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INDUSTRIAL SERVICE SYSTEMS



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PREFACE

This is a textbook intended as study material in the Industrial Service Systems course at Tampere University. It covers the core contents of the course and will be supplemented by additional article readings. The focus is on the enablers and management of service systems in industrial firms, including customer information, resources, service offerings, service delivery systems, organizing, and management control. The viewpoint is that of the organization involved in industrial service business and collaborating with customers and other organizations. The book is suitable for familiarizing with industrial service systems also more generally, particularly among experts and managers in manufacturing firms that consider servitization in their business.

We have utilized the reader feedback received during the spring 2020 to make minor improvements compared to an earlier version of the book, but the main contents have not changed. It is possible that the book will require improvement also in the future. Therefore, we appreciate any feedback and ideas for development from readers.

Enjoy the reading!

Tampere, Finland, August, 2020

Authors

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O. OVERVIEW: STRUCTURE AND APPROACH OF THE BOOK

Manufacturing firms in various industries are expanding their business reach to industrial services, while simultaneously using modern information and communication technologies to digitalize and transform their businesses. This book is intended to guide students into understanding the key enablers for industrial service business and the requirements for managing industrial service business. With a focus on industrial service systems, the book discusses issues that manufacturing firms and other industrial service providers need to consider when involving industrial services as a source of business. Figure 1 summarizes the structure of the book.

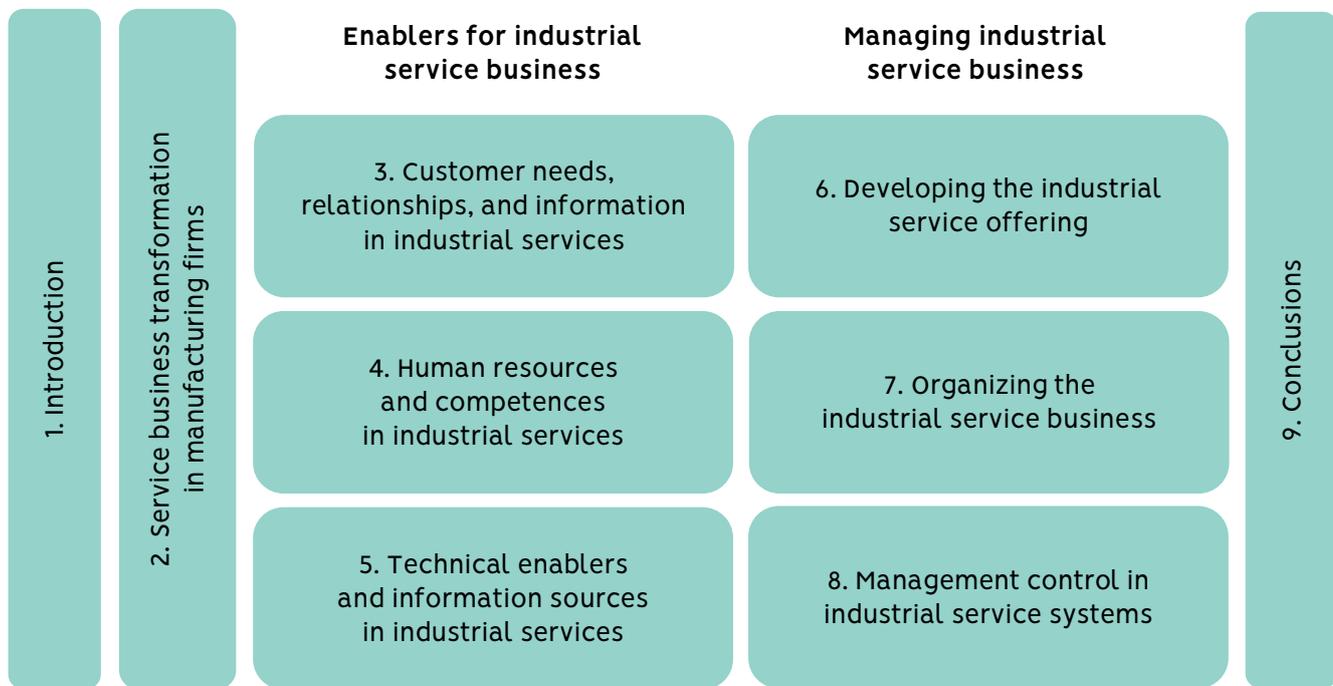


Figure 1. Overview of the book structure.

The introductory chapter summarizes some basic issues concerning business-to-business (B2B) relationships, industrial services, and the types of customer encounters, business processes, and business models that manufacturing firms face when getting involved with industrial services. Chapter 2 offers a short overview of manufacturing firms' transformation toward service business, related strategies, and the supply chain and network perspective of industrial services. It also introduces service logic as an alternative or complement to goods logic in business and shows that firms have alternative pathways to including industrial services in their business.

As shown in Figure 1, *enablers for industrial service business* are covered from three perspectives. A key starting point for industrial services is the customers' business. Manufacturing firms need to understand their customers' needs and, therefore, need to access customer information to fulfill those needs, which is the focus of chapter 3. Another key enabler deals with the manufacturing firm's resources: when including industrial services in their business, they need to develop competences for selling and delivering the services. Chapter 4, therefore, explains how manufacturing firms need to develop their human resources and competences when moving toward industrial services. Firms also need technical resources to enable services. Chapter 5 particularly focuses on information technologies and systems that can enable manufacturers to access customer information efficiently, even in remote conditions. The chapter also describes what type of customer information is available and how such information is made available and useful in the manufacturer's business.

Managing industrial service business is also covered from three perspectives. Chapter 6 focuses on managing and developing the market-oriented service mix, that is, the service offering. Just as with products, the service offering has to be known and managed for the service business to be efficient and eventually profitable. Chapter 7 draws attention to the way the service business is organized and managed, as part of the manufacturing firm's organizational structure and possibly also with other organizations. Because industrial firms can be large and global, scaling up the service organization as part of the international business is also discussed. Chapter 8 concentrates on how industrial service business can be made profitable when a manufacturing firm includes these services as part of its business. On one hand, the firm can lead the developments of its service business, keeping in mind the profit targets. On the other hand, it needs service-oriented management control mechanisms to steer the business in the right direction.

Finally, chapter 9 provides conclusions regarding industrial service systems in general and implications of the themes of this book in particular. Although this book is intended to offer comprehensive knowledge on industrial service systems, issues are covered only in part because the book's scope is limited to a single course. For this reason, further readings are suggested in the reference list.

Key concepts are defined in boxes to make it easier for readers to find and learn about them. To reduce repetition compared to a basic course, some basic-level concepts are covered in chapters 1 and 2, and the concept list of basic-level service operations and innovations is summarized at the end of the book. The focus in this book is on the system- and business-level concepts, to complement the basics.

In chapters 3–8, we will use case examples that illustrate the chapter's main issues in a real-life setting. The case examples may stem from our own research or research published by others. These chapters also summarize lessons learned in each chapter to recap the main issues. The reference list will point out further readings that you can explore to learn more about each of the issues.

At the end of the book, we list the key concepts with their definitions as used in this book. The first list is from the basic course on service operations and innovations, primarily focusing on concepts concerning single services. The second list includes the main concepts covered in this book, focusing on industrial service systems more broadly. These lists are provided to help you become familiar with the main concepts. A more in-depth discussion and consideration of the meaning and relevance of each concept is given within the main body of the text in this book.

1. INTRODUCTION: BASICS OF INDUSTRIAL SERVICES

This chapter summarizes the basics of industrial services, covered partly also on the basic course of industrial service operations and innovations, and offers an overview of industrial service systems.

1.1 Industrial business-to-business relationships

Business-to-business (B2B) relationships deal with commercial activities between different firms (or public organizations and firms). While business-to-consumer (B2C) relationships involve a firm (i.e., a legal entity) and consumers (individual people), B2B relationships include commercial transactions between two or more legal organizational entities. When focusing attention on *industrial* B2B relationships, at least one of the organizations involved deals with industrial operations, such as raw material access or processing, manufacturing, or other related activities. These industrial B2B relationships may deal with sourcing materials, converting the materials for another use, assembling components into goods and systems, offering or procuring services, or distributing or reselling goods or services. These transactions typically imply an exchange of money to cover the costs of delivery (either directly or indirectly). B2B relationships can also deal with knowledge-intensive or professional service firms' businesses, but those firms lack the material-related transactions that are typical with industrial firms.

For this book, the B2B relationships in manufacturing firms' supply chains involving services are of interest. The most apparent such relationship is between a manufacturing firm and its customers, as indicated in Figure 2. Traditionally, this relationship has been dominated by the transactions concerning some goods or systems produced by the manufacturing firm and consumed by the customer; however, equipment manufacturers, for example, also offer services to their customers. Similarly, raw material producers may supply raw materials for manufacturing firms and may also offer services. In addition, other relationships in the supply chain may be equally relevant; for example, an external service provider may offer services on behalf of the manufacturing firm to the customers. Furthermore, various other third parties, such as system or software providers, may enable remote access between the manufacturer and the customer—or the distributors, agents, or transporters—that helps the manufacturer reach its customers. All these kinds of relationships are relevant to the scope of this book and industrial service systems in general.

Four important principles characterize the special nature of industrial B2B relationships and guide the design of industrial service systems. First, the **relationships between the firms are commercial**. Activities undertaken by one firm on behalf of the other firm are not cost-free—they always have a cost that must be reflected in the pricing. However, the cost of some activities may be covered indirectly, as part of the pricing of goods/solutions. Second, in all business relationships, **understanding the customer is crucial**, to design, offer, and deliver the right solutions. All services in an industrial context should always begin with understanding the needs, the business, and the value-generation process of customers. Third, **both**

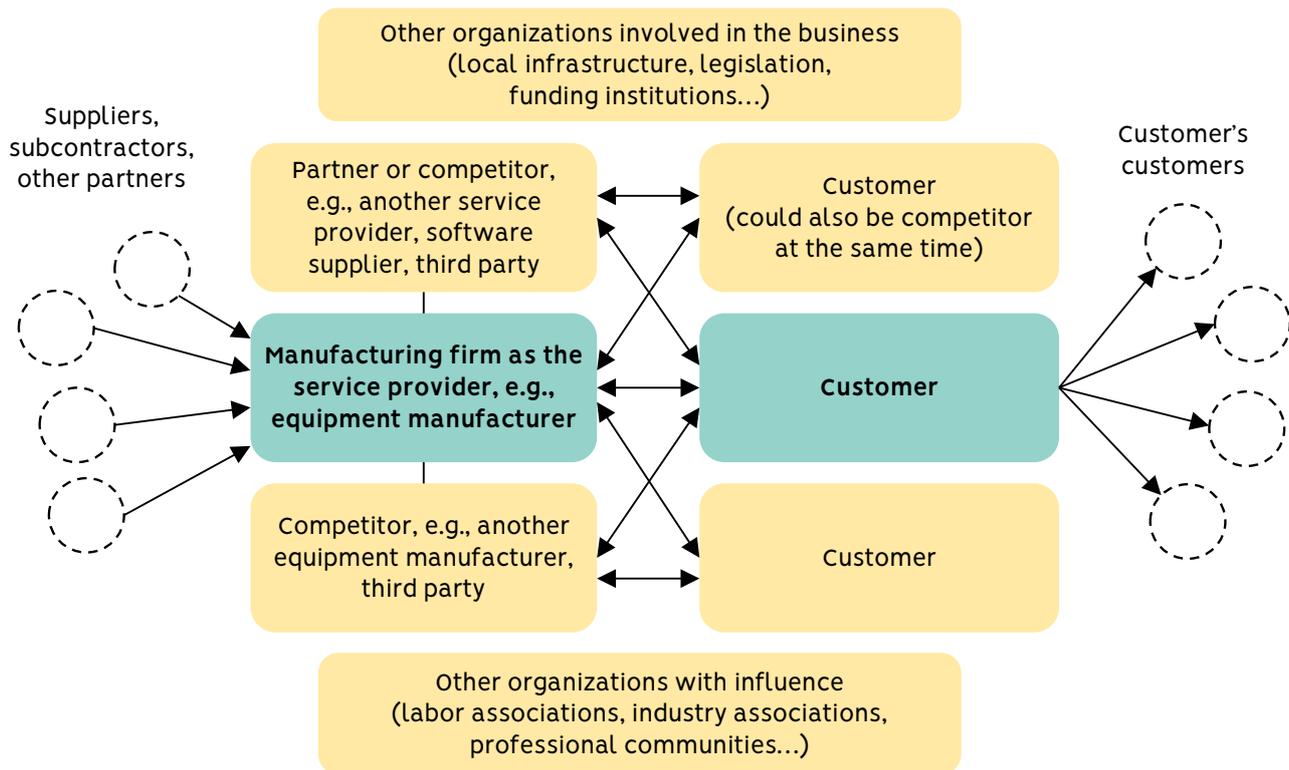


Figure 2. Overview of B2B relationships in an industrial service supply chain.

(or all) firms expect value from their mutual relationship. Sometimes the attention is purely focused on the customer's needs, but, in practice, industrial services should be designed in a way that the service provider will also gain benefits from the relationship—either directly or indirectly and either in commercial terms or in other terms. Fourth, the **relationship involves multiple internal stakeholders** in the firms involved, which creates a clear distinction compared to B2C services. The customer firm may have multiple people—for example, the service user, the service decision maker, and the service buyer—who each have unique needs. Correspondingly, the service provider may have different people for the tasks of service design, service delivery, service sales, and customer relationship management (CRM). Therefore, in B2B relationships, cross-firm cooperation needs to take into account the multi-stakeholder nature of the interaction.

Customer is the organization that procures, buys, and pays for the service. In industrial services, the customer is a company that itself can be a manufacturing firm (or sometimes a public organization). Often, there is a need to distinguish among the actor that chooses the service (decision maker), uses the service (user), and procures and pays for the service (payer) within the customer organization as these actors have different interests.

Manufacturing firm (also *manufacturer*) in this book refers to organizations that produce raw materials, manufacture goods or systems, and sell and deliver them to customers. A manufacturing

firm also can act as a service provider.

Service provider (also *service supplier*) is the organization that delivers and sells the service. The service provider can be a manufacturing firm or another type of organization that is, for example, purely focused on service provision.

Supplier is a firm that supplies any types of products – materials, components, goods or services – to another firm. *Subcontractor* is a firm that does certain activities on behalf of a main contractor (such as manufacturer) and, thereby, can supply services and/or materials for the main contractor who then delivers a complete product or system to a customer.

In this book, the focus is predominantly on manufacturers that produce machinery, equipment, and processes which are considered complex systems that require industrial services to maintain and enhance their performance level over their life cycle. However, component and raw material manufacturers (e.g., suppliers of machine manufacturers) may also need to offer industrial services to their customers.

Special categories of manufacturing firms referred to in this book include the following:

- *Original equipment manufacturer (OEM)* is a manufacturing firm that produces parts and equipment that may be designed, sold, and marketed by another manufacturer.
- *Original design manufacturer (ODM)* is a manufacturing firm that designs and manufactures products according to specifications, and the products are eventually rebranded by another firm for sale.
- *Contract manufacturer* is a company that manufactures components, products, or systems on behalf of another firm. If such components become parts of another product or system, the contract manufacturer is also a subcontractor.

Equipment (*singular form: piece of equipment*) refers to a set of tools or other objects used to perform certain tasks in order to reach goals. One type of equipment is a *machine*, which is a mechanical device that uses energy to apply forces and control operations to perform intended actions. Machines vary in complexity (from simple to complex) and consist of multiple elements. Sometimes the word *machinery* is used to refer to a more complex multi-element machine.

Installed base of equipment refers to all the pieces of equipment in a customer's use, typically from the manufacturer's perspective (how many of its produced pieces of equipment are in use in the market). Because it covers equipment produced at different times, the installed base of equipment is an important source of information for assessing industrial service potential in the market.

Equipment or machine fleet refers to all the pieces of equipment that the customer owns and uses. The word *fleet* traditionally refers to vehicles and sea vessels (a group of them, owned by a certain organization), but it can also be used for equipment/machines.

Processes are customer value-adding chains of activities that use resources. For example, innovation, production, marketing and sales, and service may have their own processes. Some processes can be considered *business processes* if they purposely seek to generate economic profit through value-generation.

1.2 Industrial services: What are they

Before going to the specific definition of industrial services, we need to specify some related general concepts, to clarify the nature of services compared to other types of offerings, and to distinguish among services, service concepts, and service products.

Services are activities or bundles of activities used to deliver value to the customer and fulfill their needs. They are considered intangible items, even though they may also include tangible components.

Products are any items (tangible or intangible) that offer a solution to a specific customer problem.

Goods are tangible, material products that satisfy customer needs and provide them benefits.

Offerings refers to any types of business proposals that a firm offers on the market. Offerings may deal with goods or services, product-service systems (PSSs), turnkey solutions, different product and service packages, and so on.

Service concept is a description of customer needs and the activities through which they are filled. A certain service concept can be formed from multiple service modules and/or components.

Service component is some activity or routine that is part of a broader service entity; it is the smallest unit of service that can be repeated (as part of different services).

Service module is a combination of service components typically included in a certain service and can be repeated in the same or other services.

Service product refers to the supplier's activities and processes that add value to the customer, fulfill the customer's needs, and are "packaged" into a sellable, marketable offering (which the customers are willing to pay for).

The general definitions of services consider them activities or bundles of activities that are used to deliver value to the customer and fulfill their needs (e.g., Grönroos, 1990; Johne & Storey, 1998). When focusing attention on services, a distinction is often made between other types of offerings, such as goods, for example:

- Services are **intangible (I)**; that is, they are activities instead of objects, so they cannot be seen, touched, or felt like goods can.
- Services are **heterogenous (H)**; that is, all services are unique and specific to the event in which they are delivered and consumed, so their quality is difficult to control.
- The processes of service production and consumption are **inseparable (I)** (or simultaneous), and the customer participates actively in some parts of the service process.
- Services are **perishable (P)**, meaning they vanish at delivery and cannot be stored or disposed of. (Zeithaml, Parasuraman, & Berry, 1985)

These (IHIP) features (Zeithaml et al., 1985) are frequently referred to, but their relevance is also debated (e.g., Vermeulen & van der Aa, 2003). For instance, the IHIP features do not apply perfectly for all services, including industrial services but may in fact be misleading. For example, industrial services typically are connected with some technologies or goods or these technologies or goods are included (e.g., spare parts services) so that at least part of the service is tangible, even if the majority of the service is considered immaterial and interactive instead. In addition, industrial services can be formalized and regulated very clearly, so that the core idea is repeated in a similar manner from one event to another. Industrial services are often repeated in a routine manner, causing the heterogeneity—or at least the degree of heterogeneity—to be questioned. Furthermore, a significant part of industrial services may be created long before their benefits are created in customer processes. In that way, parts of service production and consumption can be quite separate. It is also not fully clear whether the service can be called perishable, as its effects (e.g., a piece of equipment's manufacturing capacity after maintenance) may remain beneficial to the customer for weeks, months, or years. Besides their long-lasting effect, some service components, such as training materials or e-learning platforms that manufacturing firms provide for their customers, may be used for generating value for a very long time (unless removed from use).

Let us consider the installation of a piece of equipment sold by a manufacturer as an example of industrial services not fitting well with the general definition of services. The installation service occurs for a machine that is clearly tangible, and all similar machines are installed in largely similar ways. The process of installation and its capabilities have been planned and ensured well before the installation delivery at the customer's premises. In addition, the entire installation can take place without much active input from the customer. The customer may engage in defining the equipment (before it is sold) and commissioning the equipment (after installation).

Although industrial services are now under very active discussion in research and manufacturing firms, there is no unanimity on their definition. When industrial services are considered from the viewpoint of their markets, such as services offered to industrial markets or business markets, they are usually labeled as B2B services. Sometimes, however, industrial services are considered activities directly connected with technologies, processes, or industrial goods. Additionally, industrial services are sometimes considered processes that deliver value to industrial customers or deal with customers' value generation processes (Gitzel et al., 2016). In this book, we acknowledge all of these perspectives and use the following definition:

Industrial services are an industrial supplier's activities and processes that add value to the (industrial) customer, fulfill the customer's needs, and

- require supplier's and customer's interaction,
- are connected to tangible assets (e.g., technologies, processes, or goods),
- can be repeated for the same customer or different customers at least in part, and
- pursue business benefits for both the supplier and the customer.

Manufacturing firms' services directed at consumers also can be called industrial services due to the industrial context of the service provider.

This definition does not take a position regarding the following: whether the customers are the manufacturer's internal or external customers, whether the delivered customer value is material or immaterial (tangible or intangible), whether the business benefit is achieved directly or indirectly, and whether the benefit is monetary or some other type of value. Therefore, customers also may be company internal actors; however, in such cases, the business logic and required practices may be different from those of external customers. In this book, we focus on industrial services for external customers.

Where to draw the boundary between an industrial firm's B2B services and those of other types of firms and organizations is not always clear. There are many examples of repetitive, business-oriented services offered to other firms/organizations that resemble industrial services. For example, knowledge-intensive expert and consulting services (e.g., banking, finance, insurance, accounting, and risk management services for firms), support services (e.g., security services), and public services (e.g., corporate taxation, auditing) closely resemble industrial services and are offered on an industrial scale for firms and can benefit from an industrial-type orientation. This book purposely focuses on industrial manufacturing-related contexts, but similar phenomena may apply in other B2B services as well.

1.3 Different types of industrial services

Industrial services typically deal with events where the target of the service is the fixed assets (i.e., installed base) in use by the customer, such as equipment, processes, or industrial systems. Industrial services may be needed at any phase of the customer's business process, as suggested in Figure 3.

Most well-known industrial services are **after-sales services** (Cohen & Lee, 1990; Cohen et al., 2006) that deal with the correcting, supporting the use of, or complementing some product, process, or technology. Spare and wear parts services, maintenance, repair, and equipment use-related consulting and training are examples of typical after-sales services. Conversely, some industrial services are **presales services**, such as research, planning, product development, engineering, and technical or commercial consulting. Some industrial services deal directly with **delivery services**, such as those concerning installation, storage, and transport, or services that adjust the properties of the product or the solution (e.g., cutting,

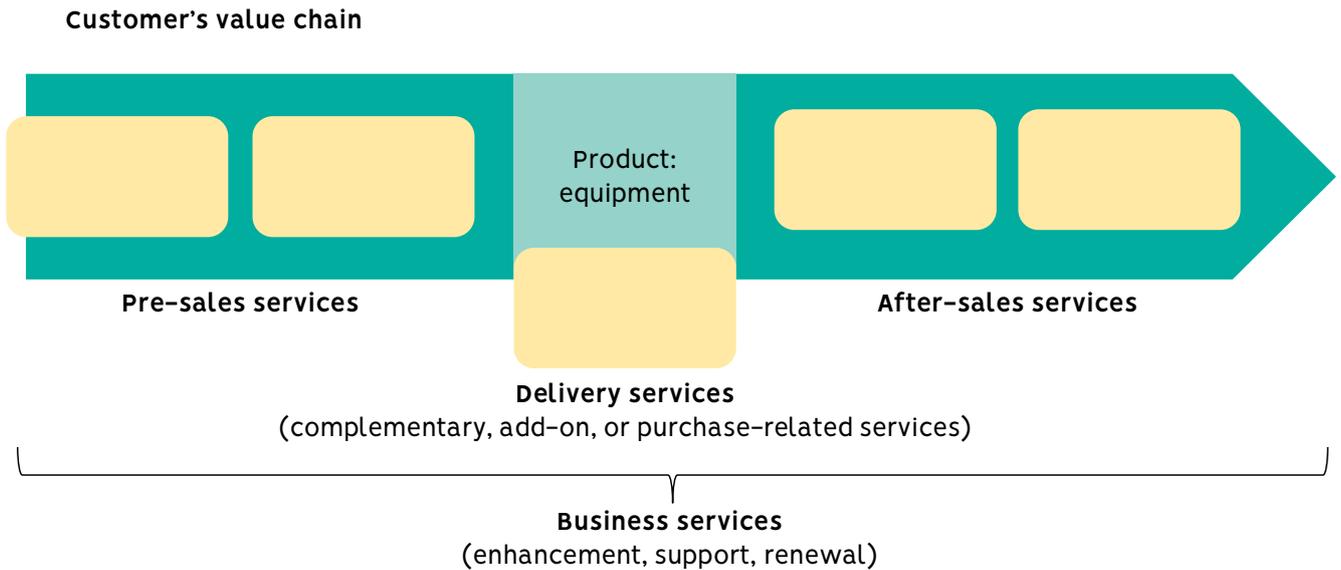


Figure 3. Services over the customer's value chain.

joining, coating, integration). Furthermore, some industrial services are **general business services** that may deal with business support, enhancement, or renewal, such as operating services, analytical services, diagnostics, modernization, and upgrades. It is possible that certain services may fit into more than one of these categories and the categorization differs across firms, due to the special nature of the customers' and manufacturer's business. Such a categorization of services across the customers' value chain can be quite helpful in realizing that industrial services are not only after-sales services, but they can be offered anywhere in the customer's value chain. Noticing the service possibilities across the value chain may offer fruitful ideas for the manufacturer's new service development.

Even the delivery of entire projects or **solutions** is an industrial service, potentially completely renewing or re-creating the customer's process or production capacity. For example, planning, designing, implementing, testing, and launching a completely new manufacturing plant is an example of a solution that is partly delivered through services and partly through integrating products and components into a complex system. Such combinations of products and services are also called product-service systems (PSSs). While customers might buy separate products and services from various suppliers to fulfill their (partial) needs, it can be more efficient for one manufacturing firm to integrate, sell, and deliver these products and services as complete solutions. These kinds of solutions are in the most advanced category of services, but they require project and program management to integrate different goods and services into a seamless entity for the benefit of the customer. Recently, various solution-type offerings have been labeled as specific types of services in other domains of business as well, such as mobility as a service (MaaS) and software as a service (SaaS), with the idea that various immaterial and material components are integrated into a seamless solution that is then delivered as a service.

Product-service system (PSS) is an offering that contains a tangible product core and some supplementary (intangible) services. Services included in the PSS ensure or enhance the product performance throughout the product life cycle and thereby complete the PSS.

Integrated solution is a complete offering (i.e., a comprehensive PSS, bundle of products and services) that solves the customer's complex need. The integrated solution is delivered to a customer as a comprehensive package that also includes coordination of the organizations involved in the solution delivery. Integrated solutions are considered "advanced services," and they can imply changes of asset ownership and the firm's position in the supply chain.

Another categorization of industrial services differentiates basic (e.g., spare part provision, warranty), moderate (e.g., scheduled maintenance, operator training, condition monitoring), and advanced (e.g., customer support agreement, risk and reward sharing contract, revenue-through-use contract) services (Baines & Lightfoot, 2013). Different industrial services can be clustered in various ways, and some clusters differentiate between whether the service value proposition deals with the product or the customer's process and whether the earnings are based on a transaction event or an enduring relationship. Figure 4 offers an example of differentiated industrial service types. Value proposition and earning logics are further discussed in section 1.5

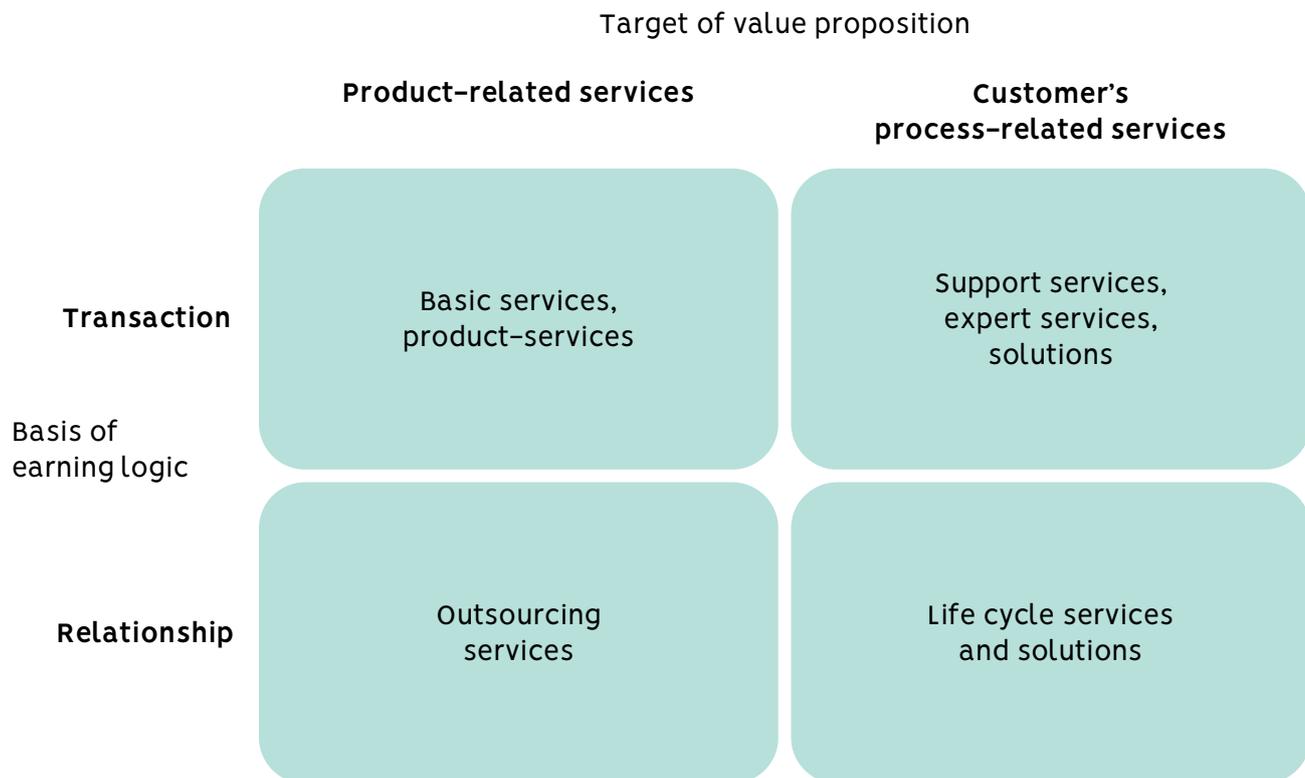


Figure 4. Different types of services (Kujala et al., 2010; see also Oliva & Kallenberg, 2003, Mathieu, 2001a).

1.4 Service encounter and processes in industrial services

According to the “inseparability” part of IHIP, service production and consumption occur at the same time, at least to some extent. An important moment in service production and consumption is the service encounter, that is, the interaction between the service provider and the customer. In consumer business, service encounters can be quite simple, such as a single contact point with an individual customer and a person who sells and/or delivers the service, and the entire service can take place in just one service encounter. In industrial business, however, the service encounters become more complex; for example, interactions occur between different organizational units; designing, selling, and delivering a service may involve multiple service encounters; and different customer representatives may interact with various representatives of the service provider at different points of the service design, sales, and delivery.

Service encounter is any interaction—face-to-face, online, by phone or mail, or any other means—between the service provider and the customer.

Service experience deals with the customer’s perception of both the service encounters and the value (benefits and costs) of the service. Service experience has an important role in defining how the customer assesses the quality of the service and, consequently, how satisfied the customer is with the service. In addition, the service provider has its own service experience (as part of delivering the service), as do any involved third parties. Therefore, it is important to be clear on whose perspective is taken when discussing service experiences.

Figure 5 provides a simplified view of the customer interface between a manufacturer and a customer, including the presence of multiple people in various roles. Here, the figure illustrates some typical actors that could be involved in industrial services (others may also exist). The service encounter may take place between any of the actors at the customer interface, such as a service salesperson contacting the customer firm’s buyer and offering services, the equipment user contacting the manufacturer’s service technician to agree on a maintenance timetable and guiding and monitoring the service delivery, the director or manager of the manufacturing firm defining a service-level contract and negotiating with the customer’s director who makes decisions on such contracts, and so on. All these events represent service encounters in which the manufacturer as service provider has a possibility to add value to the customer’s product or process.

