hampered the servitization of the industry.

Therefore, this work highlights the challenges for mastering the process of service innovation and presents a generic process model to overcome these challenges. This process model is adaptable to basic product-related services as well as to complex PSSs, concerns all relevant areas of a company during the development, and can be used as a guideline for companies.

The challenges in servitization mentioned above for manufacturers are detailed in the subsequent chapters.

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