Because service encounters deal with service activities that the customer can see and experience firsthand, they are considered front-office activities and are different from back-office activities that customers do not see. Back-office activities refer to tasks carried out by the manufacturer or its partners that the customer does not see or experience firsthand but that are needed for achieving the service value. For example, the manufacturer may need to read and interpret the customer order, schedule the service tasks, manufacture spare parts, store them, pick them up from the warehouse, and prepare a complete package for the specific customer need. Likewise, the company’s logistics partner may need to

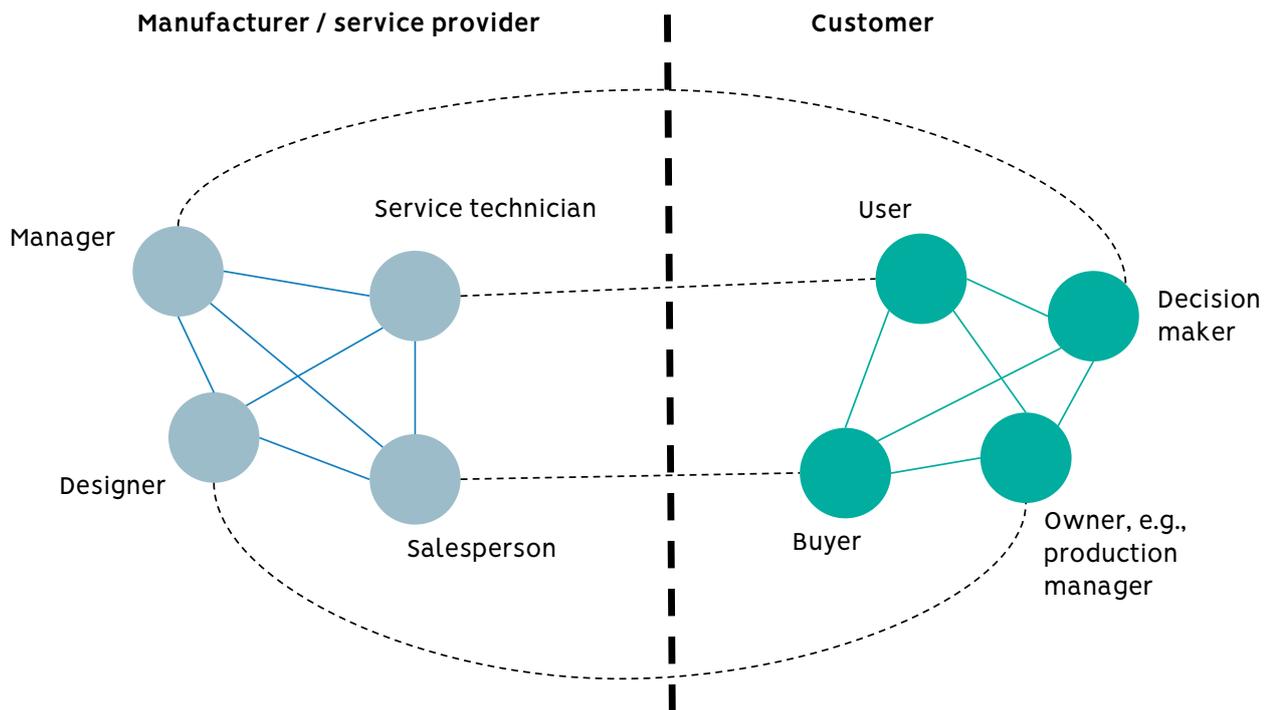


Figure 5. A simplified illustration of the manufacturing firm's customer interface in industrial services.

transport the spare parts package to the customer's premises. All the preparatory work before the final delivery occurs outside of the customer's visibility and are considered back-office activities. Despite the customer's lack of visibility, such activities are necessary for the customer to gain the benefits it expects from the spare parts service. The activities also need to be managed efficiently for the service to be profitable to the supplying company.

Front office refers to the part of a company's operations where customers encounter service personnel. For industrial services, it represents the part of the service delivery system that has direct contact with customers in service encounters.

Back office refers to the part of a company's operations with which customers do not interact directly, including development, information systems support, accounting, payroll and financial departments, and so on. In industrial services, it is the part of the service delivery system that develops services and provides any kind of support to the front office.

Front-office activities in industrial services take place in service encounters that are visible to the customer, whereas *back-office activities* are not visible to the customer.

The customers' service experience includes their perceptions of both the service encounters and the value achieved through the service, which is often compared to expectations. Both front-office and

back-office activities are relevant in the formation of the customers' service experience. When multiple persons in the customer firm are involved in using, buying, and deciding on the service, the organizational level service experience is the aggregation of the different service experiences. In addition, the service provider's perception of the service (i.e., the service provider's service experience) is also relevant because it deals directly with employees' job satisfaction and service quality.

All the service encounters (front-office activities) and any back-office activities are part of the service-related processes of the manufacturing firm. Figure 6 highlights typical core service processes and some enabling and support processes. Clearly, service delivery is just one of the processes—the manufacturing firm also will need processes for creating new services, marketing and selling the services, managing the service offerings, and performing various support processes to carry out industrial service business successfully. When manufacturing firms offer industrial services as business, they need to define all these processes carefully and start managing their performance to make the business efficient and profitable.

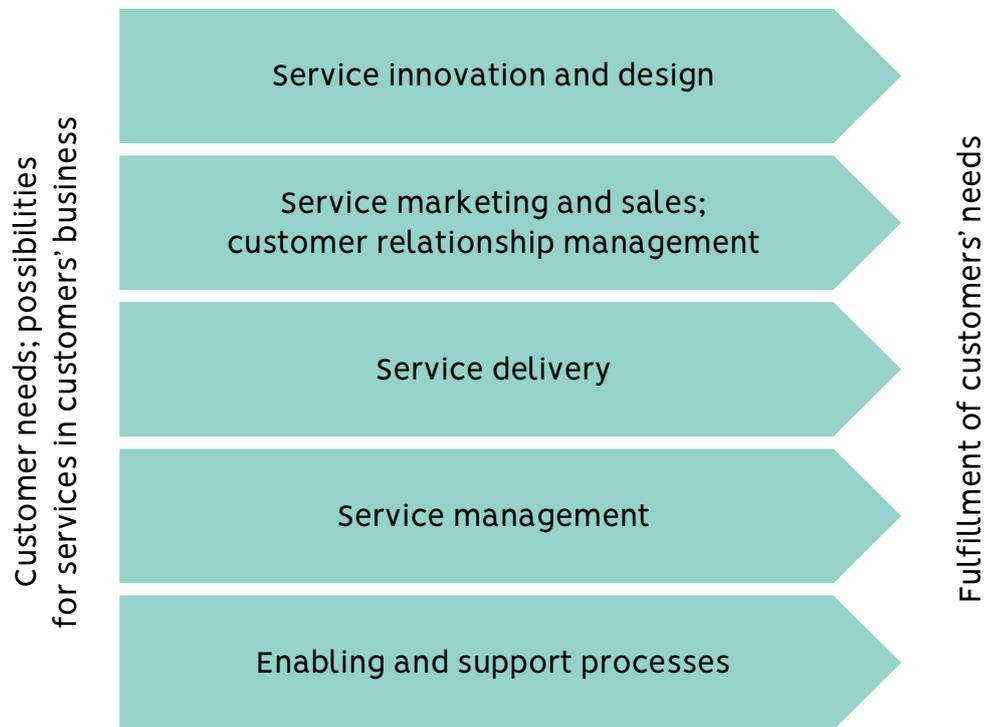


Figure 6. Typical service processes.

The equipment/solution development and delivery processes and other manufacturing-related activities may be affected by services, and the manufacturing firm has to consider its processes carefully when including services as part of business. For example, should products and services be sold in the same way? Should the same people be involved in product and service delivery, or should they be done in different groups? Will supply partners and delivery partners be involved in services, and, if so, how?

Besides the manufacturing firm's processes, the customer's processes also will be affected through services. If the customer firm has previously done certain services for themselves (e.g., maintenance), outsourcing such activities to an external firm will change the firm's processes, resourcing activities, and organization. Figure 7 summarizes some processes that need to be taken into account in industrial services between manufacturing firms and their customers.

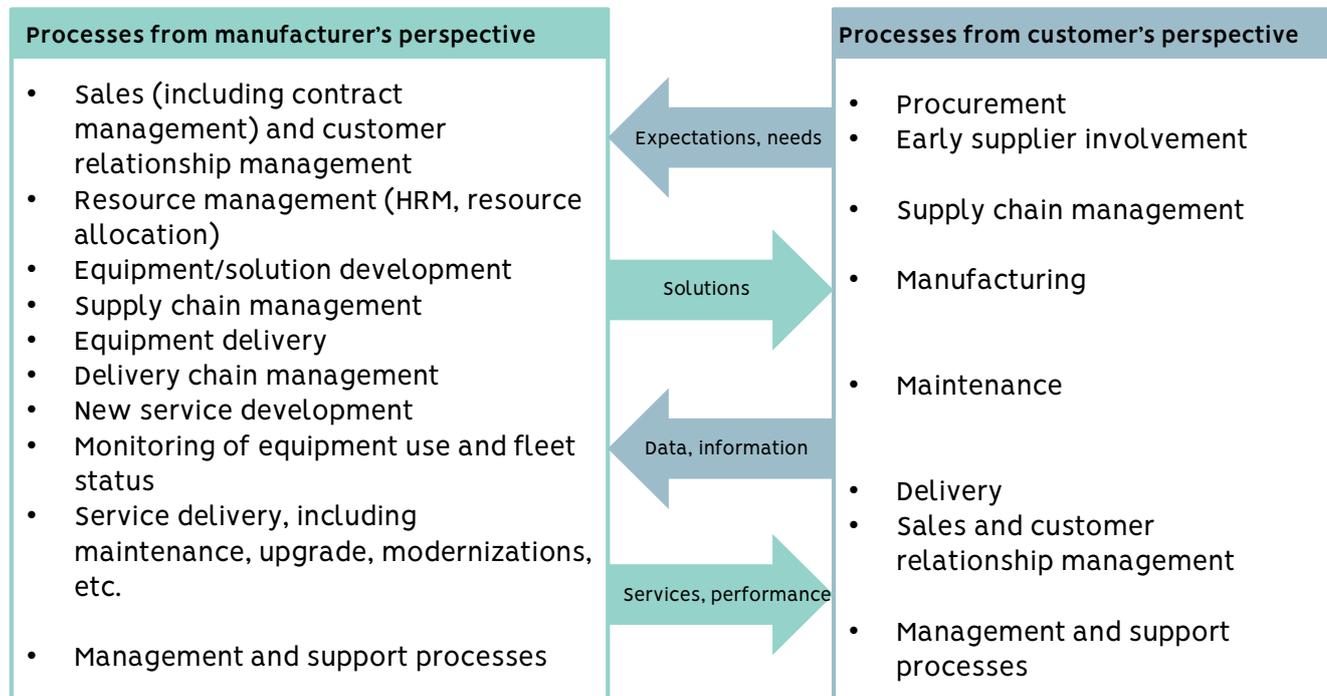


Figure 7. Processes that need to be taken into account when developing the service delivery system at the fleet level. (Adapted from Martinsuo, Mahlamäki, Momeni, Vainio, & Vuorinen, 2017, p. 83).

1.5 Business models and earning logics in industrial services

Manufacturing firms need to understand the customers and markets to develop new services, improve existing services and related operations, and target certain services to the right customers (or customer segments). When seeking strategic benefits from industrial services, manufacturing firms can no longer develop services randomly or by reactively adapting to customer's wishes; instead, they need to proactively invest in new service development. *New service development* refers to activities used for identifying, designing, and introducing such services that the firm has not offered before (and that could be completely new to the market or even to the entire world). Service innovation is a general (broader) term that covers both new service development, incremental development of existing services, and development of service-related markets, processes and practices.

When developing new industrial services, manufacturing firms must be aware of the alternatives they have regarding the customer value proposition and the delivery and business logics of the services. These issues are typically covered as part of the business model of the service (Figure 8). While new service development and service-related business models typically deal with single new services, they create a necessary foundation for mapping and managing the firm's various services together, that is, the complete service offering.

Business model is a description of customer value and how it is delivered and converted to business value. It typically includes the components shown in Figure 8. In this book, business model concerns a certain service only, and different services may have different business models. Generally, business models also can be considered for a certain business area or for the entire firm.

Note: Business model is a broader concept than *business case*, which typically is limited to the earning logic proposal only (i.e., a proposed way in which the service is converted to business benefits during service concept development).

(Customer) *value proposition* is the manufacturer's description of what the service can deliver to the customer, that is, the total of benefits that a manufacturer promises to the customer within the service in return for the customer's associated payment (or some other mode of exchange). The customer value proposition is one key aspect of the business model.

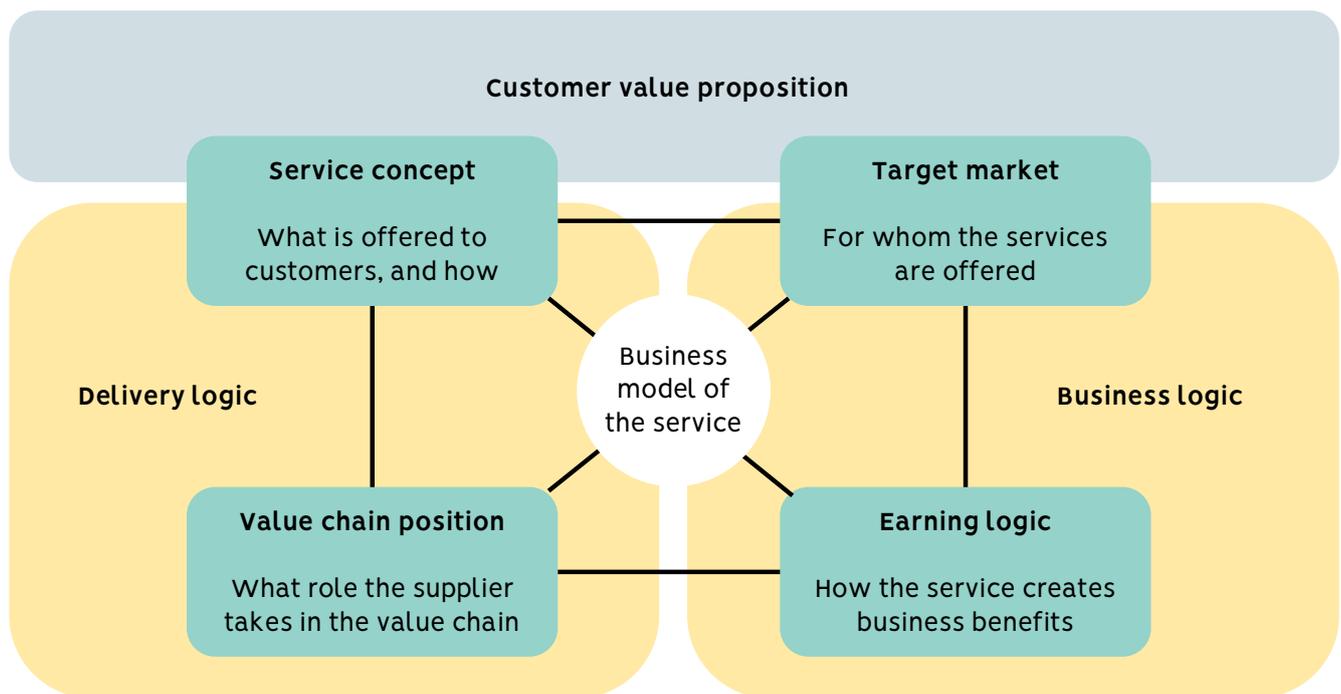


Figure 8. Main components of the business model at the level of certain services. (Modified from Martinsuo et al., 2020).

Business models are actively discussed in the context of industrial services because the service business models can deviate very clearly from those of traditional goods-centric businesses. In a goods-centric business, the business model typically is based on transactions, as the value is transferred from the manufacturer to the customer in the tangible product. The customer expects some functionality for its process (e.g., a piece of equipment that completes certain tasks in the process), and the manufacturer may have a certain product that can deliver this functionality (*value proposition*). The manufacturer manufactures a product possibly with assistance from some supply-chain partners and delivers it to the customer, possibly with the assistance of transport firms (*delivery logic*). The manufacturer prices the product, likely by calculating the sum of all material and work costs and adding a certain margin to make the business profitable, and the customer pays for the product on the basis of the product-related transaction (*earning logic*).

Transaction-based business models are still typical for many industrial services. However, this approach is not necessarily the most beneficial for either the manufacturer or the customer. In fact, industrial services (or any services) should not, or cannot, be sold with such a transaction-centric business model—at least not with a profit. Following are some reasons for considering other types of business models for industrial services:

- The customer demand for the service may vary, but the manufacturer may be required to make resources available for services at any time. Therefore, the cost of resources cannot be assessed based only on a certain service delivery episode because the waiting times also can consume resources, meaning the resources “in reserve” must also be accounted for.
- The costs of delivering the service cannot be anticipated or assessed perfectly due to the great variety of (i.e., heterogeneity of service) and situation-specific issues.
- As a participant in the service process, the customer consumes resources and has costs from the service.
- The benefits and costs of the service may be linked with other services and the system (e.g., equipment or process) it serves, and it may be impossible to separate these from each other. In addition, assessing costs and benefits separately for different offerings may make all of them unprofitable, whereas together they may be profitable (due to, e.g., synergies in resource consumption).
- The benefits of the service to the customer cannot be anticipated or assessed perfectly due to uncertainties concerning the longer-term effects of the service.
- Because of these mentioned uncertainties, the value of the service to the customer can be significantly higher than the cost of producing it. It is beneficial for both the manufacturer and the customer to take this value into account in the business model.

As an example of a service-based business, the business model could be fully based on the customer value, which emerges in cooperation between the manufacturer (service provider) and customer. If the customer, for example, wants to ensure that its manufacturing process operates as flawlessly as possible 365 days a year, the manufacturer could offer a service contract based on the performance of the process, guaranteeing that the process performs at desired volumes throughout the year (*value*

proposition). The manufacturer and customer could agree on the division of work between them and possibly other firms as follows: (1) the manufacturer’s role focuses on preventive maintenance based on condition monitoring of the process and a certain response time to process problems, (2) the lease of the entire process to the customer with its desired performance level, or (3) the operation of the entire process with the desired capacity (*delivery logic*). The pricing of the service could then be tied to the performance level of the process (value for customer) and be based on monthly fees according to the performance level, and its problems could be sanctioned (*earning logic*).

While this idea of business models deals with single services, note that choices at the single service level will accumulate to the firm level. Therefore, changes in any of the aspects of the business model are reflected in other aspects and have implications for the business. For example, changing the pricing logics of single services requires changes in resourcing and organizing either within the organization or the broader supply chain and will have an effect on how the entire service business profit accumulates (if any). Table 1 offers examples of alternative approaches to service pricing and some of their key features and related examples to show the variety of earning logics for services. Whatever the pricing approach is, earning logic also needs to take into account all the costs accruing for the supplier (including direct costs of human resources and materials, as well as indirect costs of processes, platforms, premises, and technologies). Similarly, the customer will consider its service value by contrasting its benefits to its own costs.

Table 1. Examples of possible pricing logics for services and related earning (based on Ocaña Flores 2015)

Pricing logic	Key features for earning	Examples
Transaction-based fee	Service as product, with direct earning. "You pay for what you order."	Corrective maintenance is available upon request.
Subscription-based fee	The customers pay for service availability, generally for long periods (from months to years). "You pay for availability."	Preventive maintenance is specified in a service-level agreement.
Freemium	Basic free services to get the customers hooked. "You pay for extras that have special value." Requires a balance between "enough to raise interest, but not too much to be satisfied with the bare minimum."	Reporting is based on remote data on a machine for free, which encourages the consequent purchase of more sophisticated analytics.
Use-based fee	Customer pays for services according to the usage (fixed rates or use-based rates). "You pay for what you really need now." The fee may be also something other than money (e.g., data).	Solutions are provided to nonrecurrent needs such as the use of a laboratory facility or certain tools/software, or optimization of the system.
Benefit-based fee	Service generates value-added and unique benefits to the customer’s business model. "You pay for performance." A crucial question for the supplier is as follows: What business are you in?	Capacity offering is made or the system is operated on behalf of the customer.

In this book, we will cover different aspects of service delivery by discussing the relationship between the manufacturer and customers, especially in chapters 3 and 5, and considering the broader involvement of other organizations in the supply chain in section 2.3 of chapter 2 and in chapter 7. The discussion of service offerings in chapter 6 builds on the idea that all firms may have various service offerings with different business models, and the entity of different offerings has to be managed strategically. Furthermore, the accumulation of service earnings to profits at the business level is considered in chapter 8.

1.6 Industrial service systems

Manufacturing firms typically do not offer merely one single service, but they have a complete multiservice offering to serve their customers' various needs. Particularly if the manufacturing firm espouses industrial service business as an important part of their business strategy, it will need a system — referred to here as an *industrial service system* — through which it assigns resources to service business, creates and uses relevant information, and connects with its customers.

Industrial service systems are manufacturing firms' (or other industrial service providers') dynamic configurations of resources and related information used for creating value both for the supplier and the customer. The main components of an industrial service systems are as follows:

- Processes
- Technologies
- Offerings
- Organizations and people
- Experiences

(Figure 9).

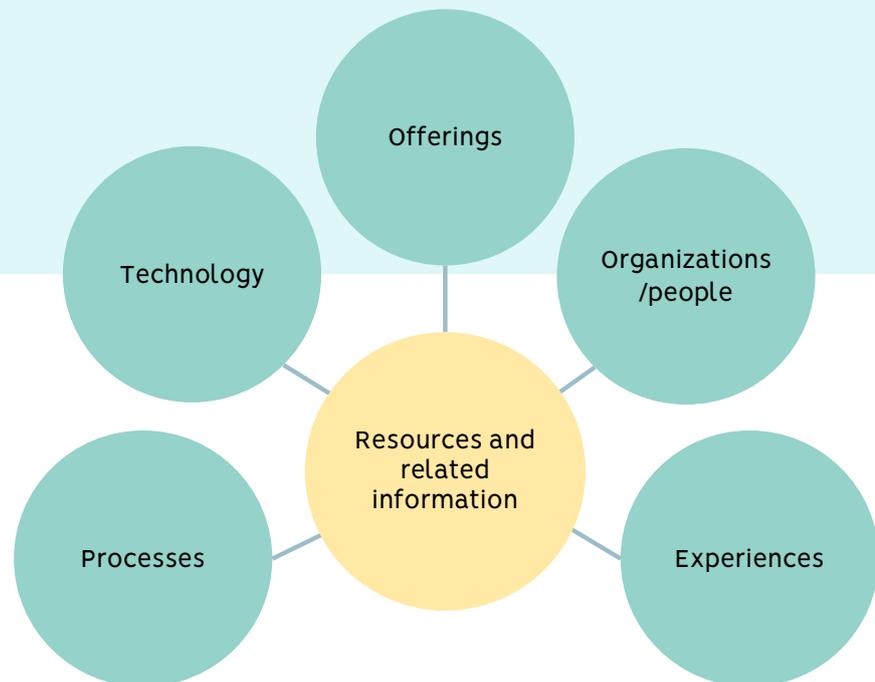


Figure 9. Overview of industrial service systems.

This definition emphasizes three main issues for the manufacturing firms' service business. First, the ultimate purpose of industrial service systems is to **create value for the manufacturing firm**. Value deals with the ratio between benefits and costs. Similarly, as in any business, service business should create some kind of value for the manufacturing firm, although not necessarily always a monetary or direct value. Later in this book, we will discuss what this value orientation means in the manufacturing firm's business.

Second, value creation in the manufacturing firm's business occurs through **generating value for the customers**. Again, customers are interested in their own value, that is, ratio between benefits and costs. By procuring services from external firms, customers expect to achieve more value (quantity) or better value (quality) than they would get by doing the service-related tasks themselves. The generation of customer value is at the heart of any service business, but it has various trade-offs due to the information asymmetry between the manufacturing firm and the customer. Later, we will discuss the centrality of information in the relationship between the manufacturing firm and the customer.

Third, the definition specifies that value generation occurs through the **dynamic configurations of resources and related information** by the manufacturing firm. Here, resources may mean people, technologies, processes, and materials, and they may be possessed by the manufacturing firm, the customer, or the other external partners (third parties). Increasingly, many resources are technology-mediated in some way: remote monitoring, control, and diagnostics are becoming very central in industrial service processes. Information is needed concerning the resources and their use to make appropriate decisions for each specific service task, and technologies can be useful in accessing and distributing that information. The service provider is responsible for configuring the resources and related information in an efficient way to generate value.

This book is loosely structured around the core components of the industrial service system: service-related processes, service-related technologies, service offerings, organizations and people, and service experiences. Our intent is to offer a basic understanding of the core enablers of industrial service business in manufacturing firms and how the industrial service business can be managed. The level of analysis is on the service business in the organization, with an interest in revealing the manufacturer's good practices involved in conducting such business successfully. Therefore, the book goes beyond developing single services, which is the main content on the basic-level course.

2. SERVICE BUSINESS TRANSFORMATION IN MANUFACTURING FIRMS

This chapter expands the perspective to manufacturing firms' industrial service business and introduces the transformation that the firms may go through when adding services to their offering portfolios and potentially changing their business logic through services. Key considerations concerning service strategies are offered, and the core affected processes are introduced. At the end, a brief introduction is offered to service-dominant logic as an alternative to goods-dominant logic of doing business.

2.1 Servitization and related transformations in manufacturing firms

When manufacturing firms include services in their offering, they may move closer to the customers and eventually even change their position in the industry value chain. Particularly when acknowledging services as a source of business income, firms need to consider how they organize and manage their industrial service business.

Industrial service business refers to the entity formed by industrial services and service operations that produces benefits both for the firm and its customers. The benefits can be financial or otherwise valuable, and they can be achieved through services directly or indirectly.

The transformation toward industrial service business can be considered as a strategic move for the firm, and it may take a long time. Research concerning this transformation often refers to a product-service continuum that characterizes the manufacturing firm's transition from goods-centric manufacturing to services by incrementally replacing or complementing material-based value creation with immaterial value creation (Figure 10; Oliva & Kallenberg, 2003). The figure shows that all offerings may include both product and service components, and the strategic move toward service business increases the share of services as part of the offering (Paloheimo et al., 2004). For example, the sales of manufacturing equipment and processes may be complemented with the sales of a maintenance contract, or, in a very service-centric case, the equipment could be supplied for the customer in the form of a leasing contract (as in car leasing in consumer business). Furthermore, the customer may be offered capacity services or operating services through a service-level contract in which the customer will not handle the equipment or processes at all but will merely pay for the outcomes of using that capacity.

Service business transformation refers to any strategic, transformational processes associated with the firm's logic of doing service business. It may mean servitization or deservitization, mergers or acquisition of firms that provide services or sell them, service growth or reduction, or other strategic transformations.

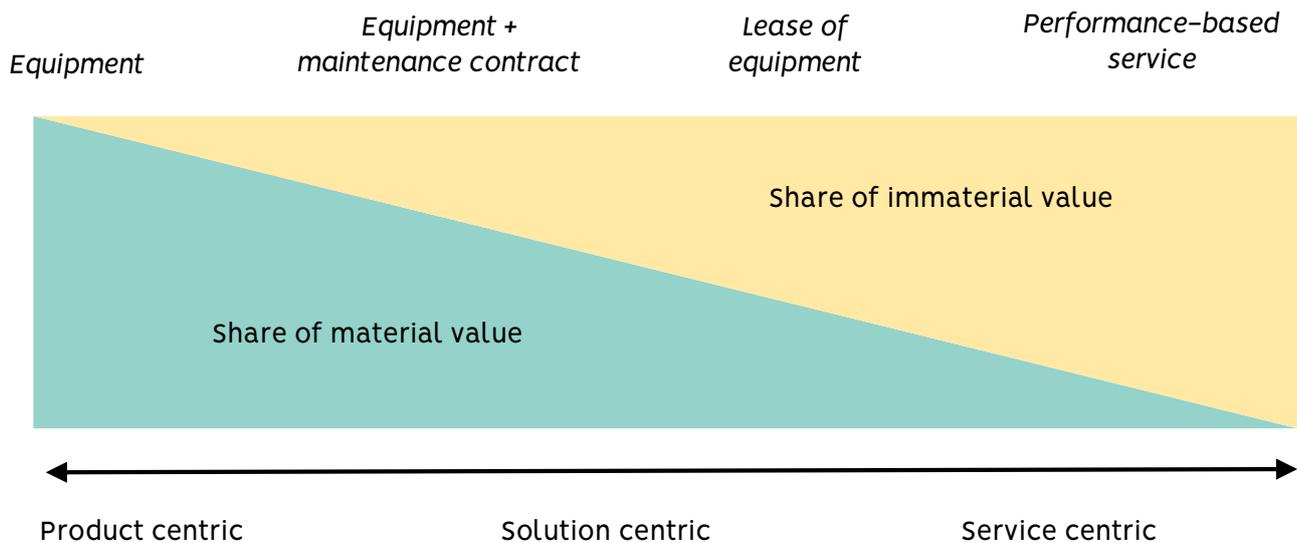


Figure 10. Product-service continuum. (Modified from Oliva & Kallenberg 2003 and Paloheimo et al. 2004).

Service business development refers to any activities that the manufacturing firm undertakes to promote their service business transformation. The firm may set up a certain project or program for service business development.

Service transition refers to any change process concerning service offerings in a firm. Service infusion deals with increased emphasis on services, but transition may deal with the entry to new markets, bringing services to a new domain, or other transitions.

Service growth or *service business growth* refers to expansion of the firm's service business, which can happen simultaneously in terms of markets (volume) and income (money), as well as the use of resources and investments into services.

Next, we summarize the key concepts dealing with service business transformation (based on Kowalkowski et al., 2017). The strategic move toward services is not self-evident, and all firms do not consider service-centricity as desirable in their business. Therefore, manufacturing firms have multiple options when considering the business possibilities with industrial services. The main questions often revolve around whether and to what extent the firm wants to change its business model through services, in which domain services are considered, and how. *Servitization* refers to when the firm changes its business model, whereas if it merely updates or enhances its service portfolio, this is called a *service infusion*. *Service innovation* deals with single services and how customer value is created through them. It can concern a completely new service, new ways of delivering services, or improvements to an existing service. A manufacturing firm can actually decide to maintain its goods-dominant logic of business, treat services as offerings in parallel with goods, and engage in innovations in selected service offerings only (not at the business level). Deservitization and service dilution are equally possible trajectories in

service business as growth-oriented paths (Kowalkowski et al., 2017). Some manufacturing firms may decide to withdraw from service business, reduce the importance of services as part of business, or completely focus on a product-centric business model.

Servitization refers to the transformational processes whereby a company shifts from a product-centric to a service-centric business model and logic.

Service infusion is the process whereby the relative importance of service offerings to a company or business unit increases, amplifying its service portfolio and augmenting its service business orientation.

Deservitization is the transformational process whereby a company shifts from a service-centric to a product-centric business model and logic.

Service dilution is the process in which the relative importance of service offerings to a company decreases, reducing its service portfolio and augmenting its product business orientation. (based on Kowalkowski et al., 2017)

Service innovation refers to a new way to create customer value through service that is implemented in practice (Martinsuo et al., 2020). Service innovation may entail the following:

- Developing new services: new service offerings, new targeting of services on the market, identifying new market opportunities for existing or new offerings.
- Developing service operations or processes: renewing the entire service value chain or some of its parts.
- Developing existing services: renewing activities and collaboration at the customer interface.

Industrial firms seek a new source of revenue and profit by complementing or even replacing their current offering with industrial services. Table 2 summarizes the pursued benefits from industrial service business. Goods-centric business is sensitive to price competition, whereas service business enables competition through customer-perceived value and use of more versatile competitive approaches. On the other hand, many goods-centric industries also use a price-centric procurement practice for services because of the deeply rooted traditions and the significant adjustments required for value-oriented, quality-centric, and collaborative procurement. Manufacturing firms' transition to service business is a strategic change that may require significant changes in the organization's structures, routines (Baines, Lightfoot, Benedettini, & Kay, 2009), and business models (Kindström, 2010). Moving from a goods-centric industrial business to services takes time and is very challenging, making it a very active research and development topic in industries (Baines et al., 2009; Jacob & Ulaga, 2008, Oliva & Kallenberg, 2003).

Table 2. Motives and benefits of the transition to industrial service business (based on Kinnunen & Turunen 2012; aligned with Mathieu 2001b).

Marketing benefits	Strategic benefits	Financial benefits
<ul style="list-style-type: none"> • Promoting product sales • Lengthening and strengthening the customer relationships • Responding to customer demand • Optimizing customers' costs • Collecting customer information • Improving the company image • Enabling customized offerings • Improved customer satisfaction • Growth of market share 	<ul style="list-style-type: none"> • Creating possibilities for business growth • Utilizing technical capabilities • Service-based competitive strategy • Impeding imitation • Increasing customers' trust • Hindering market access of competitors or new entrants • Competition based on value, instead of cost 	<ul style="list-style-type: none"> • Balance effects of economic cycles • Higher profit margins, steadier revenues • Compensation for reduced product margins • Continuity of income from the installed base of equipment

2.2 Strategies for service business transformation

One part of a manufacturing firm's business strategy is deciding whether and how the firm wants to move toward service business (Gebauer, 2008). There are at least four different viewpoints to service business transformation that manufacturing firms need to consider when increasing the role of services as part of their business:

- Extending the service offering and increasing service value
- Expanding the customer base for service offerings
- Increasing the business value of services through automatization
- Engaging service partners.

Initially, the strategic service business transformation can appear in the form of some degree of service orientation, that is, interest in considering services as part of the business and, consequently, developing service offerings. Firms can decide to add single new services into their offering or develop existing services (Oliva & Kallenberg, 2003), change the position and role of services as part of the offering (Mathieu, 2001a), or transform the business logic from goods-centric to solution- or service-centric (Brax & Jonsson, 2009; Windahl & Lakemond, 2010). In the most advanced form, the firm may decide to take responsibility for operating the customers' equipment and processes, which moves the firm to a completely new position in the industry value chain (Oliva & Kallenberg, 2003). Depending on the types of customer expectations and service offerings, firms may adopt one or more of the following strategy alternatives:

- after-sales service strategy
- customer-support service strategy
- development partner
- outsourcing partner (Gebauer, 2008)

The early studies of strategic service business transformation centered on this idea of **differentiating firms based on the types of service offerings** they included in their service mix. Many studies have emphasized the similar types of strategic moves that firms take concerning their service business transformation: for example, first consolidating the existing offering and establishing and monitoring key service processes; then transforming the organization and its structures, practices, and value chain position to achieve a good market position; and finally making choices on whether to move toward relationship-based service business logics or emphasize the transaction-based presence in customer's processes (Oliva & Kallenberg, 2003). The option of outsourcing partners—that is, taking charge of the customer's operations on the customer's behalf—is an advanced approach to services, not identified in Oliva & Kallenberg's (2003) study yet. We will discuss this offering-related transformation trajectory more in chapter 6.

Another strategic alternative concerns the **search for new customers** for the service offerings. Manufacturing firms might easily concentrate on customers that have procured their equipment (or other systems and products) only, delimiting their service market to known customers only. The manufacturing firm may seek growth even among existing product-related customers because not all customers begin to procure services at the same time. It is important to learn from the early service users what types of services they need, what types of practices they have for service procurement, and how much they want to be involved in services themselves. This learning is helpful as a source of reference when promoting services among nonservice users. Later, however, competing manufacturers' customers also might be a possible target group for services. Offering services to third parties' (i.e., competitors') installed base is clearly one interesting option for service growth (Raddats & Easingwood, 2010). However, the manufacturing firm does not have the advantage of familiarity with the equipment because competitors' equipment might be completely different from the manufacturing firm's own products. Therefore, seeking growth through offering services to competitors' products will require investment into capability development.

The third option for service business transformation relates to increasing **the efficiency of services through automatization**, which eventually is expected to add value for the customer and increase business value for the manufacturer. An early step in automatization is making services more routine and repeatable, and this can be partly achieved, for example, through documenting the service concept and core service processes so that service personnel offer the services in a consistent, efficient manner with an expected level of quality. In a more advanced form, automatization refers to the use of advanced technologies, such as information and communication technologies, analytics, and remote monitoring, to support or even replace some human processes in the service delivery. Currently, digitalization offers excellent possibilities to automate some parts of the service processes and enhance service business

transformation in industrial firms (Ardolino et al., 2018; Kowalkowski, Kindström, & Gebauer, 2013). We will discuss the role of technologies particularly in connection with the use of customer information in chapter 5.

Furthermore, manufacturing firms have alternative possibilities concerning how they enter the service market, depending on what they want to do themselves. A core strategic question deals with **whether and how the manufacturing firm involves external partners** as part of service processes. The manufacturing firm may decide to perform the services itself, license or outsource service activities to external service providers, collaborate with a variety of different service providers, enable competitors to provide services, and so on. We will further discuss the networked nature of service delivery and related transformations in section 2.3 and chapter 7.

Despite the tempting idea of service business in industrial firms, research has shown that the transformation to service business is slow, challenging, and risky. Some studies indicate that moving to services can appear in the form of firms' lower profitability and even tendency to go bankrupt (Benedittini, Neely, & Swink, 2015; Neely, 2008). Firms need to be aware that the changes will take time, and services will not convert to profit immediately due to the significant investments into development and learning as part of the process. The stepwise changes dealing with increased service orientation, including organizing, offering development, service growth, efficient service processes, and more advanced services, can be demanding tasks that require persistence, resource investments, and skilled management in the organization (e.g., Kindström, 2010; Mathieu, 2001b; Raddats & Easingwood, 2010; Raddats, Kowalkowski, Benedittini, Burton, & Gebauer, 2019). In addition, the success of the transformation may depend significantly on context- and firm-specific factors, including firm size, market maturity, customer demands, competitor activities, and features of the solutions offered. Experience has shown that manufacturing firms do not move to service business alone—they must consider their supply chain and business network broadly to ensure that partners are also on board with the strategic service business transformation.

2.3 Transformation in service supply chains and networks

Firms usually have an established position in the value chain, but during strategic transformations, they may attempt to alter this position; for example, they may decide to concentrate on assembly only, switch to system integration, add more services and focus on providing integrated solutions, or even advance toward services during solution use. While considering their value chain position, manufacturing firms may also decide to abandon some old businesses and partner with new kinds of firms. Figure 11 summarizes the key phases in industrial, manufacturing-centric value chains and illustrates the strategic moves that manufacturing firms might consider in their business.

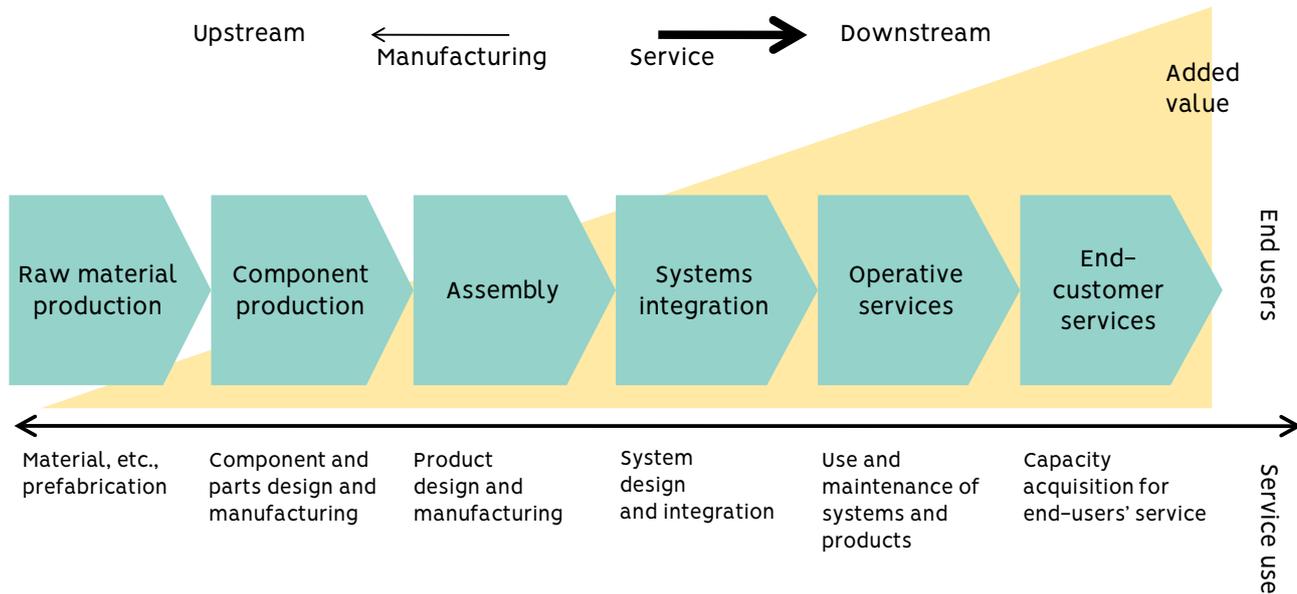


Figure 11. Moving industrial value creation toward the customer interface, that is, downstream (Davies, 2004; Hobday et al., 2005).

In one extreme condition, industrial firms may decide to strategically focus on industrial and supplementary services and move downstream in the value chain, outsourcing manufacturing to other firms (Wise & Baumgartner, 1999). This transformation is not particularly common, as industrial services very often benefit from the core competence associated with understanding the technological features and functionalities of the equipment and related processes, and it can be risky and even destructive to outsource such core competence. Indeed, firms do not necessarily give up manufacturing, but rather they increase the complexity of their manufactured offerings and move toward PSSs and integrated solutions that can be more valuable to their customers (Davies, 2003, 2004; Hobday et al., 2005).

When a firm's position or role (e.g., involvement in the value-adding activities) changes as part of the value chain, its relationships with other firms will also change. Clearly, the customer's role and position and the manufacturing firm's relationship with the customer will change when they enter into service relationships (Kindström, 2010; Oliva & Kallenberg, 2003). The dyadic relationship (i.e., a relationship involving just two partners) of manufacturers and customers has been studied extensively in industrial service business research. Customers, however, are not the only relevant partner in the service business. The manufacturing firm's service business transformation will extend to its supplier and subcontractor relationships also (Grönroos & Helle, 2010; Nordin, 2004; Oliva & Kallenberg, 2003) and potentially will require redefining the entire business network. Some research is emerging on triadic relationships (i.e., the smallest possible network, involving three partners) in industrial service business as well.

Service supply chain refers to linkages across all the firms that are directly involved in (and usually contractually tied to) the value-adding process through which the manufacturer delivers the services to the customers.

Service network or service supply network includes the service supply chain as well as its linkages with any other organizations that may directly or indirectly influence the value-adding process through which the manufacturer delivers the services to the customers. Besides the supply chain, it can include, for example, third parties not contractually tied with the manufacturer, design partners not directly involved in service delivery, local organizations affecting the conditions in which the service operations take place, and other organizations with an influence on or interest in the service delivery.

Service triad is the smallest possible network, that is, involvement of three different organizations, all having some kinds of relationships with each other in some phase of the service supply chain. The relationships in a service triad (as in any network) may vary in their composition, closeness, and strength.

One necessary consideration in service business transformations is the composition of the service supply chain (or network). What kinds of firms need to be involved in the successful delivery of services to fulfill the customers' need and promote both firms' businesses? How do the manufacturing firm's partner firms need to change their activities and processes to accommodate the orientation toward services? The involvement of other firms in the service supply chain depends strongly on the strategy and capabilities of the manufacturing firm (what will the manufacturing firm do as part of the service-related processes), as well as the strategy and capabilities of the customer firms (what will the customer firm do as part of the service-related processes). Because these firms do not, by default, have all the necessary capabilities required in services, such capabilities often need to be sought from other organizations.

Typically, for example, the service supply network includes a local service provider that delivers the services on the manufacturer's behalf; a software provider that supplies the platform for remote monitoring and control; a distributor, retailer, or wholesale intermediary that sells and services the equipment; and competitors whose equipment the manufacturer could service, besides its own equipment. In addition, transport firms, rental facilities or equipment, and public sector authorities may be needed to enable an efficient service delivery at the customer's desired location.

An example of a service supply network of a fairly simple product-related installation service situation is depicted in Figure 12, including the product delivery. The example deals with a component manufacturer that delivers certain components to customers in the construction industry and also coordinates the delivery of related services on the construction site (Ahvenniemi et al., 2013). While a supply chain with product delivery only would be rather simple, involving the customer, salesperson, and factory of the manufacturing firm, external suppliers, and transport firm, the inclusion of services in the manufacturing firm complicates the supply network in various ways.

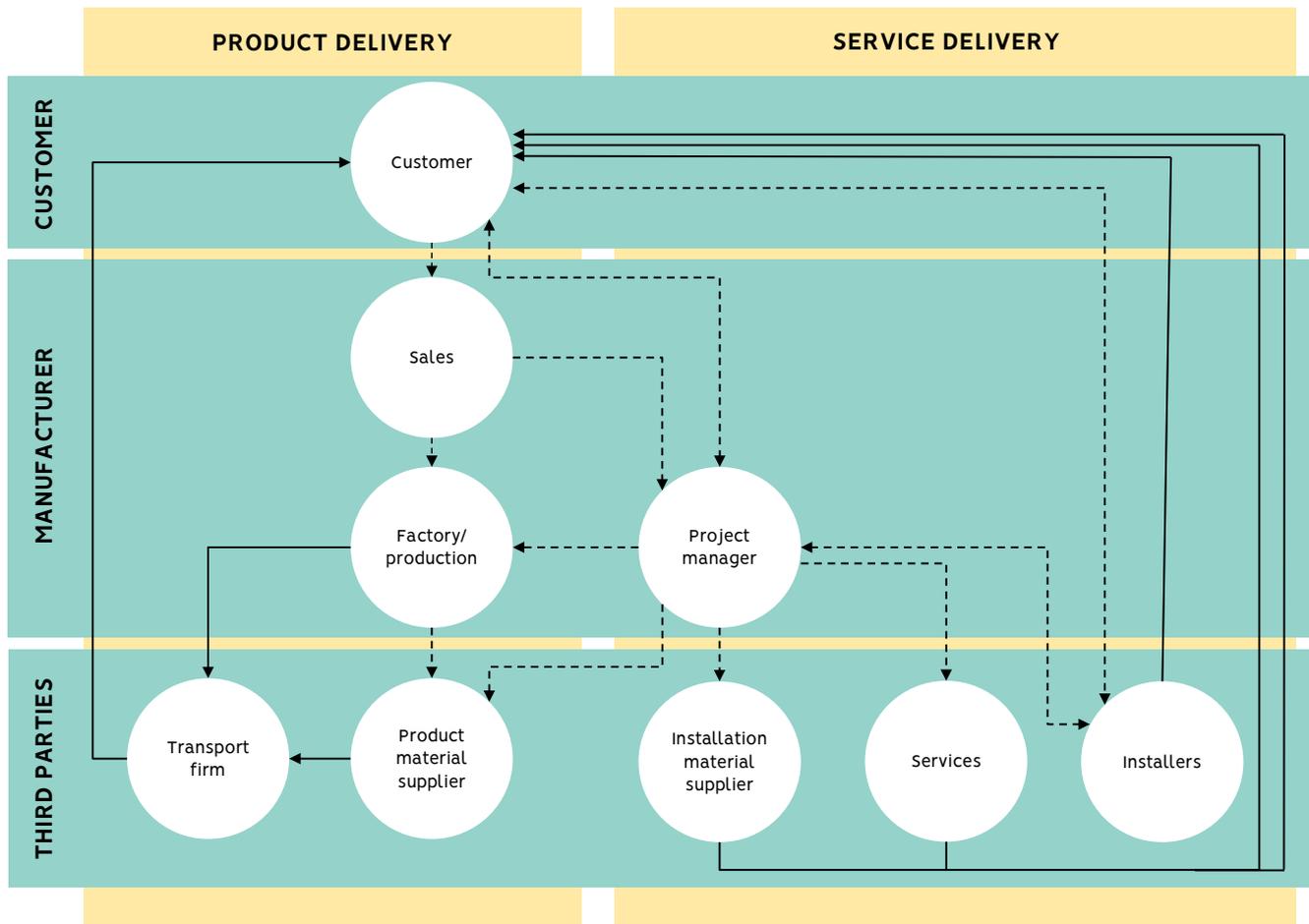


Figure 12. Example of a manufacturing firm's supply network during product and service delivery. Adapted from Ahvenniemi et al. (2013).

In this example, the manufacturing firm's project managers have direct contact with the factory regarding the manufacturing of the components. They are in charge of cooperating with other material suppliers that deliver custom-made parts integrated with the main product, and the simultaneous installations require coordination across the organizations. They also coordinate the installation process and the procurement of other materials and services needed at the construction site, and multiple external firms are involved in both the component delivery and service delivery. The installation itself is carried out in the customer's construction site by an external firm's employees, under the supervision of the focal manufacturing firm's project managers. Normally, the project managers would order any installation-related additional materials and deliveries from their dedicated (national) suppliers. However, due to urgent need, the installers were able to procure installation-related materials from local suppliers, and local transport firms handle the delivery of these materials. During the installation, other third parties are involved in the network, including waste management service providers, construction site services (meals, sanitary facilities, machine rentals), and logistics. In full agreement with the customer, the manufacturing firm's project managers handle the coordination of all these activities (Ahvenniemi et al., 2013).

With machinery manufacturers that offer advanced services to their installed base of equipment, the service networks may also become very complex due to the necessity to share information across different firms. Figure 13 illustrates a possible scenario for a manufacturer that offers services to its industrial customers, concerning its installed base of equipment globally. Various third parties are needed and involved in the service network. The manufacturer may use **distributors** in some regions to sell and deliver the equipment; these distributors may also have a role in selling services and be in direct contact with customers under the possible guidance of the manufacturer's personnel. Sometimes the distributors do not offer services themselves, but other local organizations may be involved in service delivery if the manufacturer does not have a local presence. In such cases, the **service providers** will need accurate equipment information from the manufacturer and may establish a contractual relationship with the manufacturer, with the customer, or with both (sometimes also the distributor). With advanced services, the **software system suppliers** are important third parties that create, sell, and maintain the platform for analytics and other data-related services upon which the remote monitoring connections are built. Again, the software provider can be contractually linked with the customer, the manufacturer, or both. In addition, the manufacturer's **suppliers** that deliver materials, components, and subsystems may need to be linked with the network in order for them to create readiness for services in the entire network (based on, e.g., Momeni & Martinsuo, 2019a; Vaittinen & Martinsuo, 2018).

Our own research has revealed that when manufacturers move toward more advanced data-based services, they become increasingly sensitive to whether or not the customers and third parties have similar kinds of interests regarding services. As many stakeholders in the service supply chain and network need to transform their processes and practices to enable services, their readiness is a concern and may require action from the manufacturers. For the service business to succeed, all relevant stakeholders in the network need to have strategies that drive the business in a similar direction.

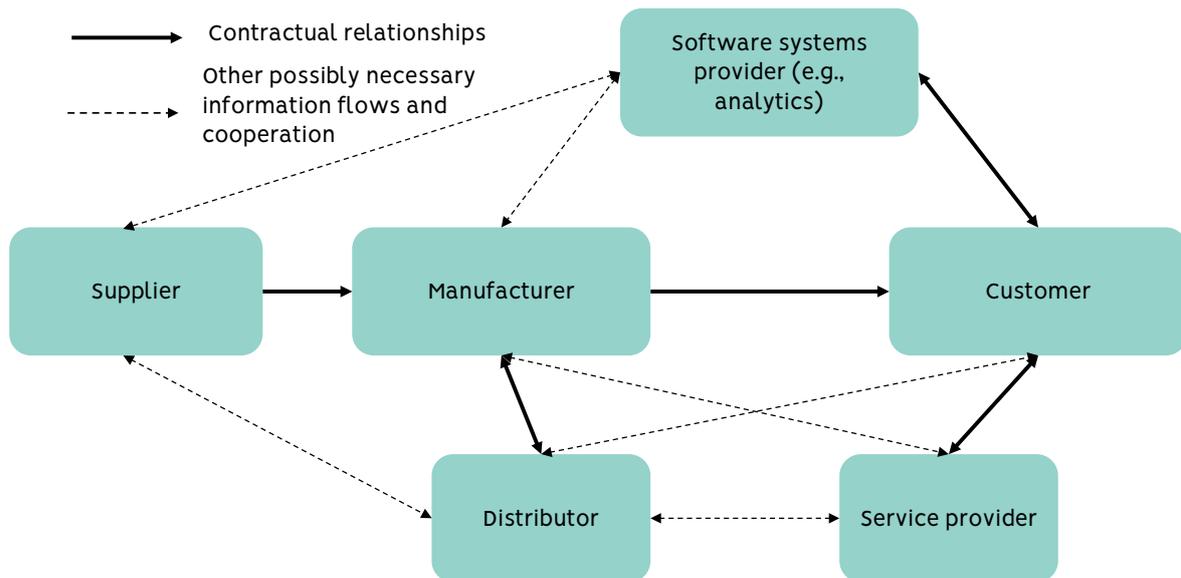


Figure 13. Illustration of a supply network for advanced services concerning the installed base of equipment.

2.4 Service logic in manufacturing and business

The emphasis on intangible value in services implies that the entire logic of business may be reconsidered. Some literature, in fact, challenges the goods-dominant logic of doing business because it rests on the assumptions of tangible resources and outputs, value embedded in goods, and transactions between the buyer and supplier. Such literature argues its replacement through service-dominant logic (Vargo & Lusch, 2004, 2008), assuming intangible resources and processes, cocreated value, and relationships between the buyer and supplier. While Vargo and Lusch (2004) portray these two different logics as logics of marketing, Grönroos (2011) sees them more as logics of the entire business. We view these two logics as alternative or even supplementary ways of perceiving business, that is, the nature of economic exchange.

Goods-dominant logic (of business) is an economic exchange where goods are the primary focus of the exchange and embedded with value, whereas services (in plural) are considered as add-on offerings to enhance the value of goods.

Service-dominant logic (of business) is an economic exchange based on service (singular)—that is, process/activities of doing something on behalf of another party—and goods may play a service-delivery role.

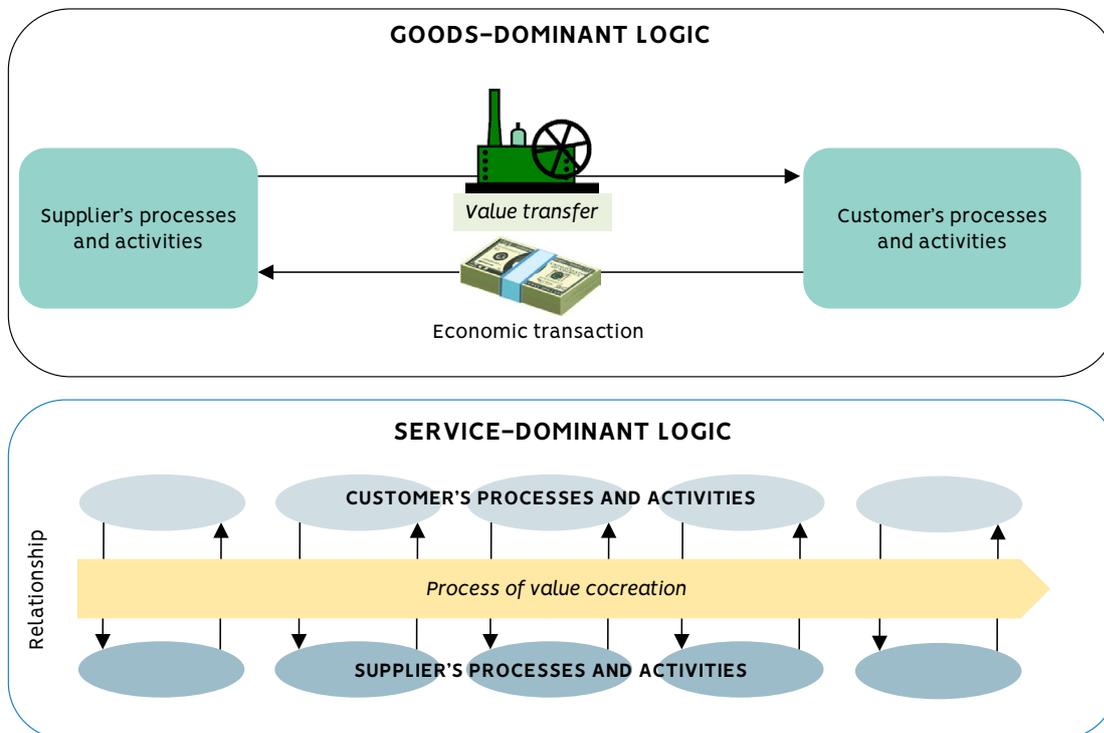


Figure 14. Difference between goods-dominant and service-dominant logics of doing business.

The business logics have some core differences, as highlighted in Figure 14 and Table 3. Goods-dominant logic assumes a tangible output as a source of customer value and tangible resources in creating that value; it also ties the manufacturer's earning to the tangible resources and output. Services, in this logic, are merely to support the goods and enhance the value creation through the goods.

As a contrast, service-dominant logic centers on the activities and processes between the manufacturer and the customer as a source of customer value, and the manufacturer's earning is tied directly to the value received by the customer. Service, in this logic, is the process occurring between the manufacturer and the customer that creates value.

Service-dominant logic consequently blurs the boundaries of the firms, as the processes of different firms occur in parallel, and the manufacturer needs to become increasingly aware of the customers' business. Providing support to the customers' business in line with the service-dominant logic requires the manufacturer to engage in activities and processes that directly promote the customers' business effectiveness (Grönroos, 2011).

Table 3. Comparison of main features of goods-dominant and service-dominant logic in marketing (Vargo et al. 2008).

	Goods-dominant logic	Service-dominant logic
Creator of value	Supplier, often with input from firms in the supply chain	Supplier and customer, network partners
Process of value creation	Value embedded in goods or services; value added through enhancing or increasing attributes	Value proposed through offerings with value creation continuing through use by the customer
Purpose of value	Increase wealth for the firm	Increase survival and well-being of the system through service of others
Role of supplier	Produce and distribute value	Propose and cocreate value
Role of customer	Use up or destroy value created by supplier	Cocreate value through integrating resources with those of others

The distinction between these two logics has caused a lot of discussion and debate in service research over the past two decades. In this book, we are sensitive to the current context and business of manufacturing firms, however. Service-dominant logic makes rather strong assumptions that cannot be used as foundations for business in the economic systems of today's society. For example, manufacturing firms have historical legacy that they cannot neglect, even when adding services to their business and updating their business models. The legal systems of societies govern how business transactions (procurement and selling) must take place between firms. Customers very often have procurement processes and practices that follow the goods-dominant logic. Contracts need to be established between firms, and contract management has certain rules and norms. Therefore, we need to take a

realistic and partly critical view of service-dominant logic that may appear in a very idealistic vein in current marketing research.

However, while acknowledging the goods-dominant history and current state in manufacturing firms, we also see that a service-oriented transformation is occurring in many industries globally, which posits the possibility that goods-dominant and service-dominant logics can supplement each other, rather than replace each other. Certain aspects of both goods-dominant and service-dominant logics may coexist in companies in full harmony, and transactional and relational businesses may coexist as well.

3. CUSTOMER NEEDS, RELATIONSHIPS, AND INFORMATION IN INDUSTRIAL SERVICES

3.1 Customer information and customer awareness

What is customer information?

Relevant customer information in the context of industrial service systems is related to the customers' needs, values, and various details of their businesses that are relevant to manufacturing companies and other service providers.

Customer need, in the context of industrial service systems, refers to the existing and potential resources, activities, and outputs that may be needed and useful in the customers' value-generation processes.

Customer wishes already contain ideas of how those customer needs are addressed.

Customer expectations represent a combination of needs and wishes that are identified and specified in the interactions with the customer.

Customer value, in this vein, refers to the relationship between the benefits and sacrifices that are the result of the product or service provided by the manufacturers or other service providers. Interaction with the customer is desired in order to understand the mechanisms of customer value. In chapter 8, the viewpoint is extended to the value related to the profitability and other aspects in customers' business.

Machinery manufacturers provide their customers with equipment and related services. From the customers' perspective, it is all about investing in suitable pieces of equipment and using appropriate methods to operate and maintain those pieces of equipment during their life cycle. Therefore, from the perspective of manufacturers, there are plenty of issues about the customers that are important to know in order to design and manage the equipment and service operations.

Customer information, in the context of industrial service systems, refers to all kinds of information about the customers, their needs for equipment (i.e., the manufacturer's products/systems), and the operations where that equipment is being used.

Customer information may take different forms: technical information about the equipment and usage, market information about the customer's customers and business generally, performance information about the customer's operations, and financial information about the performance of the customers.

From the manufacturers' perspective, the customer information needs to tell something about the customers in relation to their offering:

- What kinds of operations do the customers have? What are their success factors?
- What kinds of equipment and related services would the customer need in order to succeed in its operations?
- What kinds of technical, operational, market, or financial information tell about the customers' business and its success factors?
- What is the current role of the manufacturer's equipment and services in customers' business, and how could the firm enhance such a role?

In addition to the content of the customers' business operations and their technical, operational, and financial aspects, the manufacturers are interested in the means and procedures through which the customers make decisions about, plan, and control their operations. In theory, the customers perhaps should make their equipment investments and business renewal bearing in mind the life cycle of their business and, more particularly, the life cycle cost of the equipment and related services (see, e.g., Lindholm, 2018).

This is not always the case, however, and customers make decisions with more limited perspectives based on the visibility they have of their business operations and the end customers. Manufacturers that have an extended view of similar pieces of equipment in use among customers all over the world—perhaps enabled and further enriched by new technologies (Laine, Paranko, & Suomala, 2010)—may have customer information that is not available at a single customer, allowing them to offer more beneficial combinations and related services.

The rest of this chapter focuses on building customer awareness based on extensive customer information and discusses the ways to identify and realize service business opportunities based on such customer awareness.

What is customer awareness?

Customer awareness refers to the manufacturer knowing relevant aspects of the customers' business that can be useful in developing its equipment and service business.

Customer awareness in industrial service business is not just linked to the availability of certain information (e.g., equipment location or use at the customer) or using a certain type of customer information in a certain way (e.g., monitoring spare part and maintenance service profits). Instead, customer awareness is the manufacturer's understanding of customers' business, operations, and decision-making logic so that the manufacturer can develop its business and provide real benefits to the customers. Of course, the manufacturer could perhaps also take advantage of the customer awareness

and increase prices at the cost of its customers, but here, the focus is on acquiring and using customer awareness to create possibilities for mutual value creation among the actors involved.

A central starting point for customer awareness is identifying the service market, in terms of its relevant customer segments and their service volume and value. Knowing the service market specifies the scope for the needed customer awareness, and it needs to be repeatedly redefined as the customer awareness increases. Identifying enough service market potential represents a basis for the aim to increase customer awareness, and thus identify and realize service business potential.

Service market potential means the size of the service market at a certain time. For a manufacturer, this means the volume or value of all the service needs of their selected customers. Service market potential can be specified for each service separately or all services (the entire offering) in total, and for different customer segments separately or for all customers in total. For machinery manufacturers, this can mean more specifically all the service needs of the machinery in use at the customers during their entire life-cycle.

Service business potential represents the possible service business for a company, compared with the current share of the company of its customers' business. It could be defined in monetary terms (e.g., EUR), or in relative terms (e.g., % of business). A broad definition of service business is all the business that a company could do with its customers. A narrower definition is the potential business related to the activities, now undertaken by the customers themselves or by third parties (e.g., spare part sales vs. spare part needs).

The current division of tasks among the central actors involved in industrial service systems provides a basis for understanding the service business potential. What is the manufacturer's current and potential share of its customer's business? Typically, the central actors include the customers that provide their products and services to the end customers, the manufacturers that are providing their equipment and related services, and the third-party service providers that are providing the customers with their maintenance and business support services (Figure 15).

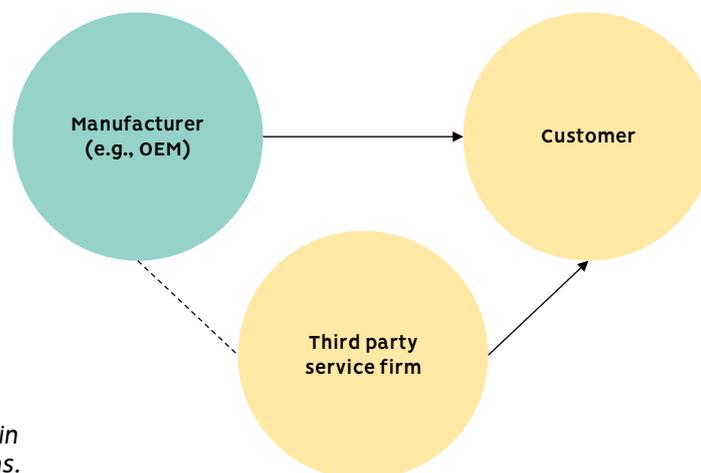


Figure 15. Central actors in industrial service systems.

The division of tasks among those actors tends to vary with the following alternatives:

- Customers undertake some service activities.
- Manufacturers undertake some service activities.
- Industrial service firms (third-party service firms) undertake some service activities.
- Innumerable new service activities are undertaken.

Along with understanding the current division of tasks, it is very important to understand the antecedents and implications of such a division of tasks. If the manufacturer believes that it has potentially valuable new service activities to provide to the customers, it needs to understand their potential consequences and the mechanisms through which the customers make decisions about them. In addition, not all customers have the same division of tasks. Typically, some customers buy only pieces of equipment and some spare parts from the manufacturers, whereas some others have set long-term, comprehensive service contracts with the manufacturers. Understanding these options and all those in between is necessary to plan and control desired changes in the division of tasks. Many customers prefer service providers that know a lot about their operations and provide value with their service offerings. On the other hand, some customers are not willing to set too close relationships with manufacturers because they are worried about losing their core competences to them by allowing visibility into several customer companies, sites and pieces of equipment in use.

3.2 Using customer information in customer relationships

Customer logic as a starting point for customer awareness and service business development

When a manufacturer seeks to develop its service business with increased customer awareness, customer-dominant logic provides a sound starting point. Quite often, manufacturers have certain strategic, marketing, and financial objectives for extending and developing their services business (Mathieu 2001b; Gebauer, Fleisch, & Friedli, 2005).

Customer-dominant logic of business refers to the type of economic exchange in which the starting point of any service provision is the value-generation process at the customer. The customer creates value and allows service providers to participate in the value creation (cocreate), thus highlighting “the creation of service value from the perspectives of value-in-use, the customer’s own context, and the customer’s experience” (Heinonen et al., 2010).

However, when the service businesses are developed based on increased customer awareness, customer-dominant logic helps identify how the value is actually being generated in the customers’ operations. Grönroos (2008) made a distinction between the value creation in the customers’ operations and the value cocreation that is the role of the manufacturer or the service provider. Although this distinction is rather self-evident, earlier service-dominant logics (Vargo & Lusch, 2008) focused much more on the

perspective of the service provider and its competences to be used for the customer. In other words, in the customer awareness and customer-dominant logic, the customers' business and operations are the starting point, and the manufacturers are appropriate service providers if they cocreate value in those operations. The operations at the customer are the core of service activities and the source of new ones (Grönroos, 2008, p. 310): "The firm cannot create value for customers. . . By providing customers with value facilitating goods and services as input resources into customers' self service value generating processes, the firm is indirectly involved in the customers' value creation".

More specifically, Grönroos (2008) argued that the starting point for service business development is the customer awareness that can be attained due to the visibility of and the involvement in the customers' value-generation processes: "Firm is not restricted to making value propositions only, but also gets opportunities, through the value co creation possibilities during interactions with the customers, to actively and directly participate in value fulfillment for its customers" (p. 310).

The logic of building in the service business development on the fundamentals of the customers' value-generation process was explicitly formulated as the customer-dominant logic by Heinonen et al. (2010). Building on the previous work by Grönroos (2008) and in contrast to the service-dominant logic by Vargo and Lusch (2008), Heinonen et al. (2010) argued that the customer-dominant logic should be based on the following: "value in use, the customer's own context, the customer's experience of service" (p. 531).

Customer-dominant logic is not limited to industrial service systems. However, in this context, where manufacturers seek to develop new services, new sources of competitive advantage and profitability quite naturally require understanding customers' context, operations, and value-in-use provided by manufacturers' equipment. These altogether constitute the basis of the customers' experience with the manufacturers' services and serve as the basis for developing new services.

When starting from customer awareness, it is argued that the choices of service business development should be based on the customer value possibilities embedded in the customers' context and value-generation processes. At the same time, it is important to note that not all customers have similar value-generation processes or similar willingness to let the manufacturer join those processes. As a result, the increased customer awareness should lead into considerations of the following:

- What is the role that is currently given to the manufacturer as the service provider?
- What is the role of the manufacturer as the service provider that would be desired by the parties involved?
- What kinds of extensions are desired to the service offering?
- What kinds of customers would benefit from certain services?
- What customer segment is currently (or will be in the future) using a certain service?

In addition to these generic questions, several context-specific questions should direct increasing customer awareness and thus an increased understanding of the customer needs to be used in developing service businesses and customer relationships. Many of these are related to the specific nature and

content of the value-generation processes of the customers and thus to the natural scope and content of the service activities given to the manufacturers and external service providers. Next, this discussion is deepened by mobilizing the notion of visibility-based services, where the scope of the manufacturer's services is determined by its visibility to the customer's value-generation processes.

The limits of customer awareness and related service offerings: visibility-based services

Holmström, Brax, and Ala-Risku (2010) examined visibility-based service opportunities for manufacturers and other service providers in industrial service systems. The idea of the visibility-based services is that to be able to provide maintenance services to the customers' production operations, the manufacturer or another service provider should see not only the maintenance activities but also the broader process of production. To simplify, in visibility-based services, the service provider should be able to see at least one step further in the customer's value-generation processes in order to sufficiently fulfill the customer need.

In Figure 16, this idea of visibility-based services is presented by separating the asset management demand chain (i.e., the value generation with the infrastructure and the fleet at the customer) and the service supply chain through which the manufacturer can cocreate value for the customer's process. In the figure, the visibility to the asset use in the customer's context enables service provision for installed based management. However, if the manufacturer sees only maintenance activities, this limits the scope of possible visibility-based services in the case. Requirement penetration point refers to the contact point of the customer's demand (i.e., value-generation process) and the service supply of the service provider. However, the visibility determines the possible scope of the service supply chain that potentially cocreates value in the customer's value-generation process.

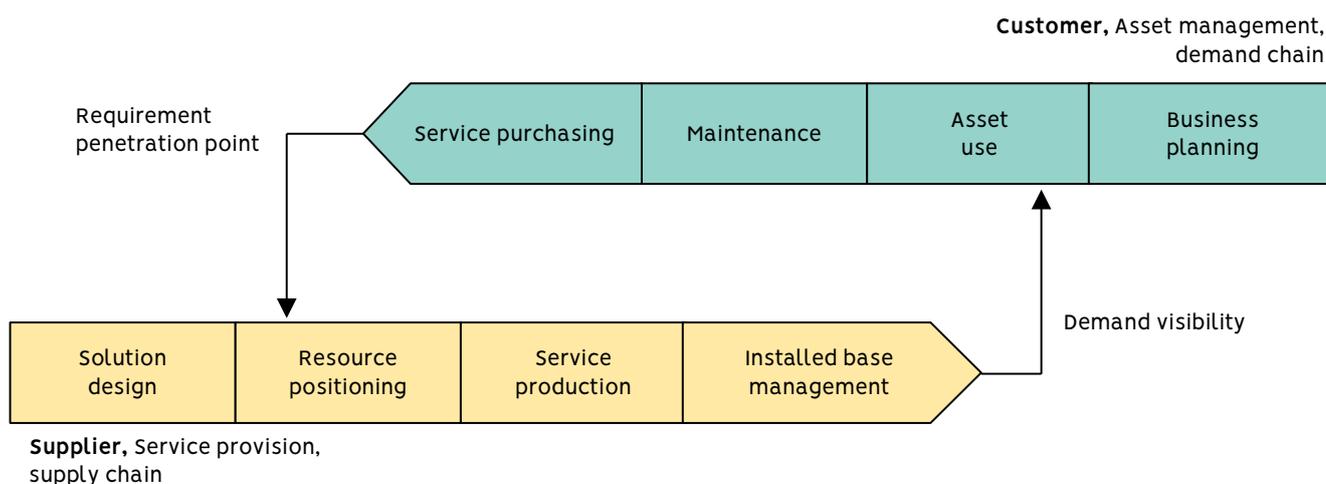


Figure 16. The logic of the visibility-based service. (Adapted from Holmström et al. 2010).

As Holmström et al. (2010) argued, the visibility is not static, and the manufacturer or the service provider may develop its visibility to the customer's value-generation process and thus extend its possible scope of service business. The examples presented by Holmström et al. (2010) include the following service concepts and related visibility to the customer's processes:

- collaborative service supply chain management (SCM)
- condition-based maintenance as a service
- visibility-based asset management

In condition-based maintenance as a visibility-based service, for example, the value added for the customer can be defined as improved asset reliability of those assets under this maintenance plan. More specifically, any actions related to condition-based maintenance need to be planned based on an asset information model that describes the expected condition of assets as a function of use, maintenance, and environmental variables, for instance. Furthermore, to succeed in such planning in an effective and efficient manner, one needs to have information (i.e., visibility) regarding the asset use and conditions (and perhaps operator observations) in the customer's value-generation processes. Of course, a manufacturer with multiple service customers in its equipment fleet could make analyses on the differences between a particular customer and its assets and the wider fleet in order to perform even better in condition-based maintenance. This enhanced performance may be due to identifying exceptional problems in advance from weak signals or standardizing problem identification and related actions.

Despite its potential, not all customers will allow this new role of condition-based maintenance to be given to the manufacturer because it requires sharing information about asset use and conditions. Many customers do not want to become dependent on a single manufacturer or service provider company, and this may hinder visibility and thus possibilities for customers' supporting value generation. Besides, even if a customer allows such the manufacturer to take such a role, the pricing of condition-based maintenance may remain a tricky issue. Should the customer pay only for condition-based maintenance actions? Or should the customer pay for the increased reliability?

In different industries and supply chains, the current division of tasks may vary significantly. Therefore, it is extremely difficult to determine a desired scope of service business from the manufacturers with possible visibility into the customer's value-generation processes. However, what remains is that the manufacturer or service provider needs to have a wider visibility than the scope of the service business. In addition, along with the scope of the services, the involvement of the customer and manufacturer in the process affects the need for visibility. Sometimes the manufacturer takes over the entire process for the customer and provides comprehensive maintenance or vendor-managed inventory for spare parts. On the other hand, sometimes customer involvement is required if the external maintenance and machinery operator work together in the maintenance activities and process optimization.

Traditionally, service literature has focused on customer involvement in the service processes. Such involvement has meant providing infrastructure, providing resources (e.g., materials, tools, and techniques), or working together with the service supplier to reach the desired outcome. The customer-dominant logic turns the setting the other way around because it is the supplier that is accepted to be involved in the customer's value-generation process. Such involvement may range from providing resources to undertaking activities and to being responsible for a wider entity. These different types of involvement are presented as examples in Figure 17.

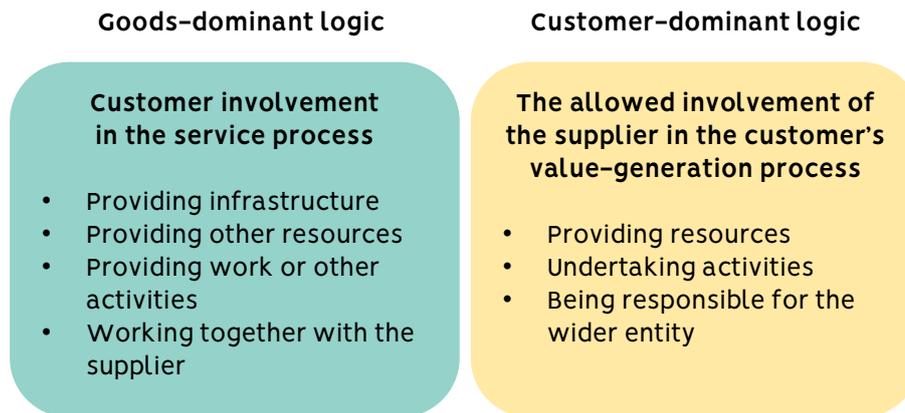


Figure 17. Different types of involvement from the supplier's and customer's perspectives.

In all, however, understanding the division of tasks and having sufficient visibility into the customers' value-generation processes provide a solid basis for developing new services businesses in industrial service systems.

3.3 Customer value and customer awareness driving service business development

A central question in developing new service businesses is understanding what the role of the manufacturer (or the given company) should be in its customers' business. Cocreating more value in the customers' value-generation process is a sound starting point for service business development. In addition, the service provider needs to understand what the most reasonable and valuable division of tasks could be between the parties involved; such understanding requires visibility into the customers' value-generation processes and overall customer awareness. Especially regarding customer awareness, central questions for the manufacturer include the following: What should our role be in customers' business now and in the long-term? Should we extend our service activities? Should we specialize and focus on particular activities?

Laine, Paranko, and Suomala (2012b) provided a case study about using a business game concept to increase customer awareness and support service business development of a manufacturer providing

its production machinery and related service globally. The case study was based on an in-depth interventionist case study, where the researchers together with the company experts designed and used a business game concept on the manufacturer's customers business in order to thoroughly understand the kind of value exists and how much is currently generated (or could be generated) in the customers processes. Essentially, the business game concept focuses on the customers' business; that is, the choices and decisions made in the game are those kinds of decisions made by the customers in their businesses. Therefore, the focus is not on the manufacturer's business but the wider aim of the manufacturer to help its customers become as valuable as possible. In this vein, the winner of the game is the team (i.e., the company) that is the most valuable at the end of the game (Laine et al., 2012b). The idea of the game is largely in line with the idea of the customer-dominant logic of service (Grönroos, 2008; Heinonen et al., 2010). Furthermore, as presented in this context, it is in line with the idea of visibility-based services: the further the service provider understands its customers' businesses and operations, the wider the scope of service possibilities (Holmström et al., 2010).

Figure 18 presents the idea of the game. In game events that lasted one to two days, the participants played the game as teams, typically around five periods representing five years of business of the customer companies. The game events included informative lectures on the customers' business and technical advancements within, as well as discussions and reflections among the participants on the topic of the game. In each period, the teams made decisions on the customer's end products, production volumes, machinery investments and maintenance plans, and technical and product quality aspects. Because the manufacturer provides its machinery and services to different stages of the multiphase production process, the teams were encouraged to think about the production system configuration, elaborate on the potential bottlenecks, and reflect on the interdependencies between the different choices. As a result, the teams received financial statements and reports regarding their achievements, which also served as the basis for the choices for the next period. (Laine et al., 2012b).

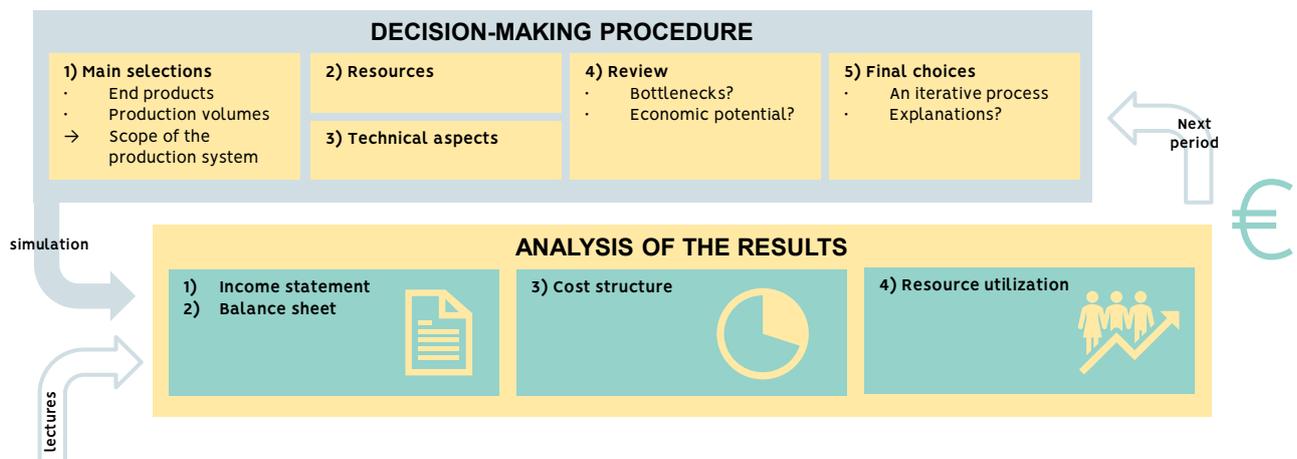


Figure 18. The business game concept for increasing customer awareness (Laine et al., 2012b).

During the three-year research process, more than 100 players participated in the game, including both customer and manufacturer representatives. Moreover, regarding the manufacturer personnel, there were essential learning outcomes. Top management representatives were able to discuss the manufacturer's service strategy and the interdependencies of the different product offerings. R&D personnel understood much more about the production process bottleneck and capacity needs, as well as the role of maintenance in production capacity. Some machinery was never a bottleneck, which was surprising. On the other hand, the unavailability of some machinery caused immediate losses to the customer company that was the focus of the game.

Overall, the business game concept responded to two challenges the manufacturer faced when attempting to enhance customer awareness and develop its service business: (1) defining the actual content of a desired service business in a given context, and (2) gaining a shared understanding of the desired service business among the business functions and units of the manufacturer. More particularly, as the business game concept cumulated customer awareness of the manufacturer and dozens of real-life customer cases dealt with by the company experts, the business game concept was able to foster more detailed discussions on the following topics:

- Why and when should we develop certain services?
- Should we develop new services through exploration or exploitation?
- What is the actual value (and price) of a particular service?

As a result, finally, the business game concept provided detailed discussions on customer value, the desired role of the manufacturer in customers' businesses, and the mechanisms for generating revenues and costs in the customers' operations. As an implication, such an approach responds to the need for enhancing customer awareness and constructing consensus on the service business objectives and interpretation as it provides the opportunity to simulate and elaborate on the alternative operational configurations, organizational structures, controls, and incentives. Such detailed examinations are needed to build and enhance customer awareness.

3.4 Case example

Company A has an active fleet of 1,000 pieces of equipment in use at 200 customers globally. The customer has from 1 to 20 pieces of equipment, and more than 500 pieces of equipment are in two major market areas, although Company A operates globally. The equipment provided by Company A is in use 24/7 in some of the infrastructure operations; however, in some application areas, the equipment is being used on a need basis, around 1,600 hours per year. Company A gets 20% of its revenues outside equipment sales, and these revenues stem mainly from spare part sales (15%), maintenance (4%), and contracts (1%), including some business consultancy. The company's estimated market share is around 50% of the theoretical spare part consumption of its customers and much smaller with respect to the maintenance and business consultancy.

When it comes to customer awareness and customer information, Company A knows some of its customers much better than others because there are long-term customer relationships and maintenance contracts with some key customers. However, the company is not aware of the actual maintenance service needs of its customers outside the contracts, and especially outside the two market areas. Recently, Company A has heard that the equipment is used in too hard conditions in some areas, and the power of the smaller equipment models is barely enough for the applications in some areas. This causes some maintenance problems and unsatisfied customers.

To develop its customer awareness, the company established the following plan:

1. The company wanted to collect “minimum information from everyone,” that is, the location and owner of every piece of equipment, its status, applications area, and number of hours it has been used. This enables Company A to manage a portfolio of equipment based on the different statuses of that equipment: “good condition,” “problematic,” and “at risk.” Such information was first collected by the market area representatives, and, after that, customer surveys were sent out.
2. The company wanted more detailed information about some customers and their equipment to understand the life cycle of their equipment in terms of investments, rebuilds, spare part consumption, maintenance needs, and production output. Such information will enhance the understanding of both the role of Company A in the business of some customers and the service business potentials outside these customers.

Altogether, after collecting such information, the customer can more specifically identify its service business potentials and formulate strategies to realize those potentials. In line with the idea of visibility-based services, Company A needs a means to collect information about certain customer operations to an extent that is greater than the domain of the new service in order to provide new services with a solid base. For example, understanding the spare part consumption during the entire life cycle of a piece of equipment, Company A could design spare part kits for the warranty period and periodic maintenance plans for the equipment in line with the overall spare part and maintenance needs.

3.5 Lessons learned

This chapter has focused on customer information and customer awareness, which are central parts of service management and service business development, as service is essentially about supporting the value creation at the customer. When enacting customer awareness, in line with the idea of customer-dominant logic of service, the focus should be first on the information about the customer process and then second on the role of the services and service providers in it. Furthermore, all the service activities that do not support customer value creation can be questioned because they are not service activities.

In this chapter, the notion of visibility-based service was presented because the service provider needs to know the customers' value-generation processes beyond the scope of its services in order to

truly understand the customer value mechanisms. For the service provider to understand customers' value-generation processes comprehensively, it must understand customers' overall business, financial statements, and decision-making procedures, as was the case in the business game concept example.

The discussion regarding customer information and customer awareness in connection with service business potential raised some fundamental questions:

- What service activities should our firm undertake for the customer?
- What service activities could the customer outsource to us?
- What customer information do we have now?
- What customer information do we need to (1) develop desired new services and (2) succeed in them?
- Are customer needs and expectations heterogeneous? Should we provide different services to different customers?

Addressing those questions will help any OEM or service provider to formulate and enact its service business strategy based on a solid ground of customer need fulfillment.

4. HUMAN RESOURCES AND COMPETENCES IN INDUSTRIAL SERVICES

4.1 Competences and capabilities for industrial service business

Resources are bundles of tangible and intangible assets that are owned or can be controlled by a firm. The relevant question about resource is as follows: What are the inputs for a business process?

Human resources are individuals who work for a firm or an organization (also called employees, workforce, or personnel). The relevant question about human resources is as follows: Who are the people involved in this business process?

Competences are combinations of knowledge, skills (know-how), and personal attributes that are required to perform a specific task. The relevant questions about competence include the following: What type of resources are required to do this task? Who knows how to do this task, and how well do they know that?

Capabilities are a firm's ability and capacity to deploy competences of resources (to gain competitive advantage). The relevant question about capability is as follows: How can we use or apply competences to do what we need to do?

While all organizations need to identify and manage resources, competences, and capabilities, industrial services can be seen as a special context where customers have the knowledge and opportunity to observe and assess the service organization. Customers usually question three basic factors to evaluate the service organization: experience in implementing similar services, references, and required skills or partners to implement the services (Lah, Kern, Peterson, & O'Connor, 2002). This rather high visibility of service organizations for customers makes the issue of human resources and competences more critical for industrial firms. This chapter especially focuses on human resources and competences for selling and delivering services mainly because customer value is initially created (cocreated) with the customer and then is delivered to the customer during these service processes.

4.2 Human resources and competences for selling services

Differences between selling services and selling products

While the importance of services as part of industrial firms' offering increases, the management of service sales becomes more crucial. Observations from different industrial firms reveal that firms successful in selling products are struggling in selling services. Product salespeople may prefer selling

core products of the firms due to a successful product market and higher monetary value of product sales. They may neglect the repeatability of service sales, future sales, and CRM. To organize a sales unit with a service sales focus, it is important to first figure out how selling services is different from selling products, as follows:

- Defining the value proposition for services is more complex for salespeople as well as customers. Services can range from the basic, such as maintenance, to the advanced, such as process optimization. While basic services (e.g., installation of equipment and benefits from such) can be well defined, it is more difficult to define the scope and benefits of advanced services (e.g., process optimization). The intangibility of the value proposition and the multitude of possibilities for modifying the service package can make the process of service sales longer, more complex, and more resource intensive.
- Product sales are mainly focused on specific customers' needs, technical aspects of the products, and the price of the product. However, service sales require data on the scope of the customer's operation and environment, the implementation phase to formulate the risks of not purchasing the services, and the value of bundling products and services.
- The sales force may need to negotiate with different groups of people in the customer's organization for products and services. Thus, they may need to find the right target group in the customer's organization with which to negotiate service sales.

The bottom line is that for selling services, the sales force needs to focus on long-term customer relationships and to shift the value proposition toward value-in-use. Salespeople must have a service-based mind-set and in-depth understanding of the customer's business model and organization. For these reasons, it is wise to revise the sales organization, roles, and competences of the sales force to enable selling services. The next section provides an overview of service sales organization, new roles, and competences for salespeople to sell services.

Organizing service sales in industrial firms

As emphasized previously, service sales requires more specialized knowledge and more detailed understanding of the customer's operation and how the customer uses the products in practice. Thus, adding services to the offerings of industrial firms changes the sales function to a more customer relationship-focused strategy. In *Building Professional Services*, Lah et al. (2002) highlighted five service sales functions:

- Identify new service opportunities in the existing product install base.
- Identify new service opportunities with new customers.
- Manage pricing and positioning of service proposals made to the customer.
- Close business.
- Forecast the demand for delivery resources.

Accomplishing the service sales function demands creating more points of contact with the customer's organization at several levels and thus changes the focus of the sales effort in industrial firms from the level of salespeople to the level of sales organization. It is no longer enough to have dedicated salespeople; instead, industrial firms need to develop cross-functional sales teams and a coordinated sales effort inside the firm. Service people, especially those that are in direct contact with customers, are among the key resources that need to be actively involved in the sales process. Service people can facilitate sales effort in a variety of ways:

- Service people are the most knowledgeable people in the firm regarding the customers' needs and problems in their operation. Thus, in many firms, service people are involved in the sales function by generating sales leads.
- Service people may have a key role by supporting and collaborating with the sales function in developing sales proposals and negotiation with the customers.
- Direct interaction of service people with the customers during the after-sales phase makes service people important organizational resources to enhance customer relationships. Because service people are the main point of contact with the customer's organization after product delivery and have frequent customer visits, they serve as the extended sales force.

Managing the cross-functional sales effort requires strong collaborative organizational relationships and information sharing between the sales and service functions.

New roles and competences for salespeople to sell services

While service sales and product sales can follow similar steps in the sales process, and the organizational structure can remain unchanged, the role of salespeople changes as industrial firms focus on services. Traditional product-oriented sales roles are complemented by two new service-oriented roles (Kindström, Kowalkowski, & Alejandro, 2015):

- Customer problem solver
- Brand-value deliverer

Solving customers' problems is not necessarily a new role for salespeople and not limited to service sales, but the importance of the role has increased by adding services in the firm's total offering. Particularly when offering advanced services, salespeople need to identify the real needs of the customers and combine different elements to provide additional value. The problem-solving role can be affected by two main factors. First, to become a problem solver, salespeople need to be proactive in the sales process and in analyzing customers' needs. Second, because problem-solving is a cocreation process between salespeople and customers, the capability of the customers in formulating the problem and their maturity in understanding services may play an important role in the overall experience of problem-solving.

Brand-value deliverer implies that the salespeople need to dedicate their work to explaining the total value of the offering to the customers rather than the benefits of a product. By adding more services in the total offering of an industrial firm, the salespeople sell more intangible values, such as long-term commitment, proactivity, and responsiveness, that relates more to the firm's brand. Thus, the role of a salesperson becomes closer to a business consultant rather than a product-sales engineer or representative.

To respond to the organizational requirements and new roles for service sales, the industrial firm needs to be sure that its salespeople have the right competence profile. Salespeople need to be ready to promote services, able to explain the benefits of services, and be willing to accept the increased complexity of the sales process and customers' needs (Reinartz & Ulaga, 2008). The new competence profile of salespeople can be categorized into the following four main groups:

- **Technical competences:** Salespeople need to have a broad technical knowledge about a firm's product line and service portfolio. Services can range from basic services, such as maintenance, to advanced services, such as process optimization. Each of the possible services can also have different levels and prices that need to be clarified by the salespeople. Salespeople need a broader understanding of the multitude of possibilities for modifying the service package for customers.
- **Customer-related competences:** Salespeople need a broader understanding of a customer's business and use of the product in their business. For example, product sales negotiation is mainly focused on a specific customer's needs, technical aspects of the products, and price. However, service sales negotiation requires a better understanding of the customer's operation, the implementation phase, the risks of not purchasing the services, and the value of bundling products and services. Salespeople need to be able to visualize and communicate the intangible value of services (Kindström et al., 2015). Thus, consultative and value-based selling are critical in successful service sales. This shift in the sales process could be more difficult in a sales force with a product-driven mind-set.
- **Intraorganizational competences:** The salespeople need to develop and manage intraorganizational relationships required for service sales. The number of visits across business units increases in service sales. This implies the need for increasing amounts of knowledge about the competences of internal resources in order to find suitable people in service units and collaborate with them during sales work and to lead a multifunctional sales team.
- **Interorganizational competences:** The salespeople need to develop and manage interorganizational relationships. Because the salespeople may need to negotiate with different groups of people in the customer's organization, it is important to find the right target group in the customer's organization with which to negotiate service sales. Furthermore, salespeople need to listen and understand the different goals of the customer's different departments, communicate the requirements within the internal organization, and integrate the multiple needs in the total offering.

4.3 Human resources and competences for delivering services

Managing (resources in) service delivery

Managing resources in service delivery is crucial for the service business of an industrial firm. The heart of service delivery lies in the skill, capability, and knowledge of the people. Serving more customers, ensuring customer satisfaction, improving choice and flexibility, and reducing costs are some of the main reasons that effective use of resources is important. Managing resources in service delivery includes three main domains (Johnston & Clark, 2005) as depicted in Figure 19.

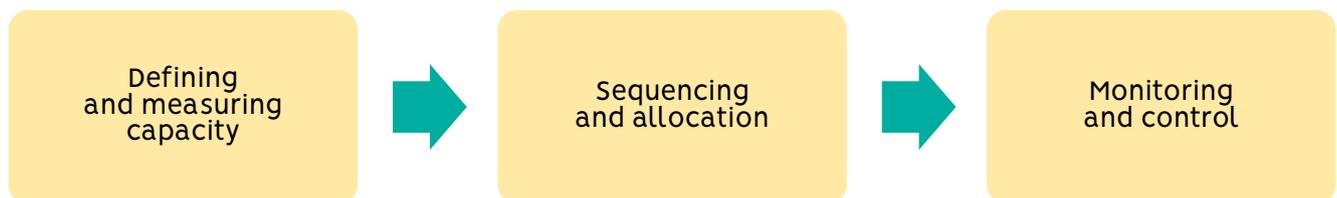


Figure 19. Main steps in managing resources in service delivery.

First, the service manager needs to **define the service capacity**.

Service capacity defines how many activities can be done in the service unit with available resources under normal working conditions during a specific period.

For example, service capacity can be measured as the number of repair calls, simple maintenance tasks, or inspections a service engineer can handle during an eight-hour day. Measuring service capacity is a difficult task, mainly due to uncertainties in customer requirements, ad hoc service needs, and unclear problem situations. First, when measuring the capacity, the service manager needs to understand which services are ordinary and basic, such as changing a machinery part of, and which are advanced, such as process optimization. Second, the level of complexity of services certainly affects the effort needed by the service employee to deliver services. Third, because service employees need to be present at customer sites in many cases, it is important to consider the distance between sites and required travel times. Fourth, customer requests can vary in terms of certainty about the problems in their operation line. For some cases, service employees need to invest considerable effort to identify the main problems at the customer's site. Finally, delivering services for complex systems requires more effort from service employees because it is more difficult to identify the key problems and their connections in different parts of the system.

After defining the service capacity, **sequencing service activities and allocating resources** to them is an important task for a continuous and reliable service delivery. Different service units may have different rules for sequencing and allocating resources, which can be informal rules or a formal allocation system.

Some of the common rules used in service units include first in, first out; most valuable customer first; most critical first; least work content first; and most work content first. Service managers in cooperation with service employees need to choose the right service people or service team to deliver services.

Finally, as in any organizational unit, the service unit also needs a **control system** that encompass all short-term and long-term service activities, such as ad hoc repairs, inspections, preventive maintenance, life cycle contracts, and so on. Having a well-functioning control system helps the firm manage the uncertainty in the day-to-day work of service units and increases the reliability of promises to the customers and other internal units such as sales unit. Thus, it is important that the service control system be connected with other systems, such as the sales system to improve planning and control of service sales and delivery.

New roles and competences for service people to deliver services

Service people are usually divided into two different roles: front-office employees and back-office employees. While front-office (or front-line) employees have direct contact with customers and are responsible for service delivery, back-office employees develop services and provide support and services to customer-facing (front-office) employees. However, the role of front-line service people in industrial firms is changing due to the shift toward more customer-focused approaches and increased use of technology in service offerings. Service people are no longer limited to being just service suppliers; instead, they need to be innovators, differentiators, enablers, and coordinators (Bowen, 2016).

First, the increased use of advanced technologies in service businesses may raise the question of whether technologies can fully substitute for employees, especially in service delivery. Observations from different industrial firms show that while the use of technologies, such as remote monitoring systems (RMSs), may reduce the need for inspection, repair, and maintenance, they define new roles for service employees. Service employees with the right profile of competences are the innovators that use technologies to develop new service ideas: they are nonsubstitutable sources of innovation and creativity. Frequent and close interaction with customers in combination with their broad knowledge and experience can help them go beyond delivering services, become more involved in identifying real customer needs, and turn these needs into new ideas.

Second, the use of advanced technologies makes the service offerings of industrial firms too similar. Service employees serve as differentiators to make the offerings of the firm unique with behavior- or human-based relationships and thereby influence the customer experience. The close relationships between service employees and customers, which are often based on trust and intimacy, make the service employees an important resource for building the firm's brand as a service provider.

Third, employees must be enablers for both technology and customers to perform well in service delivery. Service employees need to increase the technology readiness of customers and support them in properly using technology-based service systems in their operations. Moreover, the customer-focused approach

and more emphasis on cocreation of value with customers make it necessary for service employees to enable customers to perform their roles through formal and informal relationships, training, and so on.

Fourth, cocreation of value requires service employees who are good coordinators. Service employees need to not only coordinate the interdependent roles of employees and customers but also integrate their resources and customers. Communication and information sharing between employees, between employees and managers, and between employees and customers are crucial tasks in today's service business. Besides a suitable information-sharing platform, industrial firms need service employees that possess collaboration competences to manage interdependencies in the value cocreation process.

With respect to these new roles of human resources in service delivery, industrial firms need to invest in finding and training employees with the desired competency set to deliver advanced services and facilitate value cocreation. The findings of case studies show that technical expertise has been the focus of industrial firms (Neu & Brown, 2005). The intense training process includes extensive initial, formal classroom training; extensive ongoing, formal classroom training; and formal and informal collaborative training and development. By applying these methods, companies attempt to build the base of expertise, extend the expertise, and enhance learning from each other. However, adding a high degree of customer integration and using advanced technology increase the complexity of service offerings. Handling this complexity requires specific competences that might be different from those needed for basic services (Baines, Lightfoot, Smart, & Fletcher, 2013; Voigt, 2015). These competences are explained in Table 4.

Table 4. Required competences from human resources involved in service delivery.

Competence type	Description
Coordination and mediation skills	Ability to apply new problem-solving approaches by using a broad scope of professional backgrounds, work practices, and task experiences inside own unit, other organizational units, and customer organization
Confident coping with complexity	Ability to reflect upon own performance, use learning from previous experiences, and contribute to the overall achievement
In-depth learning and team orientation	An individual capability to accept and implement other people's knowledge and best practices
Flexibility	Ability to modify working routine to comply with customer requirements
Relationship building	Ability to develop and sustain close customer trust and similar relationships with other staff internal to the manufacturer
Service-centricity	An empathy with customer's problems and delivering against these; capable of putting themselves in the customer's shoes
Authenticity	Genuinely committed to delivering a successful outcome for the customer; prepared to tell the customer the truth
Technically adept	Understanding the principal operation and subsystems of products and equipment
Resilient	Capable of dealing with the personal stress incurred by working at the front line with the customer

The changes in service environment, roles, and competences show that investing in technologies does not guarantee the success of industrial firms. Designing and delivering product-related services require managing service people who have specific skills and experiences. To ensure success, the firm needs to improve the quality and productivity of service deliveries by investing in service people.

4.4 Case example

A manufacturing firm here called Engineering Co. has been in the manufacturing industry for ten years. Five years ago, they started to provide services for their heavy industrial equipment. They assigned one service manager and four service engineers to service activities. While the service manager worked in the headquarters in Tampere, service engineers were located in different geographical regions: northern, eastern, western, and southern Finland. In the beginning, they offered only repair and maintenance services to their customers. The rule for assigning service engineers to service tasks was first in, first out; that is, they reacted to customer requests in the order in which the requests came in.

Gradually, they added more and more services to their service offering, including training, proactive maintenance, retrofits, and remote monitoring. In recent years, their customers have become more interested in outsourcing their service operations to their suppliers and focusing on their core business. The new service demand in the market has challenged Engineering Co. The service manager usually receives complaints both from the firm's own service engineers and from customers. On one hand, the service engineers suffer from work overload, especially the service engineer in the northern region who is under pressure due to frequent long-distance trips. On the other hand, some customers complain about long response times. Therefore, instead of facing the issue of convincing customers to buy services, Engineering Co. is dealing with the problem of having more demand than service capacity.

To solve the problem, the service manager developed a new resource management model. The model covers five aspects—forecasting demand, capacity planning, service supply chain, sequencing, and information technology—as described next.

Forecasting demand: The service manager collected the previous data on annual service maintenance activities for their existing customers. This data helped the manager forecast the preventive maintenance services in each region. Then, the service manager asked the sales manager to send a weekly update of sold services and sold equipment that needed start-up and commissioning. These updates help the service manager to forecast potential new service demand in the future and to reserve resources accordingly.

Capacity planning: By using data from the demand forecasts, the service manager recognizes that the current service people are not able to deliver the planned services. Moreover, the service demand in the western and southern regions had grown quite high. The manager hired one new service engineer for each of these regions and allocated them to more basic services. The more experienced service engineers were assigned to advanced services. Moreover, because the service unit could access the

installed base of equipment at customer sites through RMSs, these experienced service engineers were also responsible for monitoring and analyzing the possible breakdowns in the equipment.

Service supply chain: To overcome the issue of long-distance trips in the northern region, the service manager searched for a local service provider in that area. A reliable service provider was identified, negotiations for cooperation were held, and the firm made a contract to delegate the delivery of basic services to the service provider. However, advanced services remained in-house, and the service engineer in the northern region was allocated to those advanced services.

Sequencing: The service manager gave more authority to the service engineers to sequence and schedule their service tasks in their regions. This change may help the service unit become more flexible and respond to customer needs faster. Because the firm has some customers that serve very sensitive industries, such as airports, the service manager informed all service engineers to follow a new sequencing rule: the most critical first. By using RMSs and the new sequencing approach, the service manager hoped to reduce the ad hoc requests and respond fast if they did occur.

Monitoring and control: To control all service activities and manage the information between sales and service units as well as across different regions, the service manager created a SharePoint system for the service unit that allowed all service engineers to update their service tasks there. The service manager obtained access to the service unit information system, added upcoming service tasks in the SharePoint system, and allocated them to the service engineers based on the location of customers. Then, the service engineers were responsible for scheduling the services in the system.

4.5 Lessons learned

Manufacturers that include services in their offerings require specific capabilities to provide these offerings successfully, including data processing and interpretation capability, execution risk assessment and mitigation capability, design-to-service capability, sales capability, and balancing standardization and customization capability. Thus, service people in these companies should acquire specific competences to enable these capabilities. Manufacturers integrate products and services as PSSs, and involving customers as part of service operations increases the complexity of these new offerings. Handling the complexity requires specific competences that might be different from traditional organizations. Despite the increased importance of technologies and customers in service business, human resources are still among the main assets of the industrial firms.

The changes in external environment and business logics increase the role of services in industrial firms and changes the role of salespeople and service people. Industrial firms need to develop new competences to fulfill the requirements of the new roles. Salespeople become customer problem solvers and brand-value deliverers. Service people become innovators, differentiators, enablers, and coordinators. The new roles need new sets of competences as well.

Resource utilization is another highly important topic in service operations management. Serving more customers, ensuring customer satisfaction, improving choice and flexibility, and reducing costs are some of the main reasons why effective use of resources is crucial for service business. One of the main issues regarding resource utilization in service business is the customer ad hoc request. Empirical findings show that anticipating customers' requests is difficult for managers and makes planning and scheduling difficult. Both underutilized and overstretched resources can be disadvantageous. On one hand, underutilization may lead to demotivated employees. On the other hand, overload may cause more mistakes and increase stress in the employees' environment. Carrying out tasks without enough knowledge and experience is another disadvantage of overload. Managing resources in service organizations requires a systematic process of defining and measuring capacity, sequencing and allocating resources, and using a control system.

4. TECHNICAL ENABLERS AND INFORMATION SOURCES IN INDUSTRIAL SERVICES

5.1 Sources of customer information

Generic sources of customer information

As discussed in earlier chapters, customer information is an important starting point for managing the service business within industrial service systems as well as for identifying and recognizing the opportunities for service business development. Typically, customer information deals with customer needs, wishes, and expectations. It can also deal with customer's service experiences and behavior in different circumstances. Establishing a web page or a platform for different customer interactions may serve the customer's needs and wishes and, thereby, be helpful for the customers in their business endeavor. At the same time such customer interfaces can become an extremely valuable data source for the manufacturing company for monitoring customer experiences and analyzing customer behavior, particularly if combined with various traditional sources of customer information.

Customer's needs, wishes, and expectations may refer to the existing industrial service system or may be linked to the desired developments and new service businesses within the system. To succeed in the service business, manufacturers and service providers need to acknowledge customer needs, wishes, and expectations at multiple levels.

Regarding the sources of customer information, there are both (1) direct customer contacts and (2) technology-based solutions for collecting useful customer information. Direct customer contacts may include formal customer satisfaction surveys as well as collecting data from sales and marketing and customer support interactions. Remarkably, as discussed by Gottfridsson (2012), customer focus groups may provide a detailed understanding of one customer segment and application area, whereas broader customer surveys provide more generic, but potentially superficial customer information. The business game concept, presented in chapter 3 as a source of accumulated customer information and perhaps used in interaction with the customers, is an example of a source of customer information that combines several direct sources.

In industrial service systems, increasingly, customer information is being collected with technology-based solutions, such as sensors and other monitoring and controlling technologies. Broadly speaking, a variety of technologies are in use under the labels of Internet of Things (IoT), radio-frequency identification (RFID), and RMSs (as discussed previously). What these technologies share is that the status and use of the equipment is continuously monitored, and data become available about the history of the equipment in use. However, the diffusion of these technologies depends largely on the application area, industry, and specific customer under analysis. Although many manufacturers have

installed different kinds of remote technologies for their customer equipment, only rarely can a comprehensive understanding of the use of the equipment installed base be formulated based on the remote technologies. However, information about some of the customers may be quite detailed and comprehensive, which can be used in managing both the manufacturer's and the customer's operations.

Remote technologies include sensors that gather data, networks that transmit data to a repository, and analytical and operational rule systems that are responsible for storing, retrieving, analyzing, and visualizing data as well as making recommendations and triggering alarms (Jonsson, Holmström, & Lyytinen, 2009).

Remote monitoring refers to receiving data from the installed base of equipment by monitoring the products and their use from over a distance, anywhere in the world. It could also mean diagnosing production systems and their components across organizational boundaries (Jonsson et al., 2009).

Remote monitoring system (RMS) is a collection of sensors and data transmitters that are placed on the products and enable the manufacturer to monitor products from a distance, collect data to create services based on data analysis, and improve their understanding of product utilization (Westergren, 2011).

In general, customer information cannot easily be acquired from a single source, regardless of whether it is a direct source or a technology-based solution. Instead, customer information must be collected and integrated from multiple sources, which enables triangulation of those pieces of information as well as a more comprehensive understanding of the business and value-generation processes among the customers.

Examples of customer information sources and their applications areas

Customer information from manufacturers and other service providers is often fragmented. Therefore, despite the availability of the customer information from these multiple sources, the information does not necessarily lead to managerial actions directly informed by the customer information. Different business functions, such as R&D, SCM, and CRM, have their own databases, tools, processes, and interfaces to the customer information, with their typical purposes of using that information. At the same time, managing industrial service systems requires a more comprehensive view of the customers' businesses and value-generation processes, as well as the performance of the manufacturer or other service provider in them. Therefore, multiple sources of customer information need to be combined typically.

Figure 20 presents the following sources of customer information: competitors and market indicators, customer relationship indicators, fleet indicators, R&D indicators, project and production indicators, human resource indicators, supply chain indicators, and financial indicators. Quite naturally, financial indicators include revenues, profits, and profitability at the levels of the firm, the customer relationships,

and certain products and services (discussed further in chapter 8). At the same time, project and production indicators aim to ensure that delivery times are met, and the delivered services are of a desired quality to both directly and indirectly contribute to the overall financial figures of the firm.

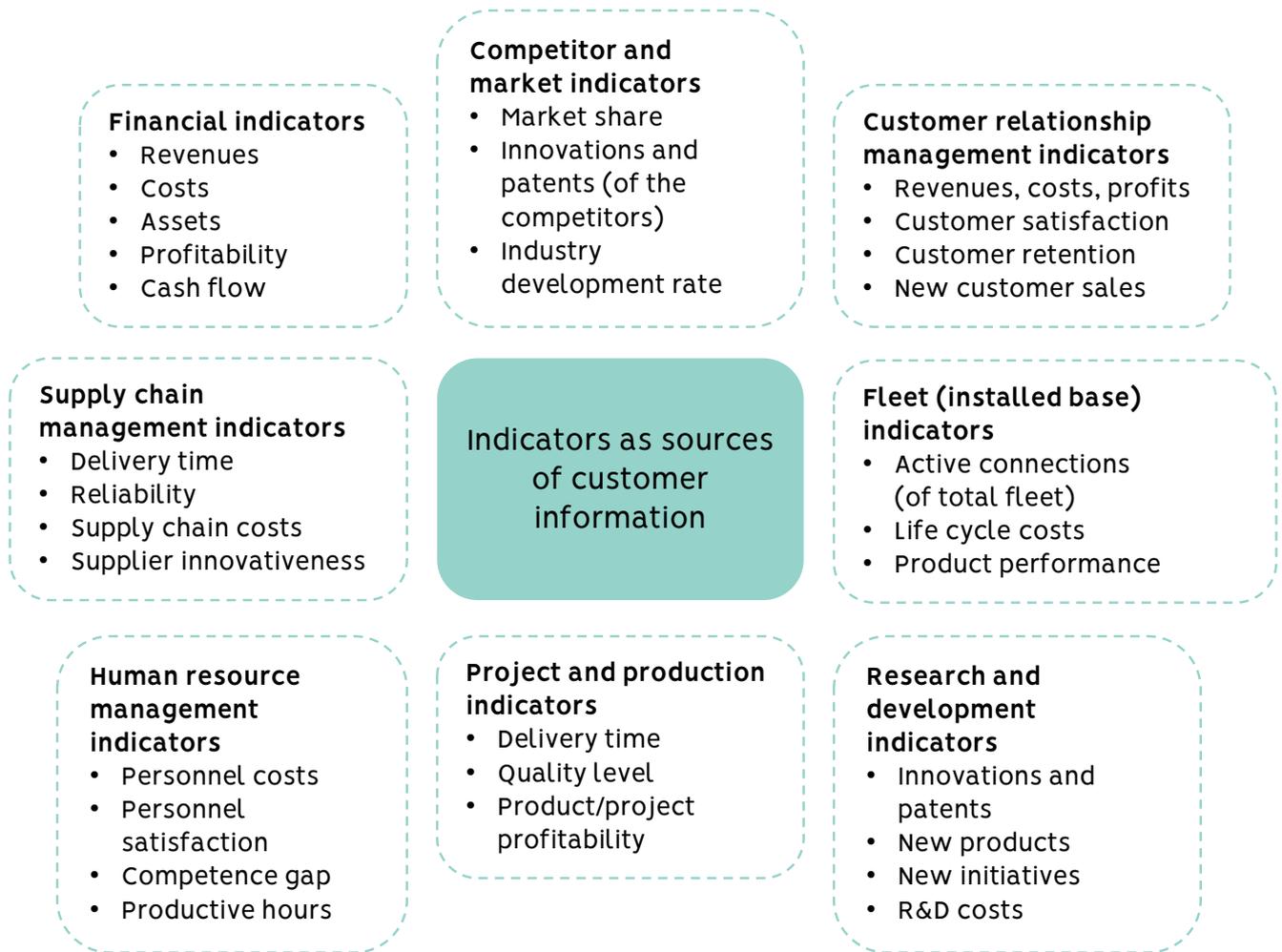


Figure 20. Sources of customer information in industrial service systems. (Adapted from Kohtamäki, 2017).

Indicator is a performance measure that provides useful information about business for a certain usage purpose.

Key performance indicator (KPI) is a part of the selected set of the most important indicators. A KPI provides information on the performance of certain business operations in terms of a predefined calculation or figure and in contrast to a business objective or target.

As the focus in this chapter is on customer information, we examine indicators in a broad sense. Eventually, some of these will be chosen to be part of the set of KPIs.

Importantly, a key performance indicator (KPI) is a part of the selected set of the most important indicators. A KPI provides information on the performance of certain business operations in terms of a predefined calculation or figure and in contrast to a business objective or target. In the context of industrial service systems, new kinds of indicators and combinations of indicators may become essential. For example, customer relationships may require more extensive, long-term measurement of financial aspects, thus raising the importance of those indicators. New indicators may be introduced, and old ones may be abandoned. In addition, the importance of a certain indicator may be recognized in the operations (bottom-up) or in the top management (top-down). In a well-functioning performance measurement, the set of indicators continuously reflects the business environment and the selected strategic plans of the company (see, e.g., Korhonen et al., 2013).

As conveyed previously in Figure 20, competitor and market indicators and customer relationship indicators represent a natural starting point for customer information. All manufacturers are interested in their market position, market share, and possibilities for developing their business. In the context of industrial service systems, the market share of the manufacturer in the equipment business may be largely different from the market share in the spare parts and maintenance businesses. To understand the market share and its dynamics, a manufacturer needs to supplement its competitor and market information with, for instance, fleet indicators that perhaps tell about the share of the pieces of equipment from the total equipment fleet, and about the actual use and maintenance plans of given pieces of equipment in use at the customer sites. This customer information is not necessarily discussed together, but this kind of information could pave the way for developing service businesses in order to capture the service business potential.

Customer relationship indicators typically address different phases of the customer relationship life cycle and the different activities undertaken within these customer relationships. New customer acquisitions, customer satisfaction, and customer retention are very important perspectives for manufacturers in industrial service systems. Good performance from these perspectives is the antecedent of customer profitability. However, customer information in traditional customer relationships may not be enough for developing service business within industrial service systems. Active use of remote technologies may help in identifying (weak) signals of customer satisfaction already before customer dissatisfaction in service transactions, for instance. Perhaps more importantly, understanding the equipment use at the customer more thoroughly may enable services to be provided in a proactive manner, before customers explicate the need for such services. However, such an approach requires the systematic review of fleet indicators at different levels to pinpoint service opportunities regarding certain customers, equipment categories, applications areas, and so on. One example of such a proactive approach is to launch spare part campaigns in which the manufacturer replaces certain parts of the equipment at the customers with certain types of equipment before any serious problems emerge. Such campaigns can be based on the customer relationship and fleet information combined and can lead into rather productive customer interactions in the service operations. In addition, when implementing the campaign, it can be used as a source of detailed customer information when the maintenance personnel are in a direct contact with the customers.

In addition to the customer relations management and fleet management, other business perspectives may also represent a good source of customer information. Combining human resource information about maintenance personnel job satisfaction and project and production information about delivery accuracy to the fleet information, the manufacturers may get hints about problems and misuse of equipment at customer sites or hints about the lack of maintenance personnel in fulfilling the customer needs and wishes in a certain market area. Identifying such connections helps in developing the service businesses both in the short term (overcoming challenges) and in the long term (developing the service business approach in a given market area).

Altogether, customer information is available in a variety of different internal and external sources. Typically, identifying and realizing the service business potential requires combining multiple traditional information sources and indicators, as well as making sense of the customers' business more thoroughly than before.

5.2 Business intelligence and analytics for industrial services: The case of smart, connected products

In industrial service systems, the core is the combination of traditional customer information sources and sources that have been made possible by new technologies. Physical products embed intelligent tools and technologies that can be connected to each other, thus paving the way for a system that combines different pieces of information about the value-generation processes of the service customers. Furthermore, due to the connectivity between different products, platforms, and systems, industrial service systems may become systems of systems that consist of several product domains and applications areas. Therefore, managing industrial service systems requires acknowledging and understanding the different systems separately as well as the entity consisting of different systems.

Internet of Things (IoT) refers to the networked interconnections of everyday objects (Xia, Yang, Wang, & Vinel, 2012). In industrial service systems, these interconnections of objects form the *Industrial Internet*, which refers to establishing and using those interconnections in the industrial context. Thus, the Industrial Internet is a narrower concept.

Porter and Heppelmann (2014) examined the new kinds of smart and connected products within industrial service systems and presented the system of systems as conveyed in Figure 21. In their vocabulary, a tractor will become a smart product when it includes sensors and technologies to collect information about the product. Such a smart product will become a smart, connected product when a remote technology is used to collect the data about the use of the tractor at the customer, and the data are analyzed for several purposes related to planning and controlling the use of the product. Regarding the smart, connected products, several possibilities for maintenance service businesses have already emerged. The product system, then, consists of different tractors of the farm that are connected to each other to enable comprehensively planning and controlling the value-generation process of the customer.

In this context, the customer information is not limited to the status and use of the single piece of equipment, but customer information is needed more readily on the customer's production operations and possibilities to provide value-adding planning, controlling, and maintenance services. The widest entity in this example is the farm management system (as a system of systems), where tractors, smart technologies, and related customer information are connected to other product systems of the farm, such as the weather data system and seed optimization system (Porter & Heppelmann, 2014). As a result, planning and controlling the farm's value-generation processes requires understanding these different systems and their interdependencies.

On the other hand, from the perspective of a manufacturer, such as a tractor provider, it is rather difficult to master the entire system of systems. However, it would be beneficial to understand the product system around the tractors and the needs and expectations stemming from the wider context. According to the notion of visibility-based services presented in chapter 3, to provide services to the entire product system comprehensively, a manufacturer (or service provider) needs to understand the wider system of systems.

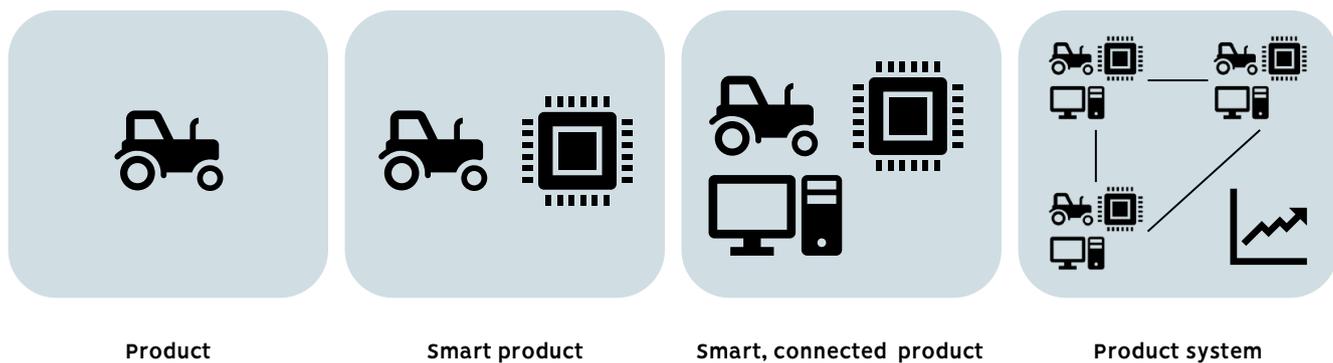


Figure 21. Smart products in industrial service systems. (Adapted from Porter & Heppelmann, 2014).

While Porter and Heppelmann (2014) examined the different opportunities stemming from smart, connected products, they still argued that despite the new sources and levels of customer information, sources of competitive advantage remain rather similar. To simplify, the sources of competitive advantage are connected to the possibilities for differentiation and cost-competitiveness. As formulated by Porter and Heppelmann (2014): "Some have suggested that the Internet of Things 'changes everything,' but that is a dangerous oversimplification" (p. 67).

Still, regarding the basis for competitive advantage, the new sources of customer information may become essential in attaining differentiation or cost-competitiveness. For example, if a company becomes an expert that masters the product system in one area, the company may be able to provide its service more efficiently (e.g., proactive maintenance) or differentiate its services from others (e.g., provide information for production process optimizations).

Identifying and fulfilling real customer needs is the key to succeed in the entire system of systems and all the other levels within it. The mechanisms underlying the competitive advantage of the manufacturers and service providers remain in the possibility to cocreate value in the customer value-generation processes. In practice, the implications of the new sources of customer information for the manufacturers or the service providers within the system of systems may include the following aspects:

- What new opportunities (and requirements) for R&D and other operations stem from the new customer information and connected products?
- How will the new kinds of customer information change (improve) reliability, availability, maintenance, and security of the smart and connected products?
- How will the new kinds of customer information change (improve) the role of people and human resource management in industrial service systems?

These aspects represent the basis for identifying competitive advantages (or differentiation of cost efficiency) in the context of the smart, connected products and the wider industrial service systems. However, the logic of introducing new aspects and business possibilities still remains the same—only the circumstances and information about those circumstances have changed due to recent technology advancements.

5.3 Case example

Powerscreen Pulse is one example of a commercial *remote monitoring and fleet management system* that enables crushing and screening equipment operators and owners access to key data regarding the crushing and screening operations of quarries and mines. As suggested by the provider, analyzing the data could improve machine operation, increase uptime, and allow in-depth reporting and fleet management.

The customer information collected by the technology includes the following:

- status of the machinery (on/off, output tonnage, error messages)
- machine data (maintenance log and specific events)
- utilization report (production log)
- location (GPS)
- fuel consumption report
- specific reporting on the different parts of the crushing and screening system

This kind of information enables customers to plan and control their production operations based on the previous days, weeks, and months as well as the actual production and maintenance operations. As a practical example, customers may also become more convincing providers to end customers when they can show the production log information to the end customers and show their efficiency and

reliability as producers. Another example is that after the machinery continuously reports its location and status, the insurance premiums for the machinery may become cheaper (e.g., theft insurance).

From the manufacturer's (or service provider's) perspective, a wide range of possibilities may emerge from the use of the equipment fleet information. Regarding the customer's operations in general, the manufacturer may become aware of the industry cycles in advance if early signals regarding the changes in production volumes emerge. In addition, if one piece of equipment suddenly becomes idle, sales personnel can contact that customer for further inquiries. More traditional use of the equipment fleet information lies in planning and controlling the maintenance operations of the manufacturer to be effective and/or cost efficient. However, it is always difficult to determine who owns the information and what kind of access to the complete equipment data is made available for the manufacturer. Quite naturally, the potentially beneficial purposes of using the information are possible only after comprehensive access to the data on the customers' operations.

In most cases, there is still ample scope of improving planning and controlling the value-generation processes at the customers. However, using remote technologies for planning and controlling purposes is not the only reason for their use. Porter and Heppelmann (2014) stated that the remote technologies could be used (increasingly in the future) for optimization of the processes and even for developing the autonomy of some production technologies. Optimization in this context means enhancing product performance by developing algorithms that use the data of the remote technologies (and other sources). Autonomy may refer to self-diagnosis or even self-coordination of operations with other pieces of equipment (Porter & Heppelmann, 2014). Such advancements will still require a lot of work in many cases to capture the desired performance and related activities in the actual industrial service systems.

5.4 Lessons learned

Every customer interaction enables the manufacturing firm to understand the customer behavior and value generation better. Thus, using customer information provides a fruitful starting point for development and learning both in the short term and in the long term. Customer information comes in several forms and sources, including a variety of different internal and external sources. Practically, reporting regarding any business function may have an interface to customers' operations: R&D, operations, supply chain, sales and marketing, customer relationships, human resources, and finance. Typically, combining two or more perspectives opens new insights into the manufacturer's performance in customer operations.

Customer information is a fundamental basis for identifying and realizing service opportunities. For example, smart and connected products represent new sources of customer information and new possibilities for service businesses. Remote technologies, for instance, provide information about the status of the equipment, as well as the history of using and maintaining that equipment. Such information may serve various planning and controlling purposes related to the customer's operations and service activities.

Despite the new potential sources of customer information, the mechanisms of competitive advantages remain rather similar. To change the division of tasks, activities must be performed more effectively or efficiently than the other parties involved.

6. DEVELOPING THE INDUSTRIAL SERVICE OFFERING

6.1 From single services to service mixes, service portfolios, and service offerings

Industrial firms cannot limit their attention to single services only, but they have to consider the management of the entire service mix because of the coexistence of multiple services and their possibly increasing share as part of the manufacturing firm's turnover (Kowalkowski et al., 2011a). Service mix refers to the multiple services the manufacturing firm makes available on the market. Managing the service mix plays an important role in managing the entire service business both in the company-internal perspective (service portfolio) and the external perspective (service offering targeted at certain customers or markets).

Service mix is the collection of services that the company offers to customers.

Service portfolio is a collection of service modules and concepts that can be used to tailor various services to customers' needs.

Service offering is an entity formed by a certain service and its delivery, or multiple services directed at a certain need or market. When viewed as multiple services, in other words, it can be considered a market-specific service mix.

When customers understand their own needs, they can demand increasingly specialized and unique services (Böttcher & Klingner, 2011; Edvardsson et al., 2007; Kindström, 2010). Similarly, the manufacturing firm can use the customer information that it collects to segment the market based on different customer needs, specifically focusing on service needs. This idea of service-centric segmenting may deviate significantly from product-centric segmenting of markets, due to the specific nature of services. To serve different customers' unique needs, the service mix needs to include sufficient variety and, yet, some standardization, to enable a cost-efficient delivery (Böttcher & Klingner, 2011; Edvardsson et al., 2007).

This requirement for serving customers' unique needs while simultaneously using standardization to achieve cost-efficiency requires resolving a conflict. On one hand, firms cannot make all services unique as that would require too many resources and become inefficient. On the other hand, they cannot settle with creating one service product only as that would likely make most (if not all) customers dissatisfied. Some of the challenges with creating service offerings have been identified in previous research (Böttcher & Klingner, 2011, p. 321):

- no standardization of complex services and therefore a loss of economies of scale
- no ability to handle the service complexity and thus less structured planning and delivery

- no opportunity to reuse existing service offerings, leading to the necessity of reinventing or replanning existing service offerings
- no or only poorly documented service catalogues, resulting in suboptimal offerings

These challenges have led manufacturing firms to realize that they need to consider service mixes in a modular way (Böttcher & Klingner, 2011; Rahikka et al., 2011). They need a modular, dynamic service portfolio that they can use to design customer-specific service offerings to different customer needs in a cost-efficient way (Kindström, 2010). Figure 22 highlights the key differences between a service portfolio and a service offering: a service portfolio is the manufacturing firm’s internal compilation of service modules and concepts, whereas a service offering requires the customer-specific or market-specific packaging of those modules and components into repeatable services fulfilling a certain need. This “packaging” or “bundling” of services is sometimes referred to as productization, standardization, or knowledge codification, and it enables the firm to repeat approximately the same service in a consistent way. Sometimes, however, services need to be tailored for customer-specific needs without the services being included in the official service mix. Again, if such services face a repetitive demand, then some kind of packaging (or productization) is needed and can happen after being offered to the first customer.

SERVICE PORTFOLIO VS. SERVICE OFFERING

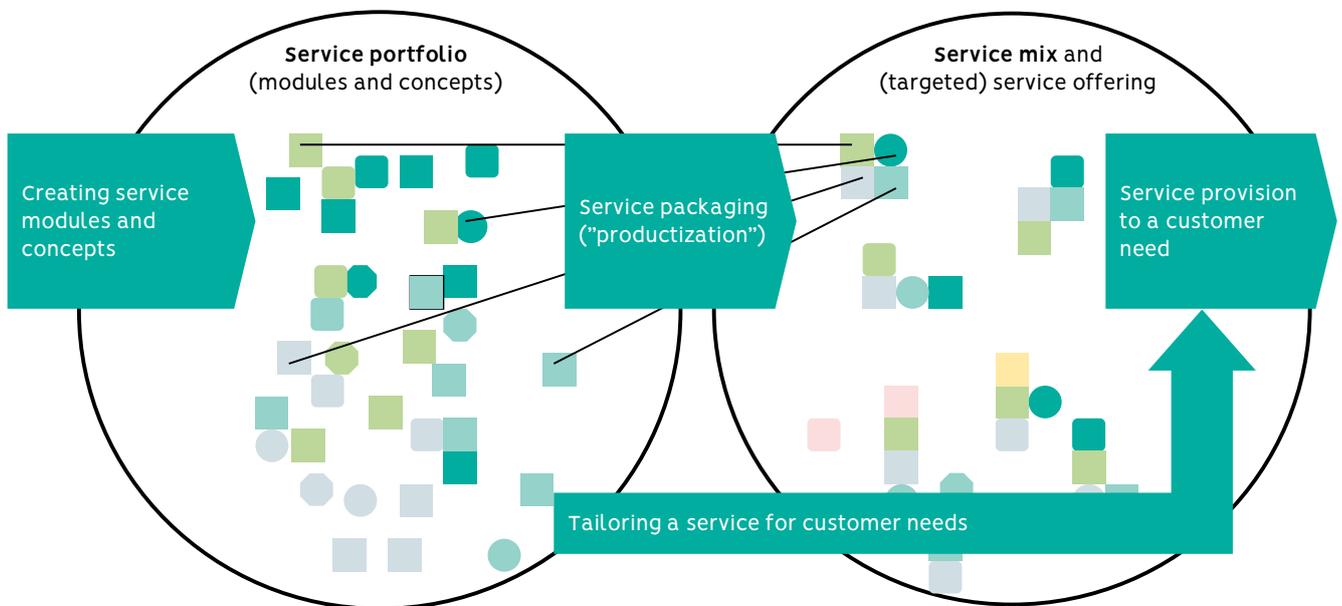


Figure 22. Internal and external service mix—compiling services to customer needs from predefined service modules and components (Martinsuo et al., 2020).

Modular service portfolios are particularly useful for complex services that need some variation for each specific customer. This means that the firm must design standardized service modules that can be reused for multiple service concepts. Making the service structures modular will help with managing the services, pricing them, and allocating resources to their delivery (Bullinger et al., 2003). There are two different approaches to designing the service modules (Böttcher & Klingner, 2011): (1) you could start creating new service modules from scratch by focusing on such parts of services that can be useful for multiple service concepts, or (2) you can start from existing service concepts and discover those parts that are already repeated across services and can be standardized. Standardized service modules will increase service delivery efficiency and enable flexibility that will add value to different customers due to the availability of customer-specific tailoring of service offerings (Rahikka et al., 2011).

The idea of modular service portfolios is attractive, but it can also be challenging due to the firm's resource restrictions, the diversity of customers' needs, the dynamic nature of service business (and thereby customer needs altering over time), and service personnel's desire for autonomy and flexibility in different service encounters. Particularly when moving toward advanced professional, capability-based services, personnel tend to like their freedom and ability to modify the service based on customer needs. Going for a modular approach in service business typically requires expanding the service portfolio significantly and putting in the effort to document the service components and modules, which may not be attractive. Manufacturing firms may need to keep the service portfolio manageable by reducing the complexity in the modular service structure, limiting the standardization of service modules to those that are most frequently repeated, enabling personnel's flexibility considering different customers' needs, and pursuing a larger clientele.

6.2 Process for service offering development

When viewing the service offering as the entity formed by multiple services directed at a certain need or market, manufacturing firms face the challenge of how to manage that service offering effectively. To make their service business profitable, manufacturing firms need to understand the given service market and put effort into developing suitable offerings for that market. Figure 23 illustrates the general process for developing service offerings. A crucial starting point in this process is delimiting attention to a certain market domain and understanding the possible needs and drivers from customers and other stakeholders in that domain. Manufacturing firms have their own strategy and customer relationship management processes where they monitor and follow up such needs and drivers constantly or at least annually. The figure implies an idea of circularity: even at the end of the cycle, such monitoring and follow up is ongoing, new needs may emerge, and the cycle may begin again.

Identifying the current service offering

To develop or perhaps expand the service offering, the manufacturing firm must first know what services it already offers, for which markets, and how (Jaakkola et al., 2007). For that purpose, firms

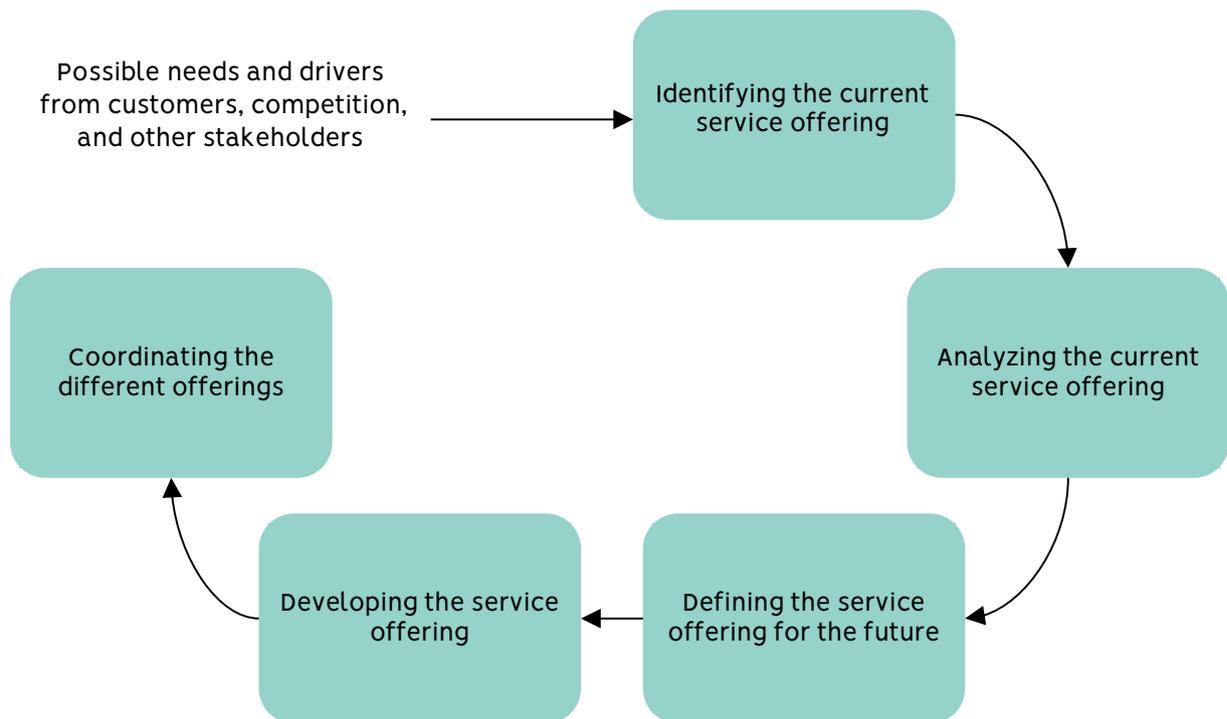


Figure 23. Phases in service offering development (Sariola & Martinsuo, 2014).

need information on existing service concepts to such an extent that they are described, as well as services that may take place informally, without descriptions of service concepts. Therefore, there is a need to collect any existing information about the service offering potentially through existing documentation and by interviewing service personnel, sales personnel, and others involved in customer interface activities. Describing the service portfolio (i.e., all the service modules and components used to build the service offering) may be a challenging task as the personnel do not necessarily consider all activities carried out with or on behalf of customers as separate service components, modules, or concepts. Some services are carried out for free in the form of sales promotions, and they may be considered components of the product or system instead of as services (Reinartz & Kumar, 2003).

Which services then are actually part of the service offering, and which are something else? An important issue is the customers' expectation of service value and the way in which that value is delivered through the service and converted to the manufacturing firm's value. There is, therefore, a need to specifically identify those services that have this value potential and exclude other kinds of supportive activities from the consideration of the service offering. For example, transporting spare parts and personnel, storing documented data from a service episode, and evaluating the time consumption of service personnel in a service process can be considered supportive activities that are quite important in delivering or developing services and also relevant service components, but they usually are not the manufacturing firm's core services (whereas some of them could be outsourced easily to other firms). At this point, the naming of the services is also relevant—each service should have a distinguishable identity and label.

For the purposes of management and development, similar types of services are commonly grouped into categories with the entire offering mapped across the different categories (Jaakkola et al., 2007). There are numerous different approaches to categorize services, including these examples:

- **Target of services:** services supporting the product versus services supporting the customer’s process (Mathieu, 2001a)
- **Scope of the services:** single service versus service package (Kowalkowski et al., 2011a)
- **Nature of the service relationship:** transaction versus cooperation (Oliva & Kallenberg, 2003; Penttinen & Palmer, 2007)
- **Completeness of the service offering compared to the customers’ need:** less complete versus more complete (Penttinen & Palmer, 2007)

Figure 24 includes two examples of using these kinds of dimensions to categorize and map industrial services and, thereby, describe the existing service offering.

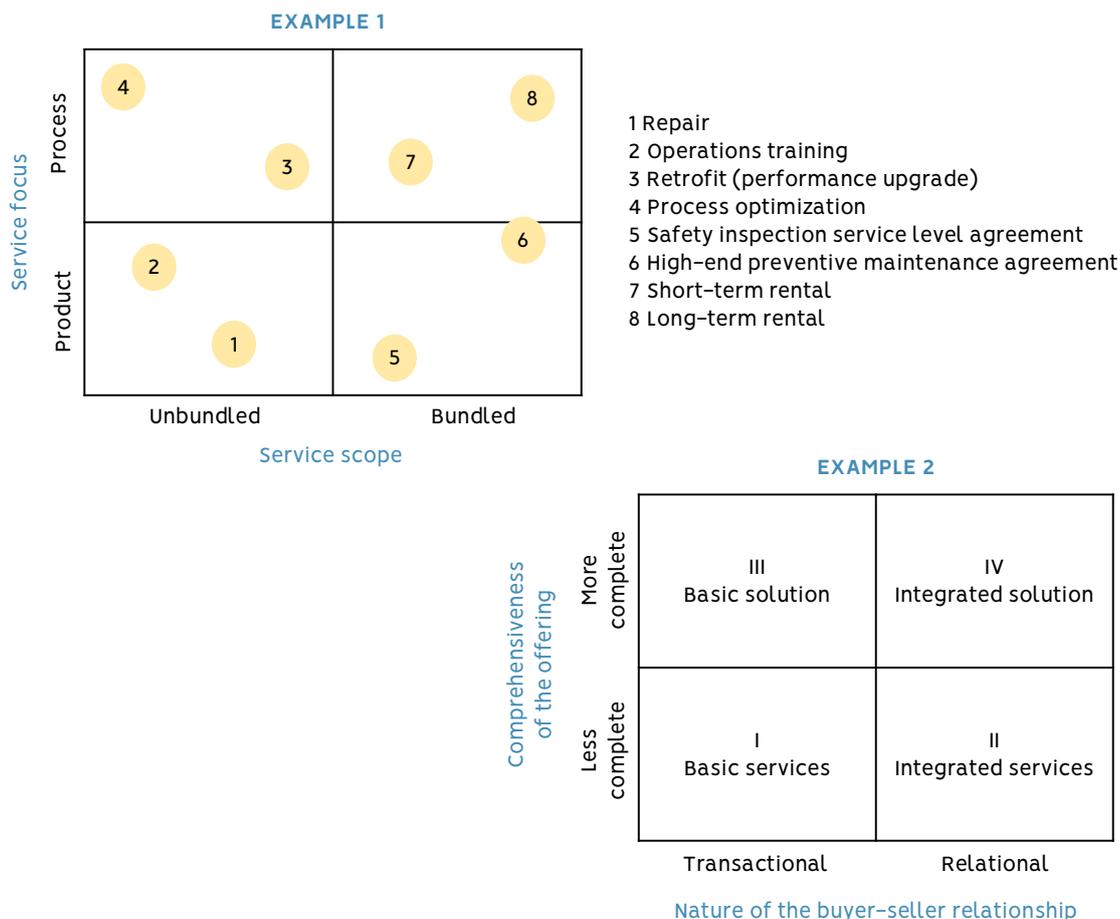


Figure 24. Two examples of mapping the service offering. (Adapted from Kowalkowski et al., 2011a and Penttinen and Palmer, 2007).

There are of course many other possibilities for mapping and categorizing the service offering (as well as the portfolio upon which the offering is built), depending on the type of business and the manufacturing firm's strategy for services. While mapping the service offering, the firm may also consider the supportive activities it found during the identification of services; for example: What are those supportive activities? Why are they carried out? What is their meaning as part of the service processes, and are they all needed? Many support services may be crucial as service modules or components, as part of certain broader service offerings, but the mapping may also reveal unnecessary service activities (i.e., "waste").

This mapping phase is important in terms of revealing the current state of the service offering, both for how it potentially fulfills customer needs and how it serves the firm's strategy. We may ask the following: Is the service offering as broad and versatile as the customers will expect? Is it serving customers' needs in such a way that the manufacturing firm's strategy requires? This superficial description, however, is not sufficient, and the entire offering needs to be analyzed in more detail.

Analyzing the service offering

The more in-depth analysis of the service offering deals with the extent to which the service offering is fulfilling the strategy of the manufacturing firm (Jaakkola et al., 2007). Therefore, the focus is on issues that are relevant to business. Figure 25 summarizes the four main issues that can be covered in the analysis in various ways, depending on how these things appear in the manufacturing firm's strategy and the unique features of the industry.

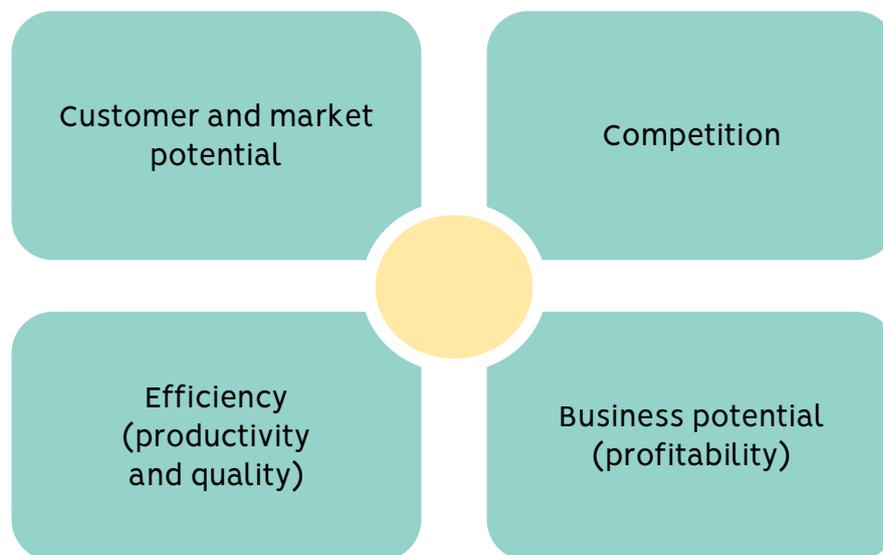


Figure 25. Core issues to be covered in the service offering analysis.

To succeed in industrial service business, the manufacturing firm's service offering must respond to some customer needs and include **sufficient customer and market potential**. Therefore, the existing service offering must be considered in light of existing and potential customer needs and the general potential seen in the market. While the firms do not necessarily know customers' needs specifically, and sometimes even customers themselves are not aware of their needs, this kind of information is important to prioritize offering-related development activities. Therefore, the firm needs mechanisms to find out what kinds of possibilities and needs exist in the market. The mechanisms used for collecting customer information (covered in section 5.1) are certainly useful sources for analyzing the service offering. Customer satisfaction surveys, customer feedback on service encounters, customer claims, demand analysis, market and customer studies, and even interviewing customers and observing customer processes are useful ways to collect such information. In addition, increased interaction between the manufacturer and customers will help both parties understand the needs better (Böttcher & Klingner, 2011; Edvardsson et al., 2007; Kindström, 2010). The manufacturing firm can, through this kind of information, analyze the service offering by comparing it to the potential it sees in the market among current and future customers.

Firms' strategies seek some kind of competitive advantage in the business, so it is also important to analyze the service offering compared to **competition** and competitors' service offerings. Obviously, competitors will not necessarily communicate sensitive information about their services publicly, but it is very important to keep track of whatever information is available. Various competitor intelligence activities may be useful for providing comparative information from competitors to the analysis of service offerings. General market research and even annual reports may reveal relevant business-related information about competitors' strategies and trajectories concerning service business. Because services are increasingly marketed, general information on them should appear on competitors' websites or fair appearances, and new services may be actively promoted in different media. In addition, a manufacturing firm's sales and service personnel may see competitors' activities during their work at the customer interface if the same customer has two manufacturers' equipment in the same premises. The manufacturing firm can, through this kind of information, analyze the service offering by comparing it to competitors' related offerings.

Efficiency deals with the performance of the service offering in light of the firm's own performance criteria, often defined in terms of productivity (outputs in relation to inputs) and quality (fulfillment of customers' expectations). It is important to assess the performance of the current service offering, covering both the resource investments and outcomes of the services. Assessing service-related efficiency is difficult because of the challenge in itemizing and measuring service-related inputs and outcomes. When the firm moves toward standardized service components and modules, measurement may become easier. "Inputs" in services deal with any resources used in them, which can typically be measured by the number of employees, the time consumed in service work, and the use of any materials, tools, systems, and equipment as part of the services. "Outputs" can be assessed from both the manufacturer's and the customers' perspectives. For the manufacturer, it could be service sales, service level, or some other strategic output measure; for the customer, it could be customer

satisfaction, experienced service quality, or another dimension of benefits (e.g., Jaakkola et al., 2007). We have covered the use of KPIs in chapter 5, and they are very suitable for analyzing the service offering, particularly in light of the firm's strategic goals.

Lastly, the service offering needs to be analyzed in terms of the **business potential** it carries and the profits it turns to. Different types of services may have a very different role in terms of business potential. Some services may promote the sales of products and be unprofitable as such, but then turn to profit only through product sales. In turn, some other services might be highly profitable in themselves and thereby take a very strategic position in the income of the firm. In addition, some services as part of the offering may be poorly defined in terms of their concepts; they might be needed by customers, but their value-creation logic and business potential are not understood. The manufacturing firm should prioritize such services that have business potential and potentially develop such services that meet a customer need but unclear profitability. Services are by no means homogenous entities, so it is necessary to understand how business potential emerges through the entire service offering, across the different types of services. The analysis of the offering may reveal that some services must be terminated (to avoid losses) or radically transformed (to become profitable) for the service offering to fulfill strategic goals.

Defining the service offering for the future

Based on the analysis of the service offering, the manufacturing firm can determine the extent to which this current service offering fulfills the service strategy. The possible gap between the current offering and the strategy can be considered as a starting point for developing the service offering. The firm can specify a goal for its future service offering and define a road map for developing it, for example, over the next three or five years (Jaakkola et al., 2007). This road map can use the same kind of service mapping as in the current state analysis and include all kinds of service innovations, service infusion, and service dilution activities: adding new services, developing existing services, replicating certain service concepts for different markets or varying them for alternative purposes, and even deleting existing services. All these activities require resources and time, so setting a clear goal for the future service offering will guide the development work and also justify resource investments to development.

All manufacturing firms also want to have a competitive service offering in the future. Therefore, the service offering must include enough versatility and services of different ages, that is, those in the beginning of their life cycle and more mature services (Jaakkola et al., 2007). Before including new services in the offering, the firm has to develop them and their components and modules as part of the service portfolio. In this way, the future service offering is directly connected with the firm's service innovation goals and processes. The company needs clear principles and priorities for new service development to ensure the continuous renewal of the service offering (Kohlborn et al., 2009).

Developing the service offering

In line with the service transformation options of manufacturing firms and based on defining the future service offering, the development of the service offering can take place through three somewhat different routes, which may occur simultaneously in the firm's development strategy.

Changing the customer relationships. A typical development trajectory in service offering development is for the manufacturing firms to move toward closer customer relationships, particularly if the strategy suggests such closeness. That implies changing existing transactional relationships to more cooperative relationships and the manufacturer becoming more engaged in the customer's processes (Penttinen & Palmer, 2007). However, the manufacturing firm may also decide to go in a totally opposite direction by withdrawing from in-depth customer cooperation, increasing the standardization of services, and moving backwards to transaction-based services. This strategic consideration is reflected in how the service offerings are developed.

Changing the comprehensiveness of the service offering. Another typical development is increasing the completeness of the service offering, which can take place, for example, by bundling services to more complete service packages or solutions and thereby offering greater value for customers (Kowalkowski, 2006; Penttinen & Palmer 2007). Moving to advanced services and solutions also implies possibly changing the business models of the services, including new pricing and earning mechanisms that might depend on the service value. Alternatively, completeness may imply changing the manufacturer's role toward the customer from reactivity to proactivity (Kowalkowski, 2006). By taking a more proactive role in the customers' business, the manufacturer could anticipate the customers' changing needs and changes more generally in the market. Again, the manufacturing firm may also decide to go in a totally opposite direction: reducing the comprehensiveness of the service offering and, rather, increasing the number of customers for a selected few standardized services. The service strategy should communicate such priorities clearly.

Partnering and/or outsourcing. Through the analyses and future goals concerning the service offering, the manufacturing firm may decide to reconsider its own role and position in the service supply chain. By partnering with other firms, it may delegate service work to partners, share and include in its own offering the partner firm's service offerings, or even outsource entire service offerings to be delivered by the partner firm. Even in these cases, the manufacturing firm has to consider how the service offering appears as part of its business strategy and general offering, and how its image in connection with the services is maintained if partners are included or if withdrawing from service business.

Coordinating the different offerings (managing the service mix) and targeting the service offerings to customers

When customers require increasingly specialized services, the manufacturing firm needs to coordinate the different customer-specific or segment-specific offerings effectively (Böttcher & Klingner, 2011;

Edvardsson et al., 2007; Kindström, 2010). The firm needs to decide how many different service offerings it maintains and how it differentiates them across customers and customer segments. This means that the firm has to have a good understanding of its service mix, that is, which services are marketed and offered actively and to what kinds of customers. Particularly if certain industries and markets have somewhat similar service needs, one specific service offering can serve customers on them well.

If the firm has a modular service portfolio, assembling a customer-specific (or segment-specific) service offering occurs through compiling from the existing and forthcoming service components and modules, as illustrated in Figure 26 (Böttcher & Klingner, 2011). The figure also points out that when developing the service offering, some service components and modules may be “old” or even outdated; however, even in such cases, the customer may request and need them, and the manufacturing firm needs to consider how to upgrade and develop them while in use. Naturally, the firm has to make sure that it has resources for the service offerings and manages related risks concerning customer-specific service delivery (Jaakkola et al., 2007).

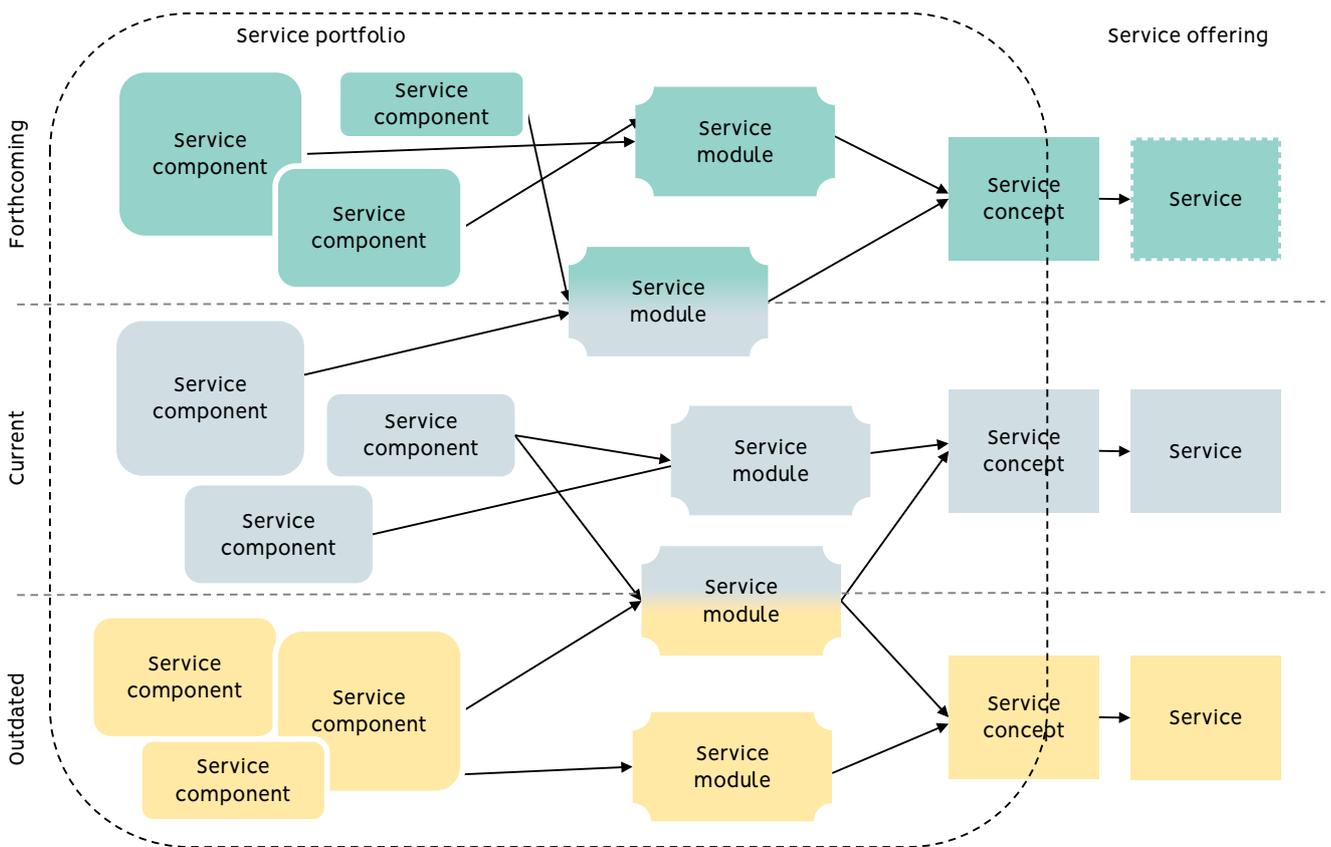


Figure 26. Forming a customer-specific service offering. (Modified from Sariola and Martinsuo, 2014).

6.3 Case example

One large machinery and automation system manufacturer faced a very typical situation concerning service offering development: it already had a versatile service offering, including training, maintenance, remote support, retrofit, delivery, and safety services, but it was not sure if the offerings delivered expected customer value and were sufficiently profitable for the manufacturer itself. The company also wanted to develop ways to enhance the sales of the service offerings. To improve the value generation through services, the firm decided to analyze the entire service offering and prioritize it in a new way.

The firm first analyzed its customer base and identified the priorities concerning customer value through interviews with key customers and sales personnel at the customer interface. Cost savings, risk reduction, increased sales, and employee job satisfaction are examples of the value dimensions identified as important for key customers at this stage. These kinds of issues relay what is important to the customers and can guide the analysis of the services too. Parallel to this customer-centric analysis, they also mapped the success factors and unique features in their own business as compared to competitors.

The manufacturer's service development team then analyzed the services that were visible in their database (that included all information on delivered offerings), marked with their specific product codes. This analysis also included mapping of the core service processes and resource requirements, categorization into service types, and each service's fulfillment of the customer value dimensions. They noticed immediately that only a minority of the actual services appeared as part of the database. When discussing this with personnel, they identified many nondocumented service activities that took place with and for customers but that were never coded into the database, nor were they monitored, priced, or defined as service products. A key distinction was then made between productized and not productized services, and the latter required much further analysis to first find such services and then determine which ones were worth productizing. This analysis showed the firm that to develop their service offerings, they need to make at least some of the nondocumented services visible (i.e., productize them), as well as somehow begin to follow the performance and quality of the services.

The consideration of future service offerings entailed accessing relevant customer information to determine what kinds of services will be relevant to customers. Various sources of information were used for this purpose: customer satisfaction surveys, study of customer complaints and claims from past deliveries, and key customer interviews. The customers mentioned needs and interests both in the list of existing services and outside of it. All ideas were listed, and each service need was described tentatively. Some ideas contained multiple versions of the same service because different customers had somewhat different needs, depending on, for example, the age of their equipment, their readiness for remote monitoring services, and the location of the customer site. To help managers' with their decision-making, the service development team used two main visualizations to report the service offerings (current and future): dividing the services according to the timing of the service on the machinery life cycle (before and during selling, during delivery, and after delivery), and dividing them

into categories based on the nature of customer value (product-supporting, process-supporting, and performance-enhancing).

Based on the analysis, the company took four main steps to develop the offering. First, they had to “clean up” the existing service offering, including the need to prioritize and document such services that were delivered but were never documented or monitored. They actually decided to remove some existing services from the database, as they were not in active use. Second, they planned a portfolio for new service development to include new services that were requested by customers to their offering. This required creating a road map to define the order in which the services were to be developed, as everything cannot happen at once. Third, they now had the possibility to market the services in a better way by offering clear categories of service types based on the better understanding of customer’s value priorities. This implied also that they were able to check and clarify the pricing of services, either included in the pricing of the delivered equipment or as part of the service product. And fourth, they decided to establish some new practices to manage the service offering more systematically in the future, including at least annual status checks concerning how each of the services were performing.

6.4 Lessons learned

Even if services may be intangible and unique in their implementation, it does not mean that services should not be defined, managed, and controlled. This chapter has drawn attention to the need for industrial firms to make their service offerings visible. Only by creating and managing a clear service offering can they make the services available to customers and become profitable as a business. This does not happen by accident but requires management effort.

With the focus on organizations as multiservice entities, we have emphasized that services must be managed as carefully as any business. Particularly when viewing industrial service systems strategically, it is not sufficient to pay attention to single services only, but additionally the compilation of all services must be planned, coordinated, and monitored. To succeed in service business, manufacturing firms need to do the following:

- Understand the difference between the internal (service portfolio) and external view (service offering) of the service mix and the required resource investments (service development) that are needed in packaging and tailoring services to customer needs.
- Consider the modularization of service portfolios, particularly if the services tend to be complex and vary across different customers.
- Implement a systematic process for service offering development, particularly when implementing new strategies, anticipating new customer needs, or facing business problems with services that require analysis.

7. ORGANIZING THE INDUSTRIAL SERVICE BUSINESS

Service development and delivery cannot be isolated from the organizational context. Services are produced through interaction and connection of people, processes, and technologies. Thus, it is important to examine the service organization, strategic design choices, alternative structures, and delivery chains.

Service delivery systems are the structures, processes, and practices through which services are delivered.

7.1 Aligning the organization with the service strategy and market

Some key principles regarding organization design in service delivery need to be taken into consideration when designing, analyzing, and developing any type of service delivery systems. Figure 27 depicts these key principles in designing service organizations.

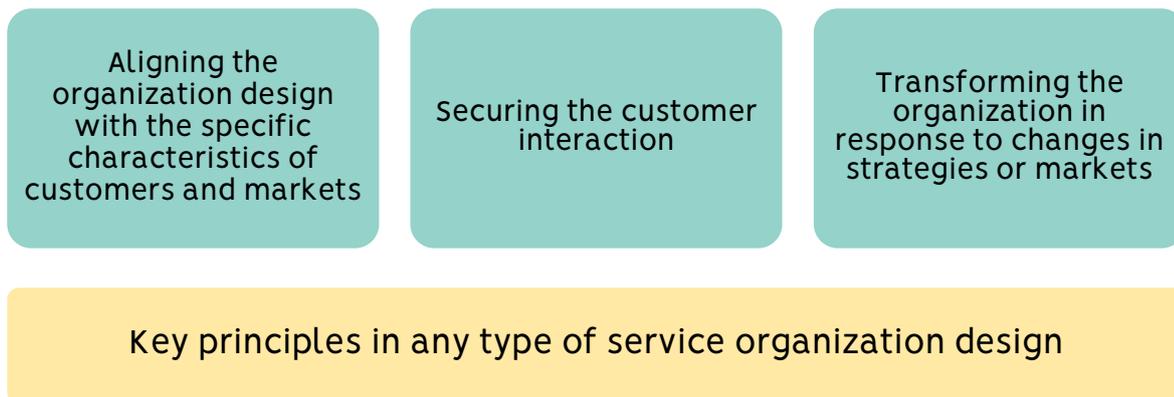


Figure 27. Key principles in designing service organizations.

First, the firms providing industrial service systems tend to operate in a complex market due to the complicated nature of the system that needs diverse resources as well as heterogeneous needs and wants of customers to support their systems (Neu & Brown, 2008). To configure a suitable organization to align with this complex market, the firm needs to answer the following questions:

- What is the service strategy?
- How do we manage human resources?
- What is the suitable structure to fulfill the service strategy?
- How do we measure performance and reward for it?
- How do we formulate and implement service processes? (Neu & Brown, 2008)

In other words, to have a successful service business, industrial firms need to develop and maintain two types of alignment in their organizations: vertical alignment and horizontal alignment (Lab et al., 2002, p. 269). Vertical alignment refers to aligning service strategy, service organization structure/design, and people. Horizontal alignment refers to aligning service processes, service organization structure/design, and customers. Figure 28 demonstrates these two types of alignments. Considering these factors can help industrial firms design an organization that fits the conditions of their markets.

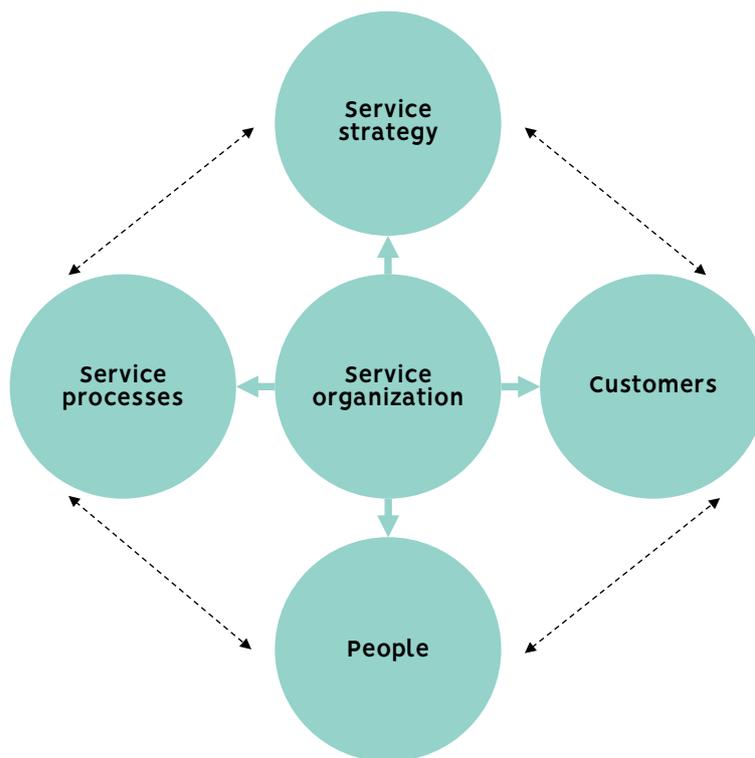


Figure 28. Vertical and horizontal alignment. (Modified from Lab et al. 2002).

Second, as discussed in chapter 3, for any type of organization design in an industrial firm, the firm needs to ensure that the service organization is able to manage customer interaction and secure the continuous flow of customer information (Turunen & Toivonen, 2011). In other words, whether the firms have separate or integrated service units, they need to access customer information about their existing service needs as well as future needs, wants, and wishes.

Third, as explained in section 2.2, the service strategy of a firm may change over time, for example, moving from an after-sales service strategy to a development partner strategy. The industrial firm should respond to this strategy change by modifying the organizational design (Gebauer, Fischer & Fleisch, 2010). Returning to the previous example, while an after-sales service strategy requires a

separate service unit, a development partner strategy needs integration of business unit responsibilities (Gebauer, Fischer & Fleisch, 2010).

7.2 Design of service delivery systems

Like any organizational system, service delivery systems are designed based on the strategic choices of a firm regarding different elements of the system. Figure 29 breaks down the different elements of a service delivery system into three categories of strategic design choices: structural, infrastructural, and integration (Roth & Menor, 2003). First, structural design choices relate to the physical aspects of the service delivery system; that is, the firm needs to determine the suitable layout, size, and number of physical locations for service delivery tasks. To do that, the firm needs to know the type of technology and equipment involved in service delivery, the service capacity, the degree of outsourcing service delivery to external service providers, and the nature of customer contact (e.g., face-to-face or technology mediated).

Second, infrastructural design choices concern people, service policies, practices, and process and performance management systems. The firm needs to determine the level of authority to give to its service people; how human resource processes will be managed, including hiring, training, and rewarding service people; the roles and responsibilities of service managers; the key processes for service delivery, and the systems and tools to use to measure service performance.

Third, integration design choices concern integration of the supply chain and organizational learning. The firms need to determine what types of internal integration between different functional units and infrastructural choices are needed, what types of external relationships with suppliers and customers are needed, how and through which technologies to manage communication and information sharing in the service supply chain, and how to manage organizational learning and knowledge within the firm and its boundaries.

The strategic design choices are jointly important, and each category complements the other category. For example, to design a service delivery system, the firm needs to define clearly end users, customers, customers' expectations, and other key stakeholders that are involved in the design and delivery of customer value (integration choices). Then, the firm needs to determine the customer's line of visibility, that is, in which activities the customers are involved and in which activities the firm needs to add value without customer involvement (infrastructural choices). As noted in section 1.4, on the basis of the line of visibility, service organizations in industrial firms are usually divided into the front office and back office (structural choices). The use of front office and back office emphasizes the impact of customer contact on the service delivery system (Zomerdiijk & de Vries, 2007).

Design choices for the front office and back office can be explored in more detail. The front office is where the service people have direct and active contact with customers and where customers can

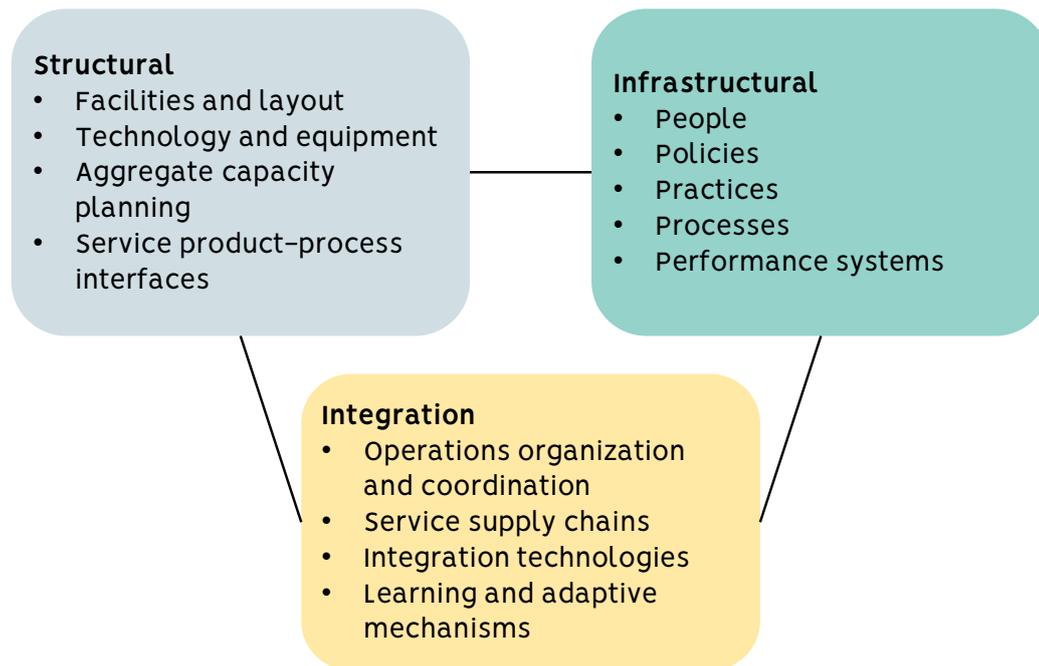


Figure 29. Strategic design choices to design service delivery systems. (Modified from Roth and Menor, 2003).

observe and experience the service process. The back office has low and more passive contacts with customers, and customers do not usually experience the service processes. However, this organization model does not mean that each service organization needs to have separate front-office and back-office processes with specific human resources allocated to them. Zomerdijk and de Vries (2007) identified three design decisions that affect the design of the front office and back office in industrial firms:

- Deciding where customer contact should occur in a service delivery process
- Deciding which activities in the process should be decoupled from each other
- Deciding how the employees that are involved in the process should be grouped together

These design decisions imply that industrial firms may have different configurations of the front office and back office. In practice, front-office (or back-office) activities are not delivered only by certain front-office (or back-office) employees who work in a separate building (Zomerdijk & de Vries, 2007).

7.3 Analysis and development of service systems

Implementing services without any plan is not an efficient way of working for industrial firms; they need to specify different service packages, decide on the related design choices, and model the service processes accordingly. Afterwards, it is critical to analyze how customers experienced the service

delivery, how the service delivery system performed, and how to develop and standardize the service delivery system.

As discussed in section 6.1 of chapter 6, the industrial firm has to consider the management of the entire service mix. To develop a service delivery system based on the service system design, the firm should decide how to use the system by combining different choices for different types of service offerings. For example, basic services can be provided only by internal service people who have the required technical skills and knowledge. However, delivering advanced services may require coordination with other units as well as collaboration with other actors in the service supply chain, such as software providers. As explained in section 2.3 of chapter 2, service business is not only about the industrial firm but also involves relevant partners and technologies. The industrial firm can have different alternative chains for service delivery based on integration design choices. The firm may use one specific type of service delivery chain for all customers and services, or it might customize the delivery chain based on specific customers and/ or some specific types of services.

First, the firm may have a direct relationship with customers—either a one-way supplier and customer relationship or a two-way and cooperative relationship (Figure 30).

Second, the firm may use a service provider to deliver services to the customers and thus develop an indirect service delivery chain (Figure 31).

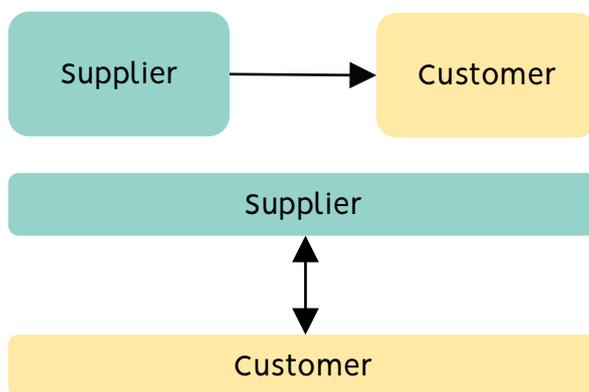


Figure 30. Direct service delivery chain.

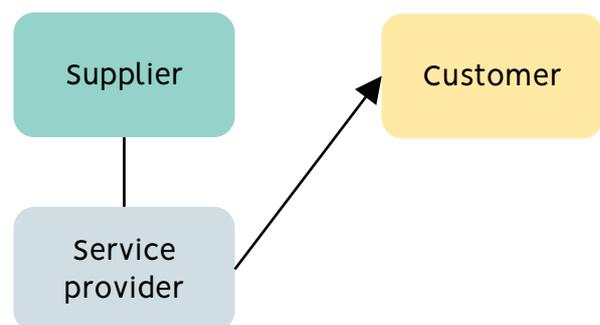


Figure 31. Indirect or partner-mediated service delivery chain.

Third, the firm may decide to use some specific technologies, such as RMSs, in the service delivery system (Figure 32). As illustrated in Figure 32, based on the role and position of the technology in the service delivery chain, the firm may have three alternatives: technology enhanced, self-service, and multiple device and/or multichannel service delivery chains.

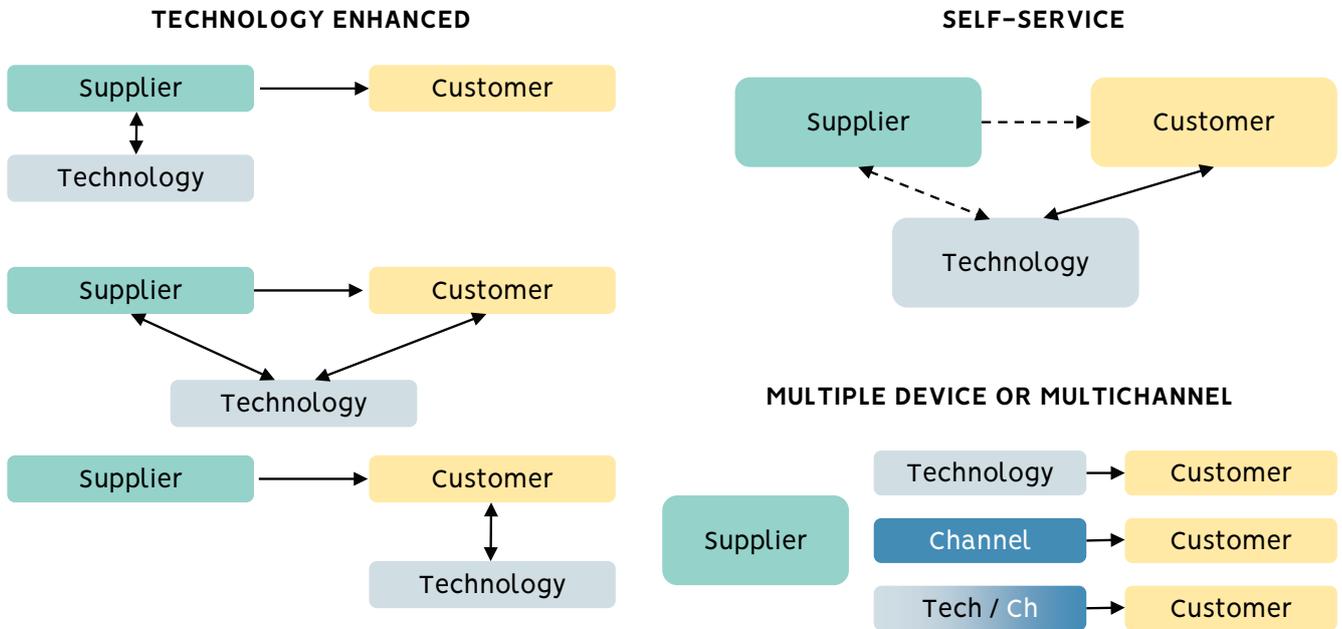


Figure 32. Technology-mediated service delivery chain alternatives.

Observations from different industrial firms show that service delivery can be different from what was intended. In other words, while the firm designs specific service organization and service processes to provide services to customers, the actual service delivery may be quite different. The concept of service encounter has been explained in section 1.4. To understand the reality of service delivery better, Figure 33 shows the relationship between service organization, front office, and customer in the *service encounter triad* (Fitzsimmons & Fitzsimmons, 2008, p. 176).

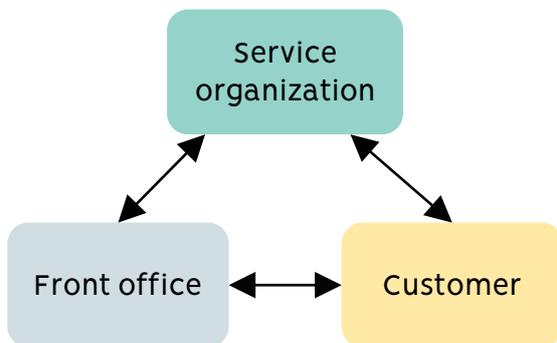


Figure 33. The service encounter triad. (Modified from Fitzsimmons and Fitzsimmons, 2008).

The manager of the service organization can design the organization based on different strategic design choices and define rules and procedures for service delivery. However, the service organization may not always have the optimal resources available (in terms of skills, skill levels, and experience) at the right time and at the right place. Moreover, services are delivered to a given need at a given time with available resources. The front-office employees need to customize the services and the method of delivering services based on these considerations. Services are provided in the customer–employee interaction. Thus, the customer preferences, way of working, and limitations may affect the service delivery in practice.

7.4 Scaling up from a local to global service business

More and more industrial firms are becoming global and selling their products to customers in various geographic locations. Besides the strategic decisions regarding how to expand the product business globally, the firm should also plan how to develop service delivery systems. The global business has implications on the service organization and service delivery chain that are not necessarily similar to the global product businesses. Because the service organization depends more on people and relational capabilities, specific service design choices must be made that enable the firm to deliver the services efficiently to global customers.

Besides the basic design choices that have already been explained, Table 5 shows that industrial firms operating in global markets need to consider other key design choices in organizing the service delivery system, including global organization, location and facilities, processes, people, technology, and equipment (Valkeinen, 2016).

Global organization choices refer to make-or-buy decisions. The firm needs to decide if the services are provided by their own service people, through external service providers, or through a hybrid configuration (Kowalkowski, Kindström, & Witell, 2011). Hybrid configuration implies that the industrial

Table 5. Design choices in the global service delivery system. (Modified from Valkeinen 2016)

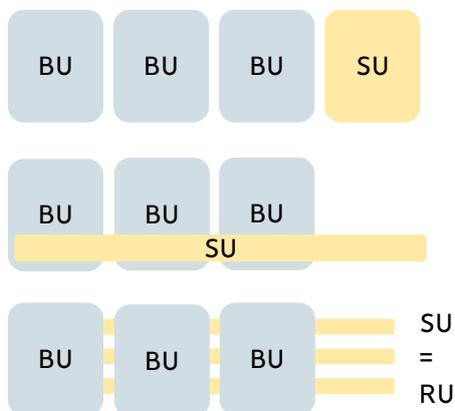
Global organization	Outsourcing Organizational clarity
Service processes	Standardization vs. customization
Locations and facilities	Centralization vs. decentralization Coordination Local presence Regional regulations and requirements
Technology and equipment	Global spare parts supply Data and intellectual property management
People	Cultural features and differences Knowledge sharing and learning

firms cannot always follow a certain outsourcing strategy, but they may provide services in-house in some regions and use external service providers in some other regions. Moreover, for more customized or advanced services, they use an internal service organization, and for more standard service offerings, they use external service providers. Whatever the outsourcing strategy of the firms, they need to clarify the roles, responsibilities, and relationships between the firm, local service providers, and customers.

Configuring the global service processes is another design dimension in global service delivery. The firm should determine which service processes can be standardized in all regions and which are needed to be customized for the specific customers and environments. For example, in repair services, the customer is not usually involved in the service process, which provides the opportunity to standardize the service process (Kowalkowski et al., 2011b). However, for more complex services, such as optimization of a production line, it is more difficult or even impossible to standardize the process. However, the firm can develop standardized subprocesses, combine different subprocesses through modularization, and then deliver services to customers.

Locations and facilities in a global market also play an important role in global service operations. One of the critical design choices in service delivery systems is the centralization or decentralization of the service organization. Figure 34 depicts simplified examples of some different approaches for the centralization and decentralization of service business in an industrial firm. These design choices mainly concern the proximity between the firm and its customers: in a centralized service organization, the location of the service unit may be remote from the customer, whereas in decentralized organizations the service units can be established closer to the customers' locations. Decentralization helps the firm improve service availability and response time. By being closer to the customers, the firm can also better understand the customers' needs and their operations (Neu & Brown, 2005). However, centralization helps the firm reduce the cost of holding inventories in multiple locations. Moreover, centralization

CENTRALIZING THE SERVICE BUSINESS



DECENTRALIZING THE SERVICE BUSINESS

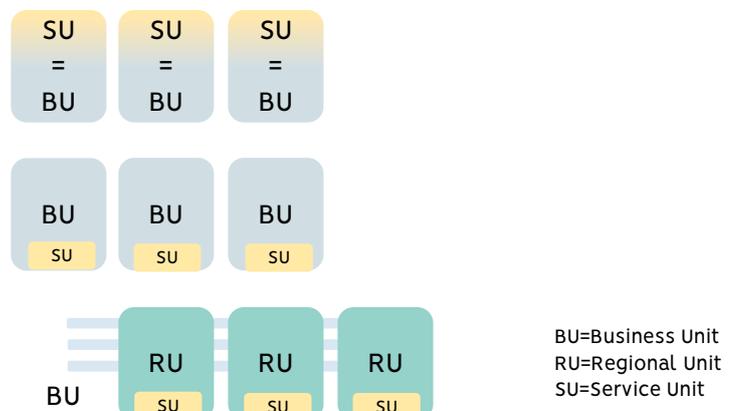


Figure 34. Simplified examples of alternative approaches to the centralization and decentralization of the service business.

enables the firm in a highly complex market to use internal capabilities across manufacturing and service operations to develop new services (Cohen, Cull, Lee, & Willen, 2000).

Regardless of the choice between centralization and decentralization, coordination and control of global units is crucial for the industrial firm to develop relationships between geographically detached units and to monitor their performance. In practice, the firms may use different integration mechanisms, such as information management systems, rules and procedures, and formal and informal communication through meetings, workshops, email, and so on. Decisions about having a local presence in a specific region also affect the organization design. The firm needs to figure out whether using local service units in some regions is beneficial for the business. For example, the local service units may have critical relationships with some key local actors, or they may be familiar with the customer's culture and way of operations in a specific region. Finally, the firm needs to consider regional regulations and legislation in different regions when organizing the service delivery system. The issues regarding management control for these different types of organizational structures will be discussed further in section 8.2.

Technology and equipment considerations also affect global service delivery. The main issue is how service delivery is organized to ensure a reliable global spare parts supply. The firm needs to decide if it wants to have a central warehouse or several local warehouses and how it will supply the possible local service providers with the right spare parts at the right time. Moreover, using digital technologies creates the issue of data and intellectual property management. Although this issue does not directly affect design choices, the relationship between the actors in a global market and the ownership of data need to be determined in advance.

Finally, while the importance of human resources was highlighted in chapter 4, human-related aspects in global service delivery need extra attention by industrial firms. The firm needs to know the cultural features of a specific region and differences between regions, for example, regarding customer interactions, to organize system delivery efficiently. While cultural differences can affect knowledge sharing, the firm needs to develop suitable technology-based systems to enhance knowledge sharing and to design the relationship between actors in a way that promotes sufficient interactions to share learning experiences and new ideas.

Finally, while industrial firms can make suitable organization choices based on strategic design choices, they need to understand the major challenges and requirements for each type of organizational arrangement. Regarding internalization of service delivery (in-house service delivery), the internal service organization requires a wide range of competences that may change over time. Service transition is generally a difficult and long-term process because establishing an in-house organization requires time, resources, and top management commitment. Fewer resources can be assigned to product business. Firms may need to manage the symbiotic relationships of having two different business logics: service and manufacturing. The firm may face the risk of running into conflict with customers that also perform services. On the other hand, externalization of service delivery (outsourcing service delivery to a third party) may imply uncertainty and potentially incongruent motives of the manufacturing firm and service

partner, and an unwillingness to adapt that can potentially lead to relationship risk and competence risk. It may be unclear who “owns” the customer interface. This method creates coordination costs between the firm and service providers. If service providers are local, it is more difficult to offer uniform international service agreements. Strategic linkages between service business and product business can become complicated.

7.5 Case example

Electro Co. has four repair shops (A, B, C, and D) located in different global market areas. Table 6 shows the information about these repair shops.

Table 6. Information about the Electro Co. repair shops.

	Repair shop A	Repair shop B	Repair shop C	Repair shop D
Location	Northern Europe	North America	Eastern Europe	Southern Europe
Number of employees	6	3	2	2
Market area	Mainly Europe and areas not covered by other repair shops	Canada, Mexico, USA	Belarus, Kazakhstan, Russia	Malta, Portugal, Spain

Repair shop A is the biggest and most professional repair shop owned by Electro Co. It is located next to the main warehouse of the global spare parts center. Besides repairing devices, the company’s service offering includes repairing other components, spare part assembling, and small-scale manufacturing of new devices. Repair shop B is located in North America. Repair shop C was established in eastern Europe. Although the distance from Repair shop A is not very long, the customs policy made it difficult to send devices there for repair. Repair shop D has been working in southern Europe and serving mainly customers from a certain industry.

The current repair service organization can be considered as quite centralized from the geographical location point of view. The current four repair shops are located in two continents, America and Europe, and three of them are located in the latter. However, decision-making is highly decentralized, although the number of repair shops is not that big. Basically, repair shops have the power to decide how repair cases are handled in their market area and what kind of spare part stocks they have. Being close to potential customers and providing better service for them were the main reasons for establishing repair shops.

However, warehousing has been centralized, and spare parts stocks and their locations seem to be a big issue regarding the whole service business. The main warehouse for device spare parts is located next to Repair shop A, and all other repair shops need to order most spare parts from there. Additionally, the firm has thirteen distribution centers, which support service in different countries and provide some basic spare parts for devices. Because the main warehouse is located in northern Europe, the distance from there directly affects service delivery times. All repair shops do not want to have large stocks of their own because they are expensive to maintain. To achieve shorter lead times and better customer satisfaction, the firm started to decentralize warehousing. Electro Co. already has a global network of distribution centers that are responsible for selling spare parts. The firm decided to add more spare parts for devices to their selections, so that repair shops would not always have to order from northern Europe.

7.6 Lessons learned

Service delivery systems are the structures, processes, and practices through which services are delivered. To design service delivery systems, the industrial firm needs to consider several design choices: structural, infrastructural, and integration. Structural choices relate to the physical aspects of the service system such as facilities, layout, and equipment. Infrastructural choices refer to the role of service providers, such as job design, policies, and skill sets. Integration choices concern coordination issues, service supply chains, and adaptive mechanisms. A global service delivery system requires even more specific consideration regarding locations and facilities, people, processes, technology, and equipment.

To develop service delivery systems based on the design choices, the industrial firm need to define which combinations of design choices are used for which service offerings, and how. Organizing the service business is not just about the supplier but also involves the relevant partners and technologies. Thus, different alternatives of service delivery chains need to be considered, including direct, service provider–mediated, and technology–mediated delivery chains. The firm may use a combination of these alternatives to connect with the customers.

The empirical studies in industrial firms show that the service delivery architecture is challenged by real-life context: in service business, uncertainty is the reality. In other words, the design choices of the service delivery system cannot always be perfectly fulfilled, and the actual service delivery may be quite different. With respect to the developed service delivery system, in practice, the services are delivered in a specific context, to a given need, at a given time, and with available resources. In the real context, multiple question arises that can affect service delivery system:

- Did we understand the customer need properly?
- What is special about the moment and context of delivery?
- How capable are our resources?

- Do we have the optimal resources available (in terms of skills, skill levels, and experience) at the right time and at the right place?
- Does the customer act in a way that the service concept requires?

8. MANAGEMENT CONTROL IN INDUSTRIAL SERVICE SYSTEMS

8.1 Profitability-driven service business renewal

Identifying business opportunities

In this section, we discuss the perspective and means of management control in identifying, justifying, selecting, and steering service business development. The section builds on the assumption that service business renewal is driven or at least affected by profitability, although possibly taking different forms in practice.

Profitability refers to the financial performance of a company, which can be measured simply by profit margin (revenues – costs) or more comprehensively by return on investment (ROI).

Return on investment (ROI) = (revenues – costs) / capital invested

In industrial service systems, both manufacturers and their business customers are interested in their elements of profitability, that is, their revenues, costs, and capital invested.

Profitability-driven service business renewal refers to developing service businesses while bearing in mind the elements of profitability at the manufacturer and at the customer. In addition to money, firms need to consider risks, uncertainties, and the personal values and preferences of the actors in service business renewal.

The perspective of profitability is essential for the manufacturers aiming at developing their service businesses. The opportunities and possibilities for service business development are typically identified with the help of current profitability figures of the manufacturing companies, their competitors, and the customers. On the other hand, the results of the renewal actions are measured and managed with similar metrics, that is, financial measures such as profitability.

The notion of profitability-driven service business renewal refers to the logic of identifying business renewal possibilities with profitability in mind and selecting and managing them to result in enhanced profitability. One important aspect in service business renewal is the offering development, which has already been discussed. Indeed, the offering development supports the overall business renewal process by identifying and managing new opportunities; conversely, the overall service business renewal may provide input for the offering development processes.

Figure 35 illustrates the logic of the profitability-driven service business renewal by combining three elements: the current status (firm profitability, customer logic, control package), the identified business renewal actions (ranging from small-scale refinements to ecosystem or fleet-level renewal activities), and the results (ranging from direct profitability effects to indirect effects such as enhanced understanding).

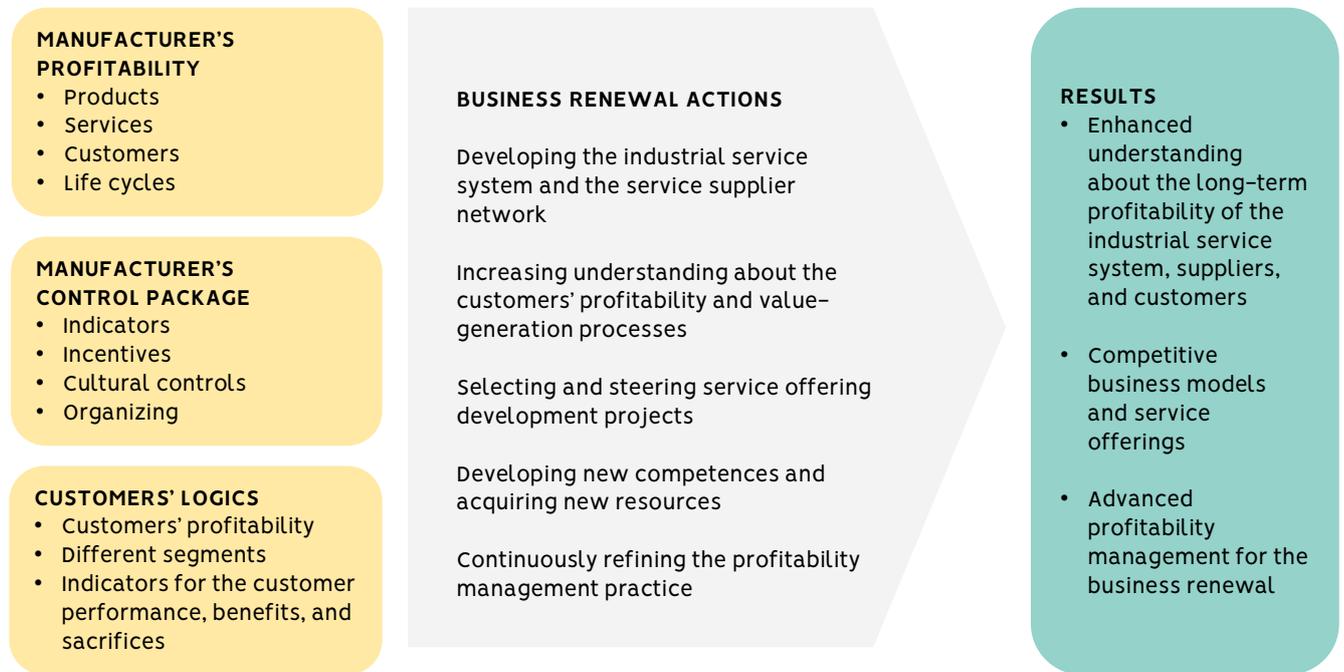


Figure 35. Profitability-driven service business renewal. (Adapted from Lindholm, Laine, and Suomala, 2017).

First, as conveyed in Figure 35, the starting point for profitability-driven service business renewal is a comprehensive understanding about the current status of the business and embedded business potentials. Currently, many manufacturing companies measure their equipment and service business profitability separately. However, understanding the interlinkages between the different categories as well as understanding the overall profitability of the manufacturers creates a solid basis for business renewal. In addition to the profitability figures, manufacturers need to understand the life cycles of their products, services, and their products in use at the customers. When aiming at business renewal, a natural starting point is to understand the dynamics in the performance of different products and services, including related trends and challenges. In addition, regarding the demand of the current and potential service businesses, firms need to understand the use context of these services in the customers' businesses, such as the life cycle of a given product at the customer and the different service needs during that life cycle. These all constitute the starting point for developing new services and for the broader service business renewal as well. Furthermore, different customer logics, segments, and elements of profitability at the customer provide a starting point for developing the service businesses at multiple levels.

Manufacturers' profitability figures do not immediately lead into actions regarding service business renewal. Instead, management control for selecting and steering the renewal actions should be considered as a package deal. Obviously, financial and nonfinancial performance measures represent one starting point for renewal actions. However, this information is interpreted via different organizational methods, different cultural controls, and the incentives of different actors involved in the manufacturer's business operations. Therefore, identifying, selecting, and steering the business renewal actions is not a straightforward, "rational" process, but rather a part of the overall management and management control system (MCS) of the manufacturing company.

Second, as noted, the scope of the service business renewal actions may vary a great deal, as shown in the examples of the identified service business renewal activities in Figure 35. In practice, the renewal may focus on the customer's value-generation processes and the possibilities to develop the fleet management accordingly. The widest scope of the service business renewal may address the entire ecosystem or the industrial service system, as discussed broadly in this book. The development of the service offering is a more operational set of activities for service business renewal. In the manufacturing companies, regarding the offering development, the selection and steering of new product development and new service development projects is typically made based on evaluation criteria that include financial metrics. These are typically related to the net present value, ROI, or pay-back time of the project under evaluation. Service business renewal activities and new service development projects are not exceptions. However, these may represent "special" or "untraditional" offering development projects to the manufacturing companies that require special attention to their selection and steering.

Third, the desired outcome of the profitability-driven service business renewal is simply better competitiveness and thus better profitability. This may consist of new business models and offerings that enable a new competitive position and more effective service businesses in practice. However, many service business renewal activities provide more indirect or even negative effects to the short-term profitability of the manufacturing companies, despite the positive financial consequences in the long term. For example, investments on the visibility into and understanding of the customers' value-generation processes may require resources well before the revenues stemming from the new service business arrive. In addition, it is not necessary that all the offering development result in extra direct revenues from services, but new capabilities and understanding about the customers' value-generation processes may first result in an increase in equipment sales followed by, more indirectly, an increase in the service business.

As a result, service business renewal requires understanding the current status of the businesses in a rather flexible and dynamic manner to continuously manage and control the renewal activities to get the best possible results.

Different levels and units of analysis

Managing and controlling service business renewal requires examination of the business possibilities within and beyond traditional financial reporting. Here, different units of analysis are being examined,

including product and service profitability, customer profitability and fleet profitability, from the perspective of the manufacturing company. Of course, in addition to these units of analysis, the customer companies have several units of analysis regarding their value-generation processes. Additionally, there are potentially possibilities to analyze the financial and nonfinancial performance of the industrial service system more generally. However, understanding the performance of the service businesses is a natural starting point for profitability-driven renewal within industrial service systems.

First, a traditional role of management accounting and control is to measure and manage the product and service profitability of the manufacturing company as profit margin (%) or in absolute euros, for instance. Traditionally, the machinery or equipment sales have been measured and controlled in terms of product profitability, whereas there are companies that have less information about their service profitability. In addition, equipment sales have represented rather big investments by the customers traditionally, and these may be considered more interesting for the manufacturing company compared with rather operational and small-scale maintenance service transactions. In all, however, many companies get more than 40% of their revenues outside equipment sales, and thus the overall profitability of different products and services has become extremely interesting for machinery manufacturers. As in any multiproduct companies, the profitability across different product and service categories varies. Even though the service business is supposed to bring financial benefits, there may be big differences between different service categories. Stereotypically, spare parts can be rather profitable, but transactional maintenance is a highly competitive, low-margin business. However, the profitability across different categories requires case-by-case considerations. When analyzing product and service profitability, the figures need to be compared not only with each other but also to more specific target levels, benchmarks, and trends within each category. In addition, regarding new service businesses, sometimes the idea is to strengthen a customer relationship with a certain service and thus yield indirect profitability. Therefore, the profitability figures may intentionally vary across different products and services.

Second, customer profitability is one of the key drivers of company profits. Especially regarding service business renewal, the development is typically focused on long-term customer relationships, where both equipment investments and several different services are provided by the manufacturing company. As described before, the profitability of the different products and services tends to vary; therefore, it is increasingly important to understand the dynamics of profitability within customer relationships. In principle, customer relationship profitability also can be measured and managed as a margin (%) or in euros, by including the revenues and costs of all the products and services of a given customer relationship. Customer-specific costs of initiating, developing, and maintaining a given customer relationship need to be considered as well. Indeed, different customers may cause different costs to serve them, which results in differences in customer profitability. Regarding customer profitability, Customer Profitability Analysis measures profitability at the customer level afterwards, which may result in similar management considerations to the product and service profitability analyses: Where should we invest? Where do we observe challenges? How do we deal with fewer profitability units of analysis? A more proactive and valuable approach is the Customer Lifetime Value analysis that models the future

value of the relationship by taking into consideration expected revenues and costs as well as different investments and expected benefits regarding the customer relationships. Such an approach, however, requires rather systematic and comprehensive data collections regarding customer relationships.

In addition to product, service, and customer profitability, industrial service systems may benefit from understanding the profitability of the machinery fleet in use at the customer. To develop industrial service systems, one perspective is to make sure that the machinery is operating in an effective, efficient manner. Therefore, one natural unit of analysis for the manufacturing companies is understanding how well the machinery fleet is used at the customers. Life cycle costing and total cost of ownership provide perspectives for the life cycle costs of the machinery fleet. Manufacturing companies should provide services that are optimal from the perspective of the machinery life cycle, and thus generate the optimal profitability to the manufacturing company too. Of course, in industrial service systems, there is also a high risk of suboptimization from the perspective of the manufacturing company or the customer company. However, recent research has provided analyses on how the characteristics of the fleet are related to the scope and content of the manufacturing company's service business and how manufacturing companies can estimate and develop their service businesses accordingly (Stormi, Laine, Suomala, & Elomaa, 2018). These perspectives could pave the way for analyzing the profitability of industrial service systems rather comprehensively by combining the perspectives of product, service, customer, and fleet profitability. Such analyses represent a solid starting point for managing industrial service systems toward profitability-driven service business renewal.

In addition to the different units of analysis, there are different levels of analysis where the information about the product, service, customer profitability, and machinery fleet profitability is being used. The levels and units of analysis are put together in Figure 36.

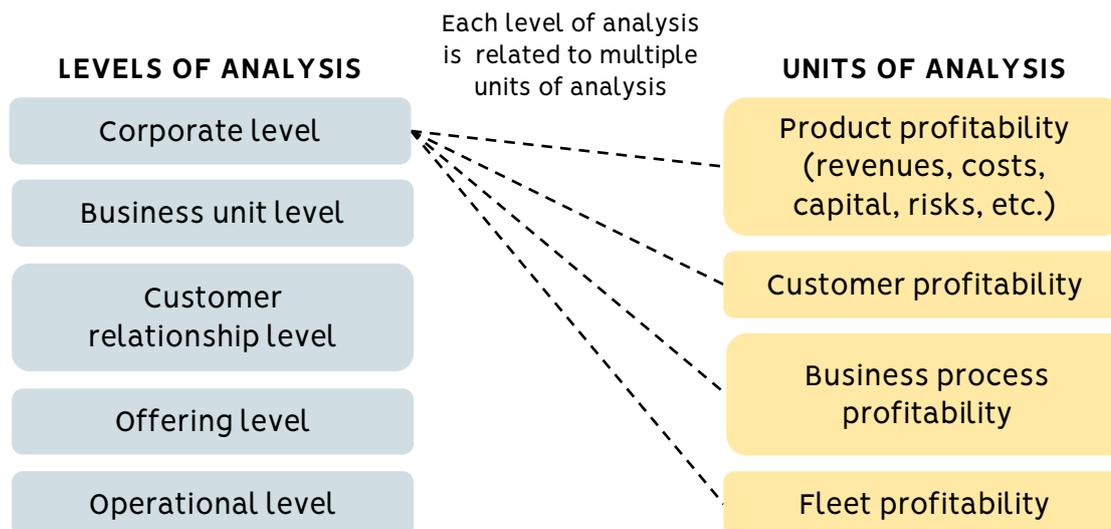


Figure 36. Examples of the units and levels of analysis in management control for industrial service systems.

Indeed, these units of analysis are important at the corporate level, where decisions on the offerings, customer segments, and profitability targets are typically made. Within the business units, the same units of analysis provide information for the business unit level decision-making. In addition, it is important that people responsible for certain customer relationships, pieces of offerings, and business processes get information to support their decision-making at the operational level.

8.2 Management control for service business

Roles and dimensions of control

Management control aims at ensuring the realization of the desired business outcomes. In addition to setting financial targets and measuring and managing the businesses accordingly, several means of management control are available. Malmi and Brown (2008) have identified different kinds of control to be included in the MCSs as “packages.” These include performance measurement and management controls, cultural controls, and administrative controls, among others. MCS packages enable the different means of control to be provided as an overall toolbox for management. On the other hand, it means that similar results may be achieved by different kinds of controls. In certain cases, setting strict economic targets and developing a highly ambitious culture may be alternatives for ensuring the achievement of certain results.

Management control is a set of means to enable, support, and ensure the fulfillment of desired outcomes.

Management control system (MCS) is an entity consisting of different control mechanisms, ranging from organizational norms to responsibility structures and performance measures. The MCS’s purpose is to ensure that the organization’s objectives are met.

In practice, MCSs may be enacted in different ways. Simons (1994) introduced different levers of control by distinguishing the following four archetypes, which all can be used in different ways in managing industrial service systems:

- **Belief systems:** What are the shared values in the organization? How do they guide the operations? In this case, values affect the management system significantly.
- **Interactive controls:** How are the objectives set and the performance measured? In this case, the process features interaction and cooperation.
- **Boundary controls:** What are the boundaries of given performance measures? What if targets are not met? In this case, certain rules are set for treating the outliers.
- **Diagnostic controls:** Selectively measuring performance according to the target values. In this case, the protocol enables diagnoses and management accordingly.

Levers of control have been criticized by Tessier and Otley (2012), among others, because the content and use of the different controls are mixed in the four categories and because there are many other ways to enact management controls. However, for the purpose of this book, the levers of control convey the important idea of finding different ways to manage and control different businesses. In addition, relatively newer and more traditional service businesses may be controlled in a different way within the overall MCS of a given organization.

Developing and managing service businesses require understanding the scope and content of those new businesses. Therefore, the role of management control regarding service business renewal may not fall into the traditional role of control in a given business context. The service business renewal, or servitization, may be considered at several different levels: at the corporate level, at the offering or customer relationship level, and at the process level. These different levels require different units of analysis, that is, accounting objects, and different forums of discussing and managing the renewal activities (Figure 37):

- Service-logic (Grönroos, 2008; Vargo & Lusch, 2008) is a business perspective. Service business renewal may represent changes in the corporate level (or even the system level). As a result, even the belief system underlying the business may change, and multilevel interaction may be required.
- New service businesses may result in changes in product offerings and customer relationships (Grönroos, 2000; Moeller, 2010), which may cause changes in the target setting (boundaries, diagnoses) regarding those products, services, and relationships.
- New service businesses represent changes in the processes through some of the IHIP characteristics, for example, because of the intangibility of some resources or outputs. Many different controls are potentially needed to learn from those new business operations.

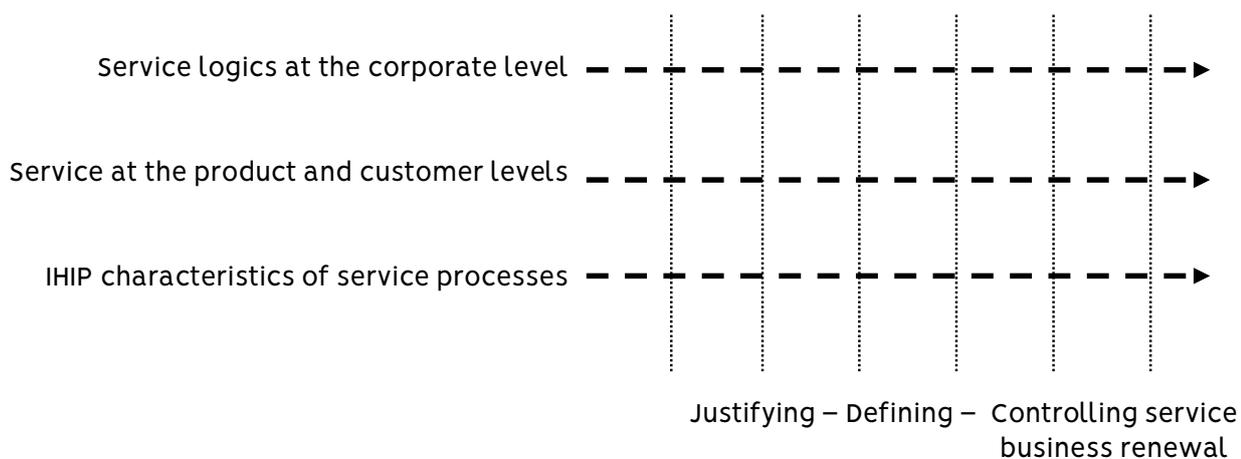


Figure 37. Units and levels of analysis and the roles of management accounting (MA) and control in service business renewal (Laine, Paranko, & Suomala, 2012a).

The role of management control in the broad service business renewal may serve multiple purposes. As conveyed in Figure 37, management control may be used for justifying, defining, and controlling the desired change (Laine et al., 2012a). Such roles may take turns during the entire service business renewal process, and these may be related to one or many levers of control, as proposed by Simons (1994). First, justifying the need for change requires finding evidence or educated forecasts regarding the future service businesses in order to build a shared understanding about the current status, aims, and future potentials of the service businesses. For gaining such justification, an interactive approach is desired to identify and communicate the possibilities embedded in the service businesses in the future. Second, defining the entity and the units of analysis carefully is important to better understand the industrial service system, the critical parts of the system, and the relevant parties involved. Therefore, different controls could provide useful information about the system, companies, business units, customers, products, services, processes, and activities. Such information for definition purposes may serve the purpose of understanding the service business potentials at different levels very early in the renewal. As the renewal process proceeds, these definitions may be revisited to update the plans according to the changes of the business context. Third, naturally, controlling the overall process and its outcomes is necessary and can be done by choosing suitable measures and using them in an appropriate manner. Note that the relative uncertainty decreases along with the process, which may affect the content and use of the MCS accordingly.

Management control for different organizational structures

As proposed by Malmi and Brown (2008), among others, the administrative controls make a difference within the overall MCS. Therefore, regarding the service business renewal and managing the service business, the organizational structure may significantly affect the content and use of the management controls accordingly. In other words, the organization structure defines the accountability and responsibility structures of the organization. As a result, the administrative controls determine who is responsible for the service businesses and what are the most important measures and controls regarding them.

In the traditional organizational structures of manufacturing companies, services may be either centralized or decentralized. If services are centralized to a separate business unit, they can be positioned either at the same level as the machinery units or at another level “serving” those machinery units. If services are decentralized, they are positioned in different machinery units accordingly. In addition, services can be organized locally in each market area, serving those customers and machinery units that are active in a certain area.

Neither centralized nor decentralized service organization is better. However, from the perspective of management control, there are implications. If services are being decentralized in machinery units or regions, the customers may get rather comprehensive service from one organization (regarding the machinery investment and related services). Thus, the business unit managers, key account managers, and local customer service may be responsible for the customer relationship. The disadvantage of this

approach is that different business units and local organizations may develop their service businesses in different directions, and no one is responsible for the service business renewal as a whole nor even the development of certain kinds of services.

On the other hand, centralizing services business to one business unit may be beneficial for defining service business renewal in the beginning, investing in developing new services, and managing service profitability accordingly. This structure also enables a systematic process for new service development as one entity. However, in this model, there is the danger of losing the special insights of certain types of machinery regarding services as well as insights into certain market areas, customer applications, and customer relationships.

Overall, organization structure is a part of the MCS for services, and careful attention needs to be paid to the implications of a given organization structure. Sometimes, in the beginning, services are separated into a specific unit to foster and pave the way for development. After that, service businesses are merged to other business units to manage and control them as a natural part of the overall business. However, the choice and enactment of these alternatives are case specific.

8.3 Case example

As described here, one natural starting point for service business development is understanding the dynamics of profitability at the manufacturer, together with the elements of profitability at the customer. To put it simply, by following the ROI logic, the manufacturer may, with the help of its services, enable customers to do the following:

- increase revenues
- reduce costs
- release capital
- affect the risks (related to the preceding elements) or affect other values and preferences

Let us consider a manufacturing company that aims at developing an extended warranty concept for its machinery. Initially, the normal warranty period is two years, and the idea is to sell an extra year of warranty for 2,000 €, when the selling price of the machinery is 100,000 €. In other words, the manufacturing company is willing to get 2% more revenues from selling the machinery but extend its responsibility until the end of the third year of the machinery in use at the customer.

Regarding management control, the extended warranty is provided in cooperation with the machinery and service units, and it requires negotiations regarding who will get the revenues and possible profits from selling the warranty. On one hand, if the machinery is designed better, fewer warranty claims will be needed. On the other hand, the service unit will be responsible for maintenance and repair (and related costs) in the extended warranty period.

The extended warranty concept can be easily justified because it is well aligned with the strategy of extending the service offering and investing in long-term customer relationships. However, as the extended warranty concept is linked to several existing units and managerial roles, its definition requires special attention. For example, should the extended warranty be directly profitable (e.g., profit = revenues – costs), or should it yield especially indirect revenues and profits (e.g., in terms of the increased machinery sales or strengthened customer relationships). Because the service unit becomes responsible for the warranty claims and maintenance and repair operations, they naturally want to be rewarded for the direct revenues. Therefore, measuring and controlling the extended warranty concept requires identifying the direct and indirect profitability of the concepts, as well as setting clear and acceptable targets for the parties involved.

The elements of profitability at the manufacturer and at the customer related to the warranty concept are also very interesting. Previously, the customer had variable costs of repair and maintenance during the third year of using the machine. With the extended warranty concept, these costs become fixed for the customer, as the customer pays the fixed price for the concept to the manufacturer. As a result, the costs of the manufacturer become variable, as the need for warranty claims and related repair and maintenance vary from one customer to another. The variance can be rather natural; that is, some components need to be replaced due to certain failures, whereas some components perform better longer. However, it is fair to assume that the customers' use conditions and the actual use of the machinery tend to vary, and thus there are customer-specific costs in the extended warranties. Related to the units of analysis by which the profitability is being measured, the extended warranty concept may require measurement both at the service level and at the customer level. In addition, it is important to note that some customer relationships benefit more from the introduction of the extended warranty concept than others. If the machinery manufacturer starts to bear more risk for the customer (i.e., by providing the extended warranty), the perceived value for some of the customers can be significantly greater. On the other hand, the machinery manufacturer needs to consider carefully which customers to offer the concept to. This is to avoid unnecessary risks regarding the warranty concepts and related maintenance needs.

Finally, the extended warranty concept provides a natural use case for the remote technologies and information provided by them. If the product, service, and customer profitability information is combined with the use and maintenance history of the machinery in use at the customer, the machinery manufacturer may become increasingly aware of the probable warranty costs and the desired customers and pieces of machinery to be provided with the extended warranty concept. In this case, the manufacturing company starts monitoring the use of the machinery during the first three years to collect supplementary information for the extended warranty concept, as well as for managing the customer relationships more broadly.

8.4 Lessons learned

Business profitability represents a natural starting point for developing manufacturers' service businesses and for realizing related service business potentials. Therefore, profitability-driven service business renewal represents a desired protocol for understanding the current business context, as well as identifying, selecting, and steering renewal actions toward desired outcomes.

Management control represents the means for supporting the fulfillment of the desired business outcomes. These means range from organizational norms to responsibility structures and performance measures. In the context of industrial service systems, the controls tend to go beyond traditional performance measures and financial controls: First, the controls are being employed for justifying, defining, and controlling the business renewal. Second, new approaches and measures are needed because the traditional units of analysis, for example, product, service, and customer profitability, do not necessarily capture the entire content of the desired service business. Instead, more attention needs to be paid to the profitability of the machinery fleet at the customer, the dynamics between manufacturer's and customer's profitability, and the dynamics between the direct and indirect profits stemming from the service businesses. For example, the profitability of an extended warranty concept is related to the peculiarities of a given piece of machinery in use at the customer, has profitability management consequences for both the manufacturer and the customer, and can be profitable either directly or via better customer relationships or new machinery investments.

Overall, simplicity for the complex environment is desired in both the profitability management and management control for industrial service systems. Usually, the value of the service business is related to the revenues, costs, capital invested, risks, and perceived values of the parties involved. On the other hand, detailed, accurate information on these rather simple aspects is desired to capture the actual content and nature of value-generation both at the customer and at the manufacturer. Such understanding represents a starting point for profitability-driven service business renewal.

9. CONCLUSIONS

This book focused on manufacturing firms and their B2B relationships, particularly as a context for industrial service business. The starting point was manufacturing firms' increasing interest in industrial services as both a way to support customers long after the delivery of equipment and other industrial systems and as a source of new business. We have explicated the variety of different types of industrial services, related processes, and business models as a foundation of the manufacturing firm's strategic move toward services. Manufacturing firms usually first explore single services with certain lead customers. Converting these into a viable business will require considering industrial service systems more holistically, as suggested in this book.

Like any type of new business, industrial service business is a strategic choice for manufacturing firms. Such strategic service business transformation has received increasing attention in the international research field and in practice in various manufacturing industries. Servitization will likely continue to be of interest over the forthcoming decades, both due to its lucrative business potential and due to the numerous practical challenges that companies face in the transformation and the risks regarding failure. Not all manufacturing firms choose to enter service business themselves, but they may also use new kinds of partners in solving customers' service needs.

Figure 38 summarizes the key enablers and management requirements in manufacturing firms' industrial service systems, thereby revisiting the book structure. As the book has shown, many enablers are needed to build the manufacturing firms' readiness for successful industrial services. Industrial service systems challenge the manufacturers to collect new information about their customers beyond their traditional goods-centric offerings. They need to establish new competences and processes to fulfill the customers' expectations. They also need to reconsider their information technologies and systems to gather, analyze, and interpret customer information efficiently and even in a predictive manner in their services.

With the enablers in place, the manufacturing firm will need to manage and develop its service offerings and potentially redesign the organization of its service operations both locally and globally. We have summarized the main changes in the industrial service system into an overarching idea of profitability-driven service business renewal. With a strategic orientation toward industrial services, manufacturing firms will need to include new practices into its governance and control systems to monitor and control the industrial service business holistically. All these areas are currently active domains in industrial service research and potential topics for further readings.

Although the focus has largely been on the manufacturing firms' industrial service systems, this book has at the same time emphasized the networked nature of industrial service business. Industrial services take place in complex supply chains and networks with multiple types of firms. We have mentioned software firms, local small service providers, competitors, suppliers, and various other types of firms

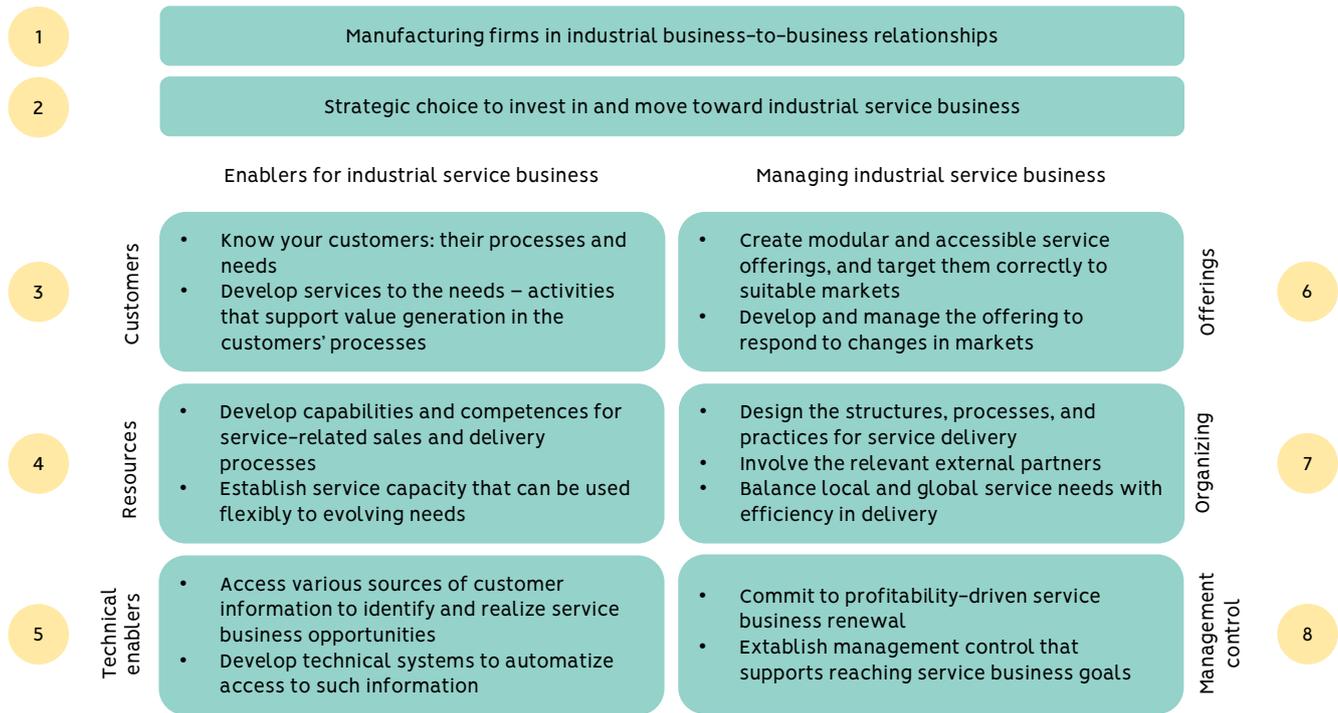


Figure 38. Summary of key issues in enabling and managing successful industrial service business.

whose business may be transformed due to their involvement with the manufacturing firms and their industrial customers. Servitization, therefore, does not imply a transformation only for manufacturing firms and their industrial customers, but the entire network. Service networks offer further possibilities for additional research and readings.

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RELEVANT CONCEPTS IN INDUSTRIAL SERVICE BUSINESS

1. Basic concepts of industrial service operations and innovations

Translated from: Miia Martinsuo, Sanna Nenonen ja Eija Vaittinen (2020, in Finnish) Teollisen palveluliiketoiminnan perusteet. (Basics in industrial service business).

CONCEPT	DEFINITION
Customer	The organization that procures, buys, and pays for the service. In industrial services, the customer is a company that itself can be a manufacturing firm (or sometimes a public organization). Often, there is a need to distinguish among the actor that chooses the service (decision maker), uses the service (user), and procures and pays for the service (payer) within the customer organization as these actors have different interests.
Manufacturing firm (also manufacturer)	An organization that produces raw materials, manufactures goods or systems, and sells and delivers them to customers. A manufacturing firm also can act as a service provider.
Service provider (could also be called service supplier)	The organization that delivers and sells the service. The service provider can be a manufacturing firm or another type of organization that is, for example, purely focused on service provision.
Supplier	A firm that supplies any types of products – materials, components, goods or services – to another firm
Subcontractor	A firm that does certain activities on behalf of a main contractor (such as manufacturer) and, thereby, can supply services and/or materials for the main contractor who then delivers a complete product or system to a customer. (Note: the customer may have its own, other subcontractors)

CONCEPT**DEFINITION****Third party**

An equipment supplier, software provider or another external actor that is NOT part of the service provider's (manufacturer's) direct supply chain but that may affect the relationship between the customer and service provider in some other way. (Note: the customer may have its own, other third parties)

Industrial services

an industrial supplier's activities and processes that add value to the (industrial) customer, fulfill the customer's needs, and

- require supplier's and customer's interaction,
- are connected to tangible assets (e.g., technologies, processes, or goods),
- can be repeated for the same customer or different customers at least in part, and
- pursue business benefits for both the supplier and the customer.

Industrial service product

Industrial services that are intended to be repeated in a similar way: Supplier's activities and processes that are expected to add value to many customers and fulfill the customers' needs.

Service concept

A description of customer needs and the activities through which they are filled. A certain service concept can be formed from multiple service modules and/or components.

Service offering

An entity formed by a certain service and its delivery or multiple services directed at a certain need or market.

**Service business model /
Business model of the service**

Description of the value chain and earning logic required by the service concept for the service provider.

- Business model, therefore, includes the service concept and its components as well as the firm's value chain position, service markets and earning logic for the specific service.
- Note: particularly from the perspective of strategy, the business model can also be considered at the level of the firm (instead of just the single service); i.e. what is the service business model of the firm.

CONCEPT	DEFINITION
Service portfolio	<p>The service provider's collection of service modules and concepts that can be used to tailor various services to customers' needs.</p>
Service mix	<p>The collection of services that the company offers to the customers and is made known to the public.</p> <p>Developing a new or existing service and targeting it for a specific customer or customer segment (to solve that customer's or segment's specific needs).</p>
(Service) tailoring	<p>Developing a new or existing service in such a manner that it can be repeated and diffused broadly to various customer segments and markets.</p>
(Service) productization	<p>A process description of the service, visually presenting the value creating tasks and interaction of the customer, customer service personnel, back office service staff and support staff, and illustrating the needed practical manifestations (such as documentation) and technology and system connections.</p>
Blueprint, Service blueprint	<p>A proposed way in which the service is converted to business benefits during service concept development.</p> <ul style="list-style-type: none"> · May include e.g. target market, customer benefits of the service concept, the market positioning of the service concept, expected income over the service lifecycle, planned investments, planned payback of the investment, and business risks. · In some companies, business case is considered in a narrower meaning and focuses merely on a financial profitability calculation that justifies the investment into developing the new service.
Business case, i.e., earning logic proposal or business model proposal of the service	<p>The operative framework (structures, infrastructure and management) for delivering services to different customers.</p>
Service delivery system	<p>The operative framework (structures, infrastructure and management) for delivering services to different customers.</p>

CONCEPT

DEFINITION

Service development process (or service innovation process)

The purposeful activities through which service innovations are created or existing services are developed.

- Note: the service development process can be used for implementing different service innovations (including new services, development of service operations and processes, and developing existing services).

Service innovation

A new way to create customer value through service that is implemented in practice.

Service innovation may mean:

- developing new services: new service offerings, new targeting of services on the market, identifying new market opportunities for existing or new offerings,
- developing service operations or processes: renewing the entire service value chain or some of its parts,
- developing (existing) services: renewing activities and collaboration at the customer interface.

Service operations

All service-related activities and tasks through which the company affects the customer's service experience.

Service process

The chain of value creating activities and related information and material flows needed to achieve certain customer benefits.

Management of service operations

The organizing, coordination and development of services required to achieve customer's service experience.

Service strategy

The company's strategic intent and means to succeed concerning a single service (or a service product family) as related to the competition. It is common to specify service strategies separately for different markets.

CONCEPT	DEFINITION
Industrial service business	The entity formed by industrial services and service operations that produces benefit both for the firm and its customers. The benefits can be financial or otherwise valuable, and they can be achieved through services directly or indirectly.
Management of industrial service business	Organizing, coordinating and developing the entity of services and service operations to achieve the benefits for the firm and its customers.
Service business strategy	The company's strategic intent and means to succeed in its service mix, as related to the competition. Sometimes there is a need to specify separate service business strategies for different business units or market areas.

2. Additional concepts for industrial service systems and business

Also covered within the main body of text in this book.

CHAPTER 1

Original equipment manufacturer (OEM)	A manufacturing firm that produces parts and equipment that may be designed, sold, and marketed by another manufacturer.
Original design manufacturer (ODM)	A manufacturing firm that designs and manufactures products according to specifications, and the products are eventually rebranded by another firm for sale.
Contract manufacturer	A company that manufactures components, products or systems on behalf of another firm. If such components become parts of another product or system, the contract manufacturer is also a subcontractor.

CONCEPT**DEFINITION**

Equipment
(singular form: piece of equipment)

A set of tools or other objects used to perform certain tasks in order to reach goals. One type of equipment is a machine, which is a mechanical device that uses energy to apply forces and control operations to perform intended actions. Machines vary in complexity (from simple to complex) and consist of multiple elements. Sometimes the word machinery is used to refer to a more complex multi-element machine.

Installed base of equipment

All the pieces of equipment in a customer's use, typically from the manufacturer's perspective (how many of its produced pieces of equipment are in use in the market).

Equipment or machine fleet

All the pieces of equipment that the customer owns and uses. The word fleet traditionally refers to vehicles and sea vessels (a group of them, owned by a certain organization), but it can also be used for equipment/ machines.

Process

A customer value-adding chain of activities that utilizes resources. For example, innovation, production, marketing and sales, and service may have their own processes. Some processes can be considered business processes if they purposely seek to generate economic profit through value generation.

Offering

Any types of business proposals that a firm offers on the market. Offerings may deal with goods or services, product-service systems (PSSs), turnkey solutions, different product and service packages, and so on.

Product-service-system (PSS)

An offering that contains a tangible product core and some supplementary (intangible) services. Services included in the PSS ensure or enhance the product performance throughout the product life cycle and thereby complete the PSS.

CONCEPT**DEFINITION****Integrated solution**

A complete offering (i.e., a comprehensive PSS, bundle of products and services) that solves the customer's complex need. The integrated solution is delivered to a customer as a comprehensive package that also includes coordination of the organizations involved in the solution delivery. Integrated solutions are considered "advanced services," and they can imply changes of asset ownership and the firm's position in the supply chain.

Service encounter

Any interaction—face-to-face, online, by phone or mail, or any other means—between the service provider and the customer.

Front office

The part of a company's operations where customers encounter service personnel. For industrial services, it represents the part of the service delivery system that has direct contact with customers in service encounters.

Back office

The part of a company's operations with which customers do not interact directly, including development, information systems support, accounting, payroll and financial departments, and so on. In industrial services, it is the part of the service delivery system that develops services and provides any kind of support to the front office.

Service experience

The customer's perception of both the service encounters and the value (benefits and costs) of the service.

Note: also the service provider has its own service experience (as part of delivering the service) and so do the possible third parties.

CONCEPT

DEFINITION

Business model

A description of customer value and how it is delivered and converted to business value.

In this book, business model concerns a certain service only, and different services may have different business models. Generally, business models also can be considered for a certain business area or for the entire firm.

(Customer) value proposition

The manufacturer's description of what the service can deliver to the customer, that is, the total of benefits that a manufacturer promises to the customer within the service in return for the customer's associated payment (or some other mode of exchange). The customer value proposition is one key aspect of the business model.

Industrial service systems

Manufacturing firms' (or other industrial service providers') dynamic configurations of resources and related information used for creating value both for the supplier and the customer. The main components of an industrial service systems are as follows:

- Processes
- Technologies
- Offerings
- Organizations and people
- Experiences

CHAPTER 2

Service business transformation

Any strategic, transformational processes associated with the firm's logic of doing service business. It may mean servitization or deservitization, mergers or acquisition of firms that provide services or sell them, service growth or reduction, or other strategic transformations.

Service business development

Any activities that the manufacturing firm undertakes to promote their service business transformation. The firm may set up a certain project or program for service business development.

CONCEPT	DEFINITION
Service transition	Any change process concerning service offerings in a firm. Service infusion deals with increased emphasis on services, but transition may deal with the entry to new markets, bringing services to a new domain, or other transitions.
Service growth or service business growth	Expansion of the firm's service business, which can happen simultaneously in terms of markets (volume) and income (money), as well as the use of resources and investments into services.
Servitization	The transformational processes whereby a company shifts from a product-centric to a service-centric business model and logic.
Service infusion	The process whereby the relative importance of service offerings to a company or business unit increases, amplifying its service portfolio and augmenting its service business orientation.
Deservitization	The transformational process whereby a company shifts from a service-centric to a product-centric business model and logic.
Service dilution	The process whereby the relative importance of service offerings to a company decreases, reducing its service portfolio and augmenting its product business orientation.
Service supply chain	All the firms that are directly involved in (and usually contractually tied to) the value-adding process through which the manufacturer delivers the services to the customers.

CONCEPT**DEFINITION****Service network or service supply network**

Includes the service supply chain as well as its linkages with any other organizations that may directly or indirectly influence the value-adding process through which the manufacturer delivers the services to the customers. Besides the supply chain, it can include, for example, third parties not contractually tied with the manufacturer, design partners not directly involved in service delivery, local organizations affecting the conditions in which the service operations take place, and other organizations with an influence on or interest in the service delivery.

Service triad

The smallest possible network, that is, involvement of three different organizations, all having some kinds of relationships with each other in some phase of the service supply chain. The relationships in a service triad (as in any network) may vary in their composition, closeness, and strength.

Goods(-dominant) logic

Economic exchange where goods are the primary focus of the exchange, embedded with value, and services (in plural) are considered as add-on offerings to enhance the value of goods.

Service(-dominant) logic

Economic exchange based on service (in singular) – process/activities of doing something on behalf of another party – and goods may play a service-delivery role.

CHAPTER 3

Customer(-dominant) logic

Economic exchange in which the starting point of any service provision is the value-generation process at the customer. The customer creates value and allows service providers to participate in the value creation (cocreate), thus highlighting “the creation of service value from the perspectives of value-in-use, the customer’s own context, and the customer’s experience” (Heinonen et al., 2010).

CONCEPT	DEFINITION
Customer need	The existing and potential resources, activities, and outputs that may be needed and useful in the customers' value-generation processes.
Customer wishes	Contain ideas of how those customer needs are addressed.
Customer expectations	A combination of needs and wishes that are identified and specified in the interactions with the customer.
Customer value	The relationship between the benefits and sacrifices that are the result of the product or service provided by the manufacturers or other service providers.
Customer information	All kinds of information about the customers, their needs for equipment (i.e., the manufacturer's products/systems), and the operations where that equipment is being used.
Customer awareness	The manufacturer knowing relevant aspects of the customers' business that can be useful in developing its equipment and service business.
Service market potential	The size of the service market at a certain time. For a manufacturer, this means the volume or value of all the service needs of their selected customers. Service market potential can be specified for each service separately or all services (the entire offering) in total, and for different customer segments separately or for all customers in total. For machinery manufacturers, this can mean more specifically all the service needs of the machinery in use at the customers during their entire life-cycle.

CONCEPT**DEFINITION****Service business potential**

The possible service business for a company, compared with the current share of the company of its customers' business. It could be defined in monetary terms (e.g., EUR), or in relative terms (e.g., % of business). A broad definition of service business is all the business that a company could do with its customers. A narrower definition is the potential business related to the activities, now undertaken by the customers themselves or by third parties (e.g., spare part sales vs. spare part needs).

CHAPTER 4**Resources**

Bundles of tangible and intangible assets that are owned or can be controlled by a firm.

Human resources

Individuals who work for a firm or an organization. The alternative words could be employees, workforce or personnel.

Competences

Combinations of knowledge, skills (know-how), and personal attributes that are required to perform a specific task.

Capabilities

A firm's ability and capacity to deploy competences of resources (to gain competitive advantage).

Service capacity

A measure of how many activities can be done in the service unit with available resources under normal working conditions during a specific period.

CHAPTER 5**Remote technology**

Technical component, tool or application used in a remote monitoring system. E.g. sensors that gather data, networks that transmit data to a repository, and analytical and operational rule systems which are responsible for storing, retrieving, analyzing and visualizing data as well as making recommendations and triggering alarms.

CONCEPT**DEFINITION****Remote monitoring**

Receiving data from the installed base of equipment by monitoring the products and their use from over a distance, anywhere in the world. It could also mean diagnosing production systems and their components across organizational boundaries.

Remote monitoring system (RMS)

A collection of sensors and data transmitters that are placed on the products and connected to information systems and that enable the manufacturer to monitor products from a distance, collect data to create services based on data analysis, and improve their understanding of product utilization.

Indicator

A performance measure that provides useful information about business, for a certain usage purpose.

Key Performance Indicator (KPI)

A part of the selected set of the most important indicators. A KPI provides information on the performance of certain business operations, in terms of a predefined calculation or figure and in contrast to a business objective or target.

Internet of Things (IoT)

The networked interconnections of everyday objects.

Industrial Internet

In the industrial service systems, the networked interconnections of objects form the Industrial Internet, which refers to establishing and using those interconnections in the industrial context.

CHAPTER 7**Service delivery systems**

The structures, processes, and practices through which services are delivered.

CONCEPT**DEFINITION**

CHAPTER 8

Profitability

The financial performance of a company. It can be simply measured by profit margin (revenues – costs) or more comprehensively by return on investment (ROI).

Return on investment (ROI) = (revenues – costs) / capital invested

Profitability-driven service business renewal

Developing service businesses while bearing in mind the elements of profitability at the manufacturer and at the customer. In addition to money, firms need to consider risks, uncertainties, and the personal values and preferences of the actors in service business renewal.

Management control

A set of means to enable, support, and ensure the fulfillment of desired outcomes.

Management control system (MCS)

An entity consisting of different control mechanisms, ranging from organizational norms to responsibility structures and performance measures. The MCS's purpose is to ensure that the organization's objectives are met.

**INDUSTRIAL
SERVICE SYSTEMS**