A capabilities-based service development process for industrial manufacturers

Roland Helm* and Yvonne Graf

Strategic Industrial Marketing,
University of Regensburg,
Universitätsstraße 31,
93053 Regensburg, Germany
Email: sigm@wiwi.uni-regensburg.de
Email: yvonne.graf@wiwi.uni-regensburg.de
*Corresponding author

Abstract: Despite years of research regarding service innovation, there is no generally recognised model for the process of new service development (NSD). Focusing on industrial manufacturers, we create a new approach based on the participating actors’ resources and capabilities. After determining general characteristics of the NSD process, we deduce corresponding requirements conducting a literature review. We find that during NSD, the supplier has to develop, next to the service elements the client receives afterwards, resources and capabilities which are required for the later delivery and hence closely linked. To learn about its necessary resources and capabilities and to match them with those of the customer the firm needs to consider organisational antecedents, communicative and collaborative skills as well as the processing and integration of new knowledge during all innovation stages. Besides, it has to assess the clients’ cooperation willingness to gain knowledge about the customers’ resources and capabilities from the beginning.

Keywords: new service development; NSD; innovation process; customer co-creation; customer knowledge; industrial manufacturers.


Biographical notes: Roland Helm is Full Professor and holds the Chair of Strategic Industrial Marketing at the University of Regensburg, Germany. He holds a Diploma from the University of Regensburg and an EMBS from the University of Wales. He received a PhD and the Post-Doctorate degree in Business Administration from the University of Augsburg, Germany. He is interested in the development and marketing of complex industrial products, innovation management and strategic marketing. His research has been published in journals such as Research Policy, European Journal of Operational Research, International Business Review, Technovation and others.

Yvonne Graf joined the Chair of Strategic Industrial Marketing at the University of Regensburg, Germany, in 2014. As a Research Fellow, she conducts research, consults and teaches on several topics including industrial
markets, service research, innovation management and dynamic capabilities. Before, she has gained substantial experience in the industry in the area of business development.

1 Introduction

The topic of developing new services has extensively been examined by researchers for the past 30 years (Carlborg et al., 2014). Although services and thus their innovation play a central role in both service and manufacturing companies (Kowalkowski et al., 2012), we are far from fully grasping the concept of new service development (NSD) (Biemans et al., 2016). This is especially true for the NSD process itself which has been shown to be an important success factor of innovation efforts (Johnson et al., 2000).

Over the years there have been several attempts to establish an optimal NSD process (Johnson et al., 2000; Scheuing and Johnson, 1989), at first mostly based on the Booz Allen Hamilton model for new product development (NPD) consisting of distinct steps and activities (Booz et al., 1982). However, as services are a combination of tangible and intangible resources as well as processes, the successive execution of activities is not an adequate portrayal of their development process (Makkonen and Komulainen, 2014).

To cope with that fact, researchers shifted from activities-oriented models to such resting upon competencies. Recently formulated NSD processes are based on learning (Gottfridsson, 2010, 2012; Stevens and Dimitriadis, 2005), networks or collaboration (Syson and Perks, 2004). However, such contributions did generally not apply a processual perspective which is important since requirements for NSD respectively their characteristics may differ in different stages of the corresponding process (Blazevic and Lievens, 2008). Hence, until now uncertainty is prevailing about the requirements needed for certain steps. In this contribution, we aim to close this gap in the context of industrial manufacturers. These firms experience difficulties in developing services due to their product-related perspective (Kindström and Kowalkowski, 2009) which they might also apply to the process of NSD. However, the adoption of this perspective for innovating services is not promising since the development and delivery of products and services differ in the mentioned context. Surprisingly, there are scarce insights into how manufacturers should organise their service orientation in terms of the innovation process (Kindström and Kowalkowski, 2009).

In order to investigate necessary requirements in this business-to-business (B2B) context, we build upon the approach of Yadav et al. (2007), according to which an innovation process can be divided into the stages detection, development and deployment. Taking them as a basis, it is first of all essential to know which actors participating in NSD influence the respective stages in which way. To address this latter aspect, we determine and contrast the characteristics of the NSD with those of the NPD process. In accordance with our focus on industrial manufacturers, we consider two actors, namely the supplier which is the innovating firm as well as its business customer. Proceeding this way, we find that the NPD process is determined by the capabilities and resources of the innovating company and the resources of the client whereby these idiosyncrasies of both actors may differ for different innovation stages. In contrast, during the NSD process resources and capabilities of the supplier are similar and thus closely linked. Additionally, the process incorporates the client’s capabilities next to its
resources whereby these are the same throughout the innovation stages including the service delivery. The firm thus has to assess the resources and capabilities of a customer segment from the beginning in order to optimally involve the clients in the subsequent delivery. This proceeding yet again clarifies that a mere transfer of NPD process models to the concept of NSD is not appropriate.

The importance of collaborating with or integrating the customer was already recognised by other authors (e.g., Alam and Perry, 2002; Melton and Hartline, 2010). However, these considerations are not sufficient regarding the NSD process of industrial manufacturers because the perspective of the client and thus the actual incorporation of its idiosyncrasies is lacking. The service-dominant (S-D) logic which we adopt for our subsequent reflections follows a different approach than the papers above defining value creation as an interactive procedure with customers being co-creators (Vargo and Lusch, 2004, 2008). Applying this theory, Makkonen and Komulainen (2014) could show that the NSD process is a multi-actor matching one between needs and technologies. However, it still remains unclear which characteristics of the participating actors are necessary for executing it. We aim to close this gap by deducing certain requirements from the literature necessary to succeed in the three previously introduced innovation stages. A result is a bilateral approach for executing the NSD process in the sense of two layers reflecting the perspectives of both the innovating company and its client from the background of the above-mentioned peculiarities, i.e., considering the resources and capabilities of both actors from the beginning. In this way, we meet the need to create a process of innovating services for which the customer’s idiosyncrasies hold as important as those of the firm. By focusing on NSD in the area of industrial manufacturers, we enter a field of research which is in an early stage (Kindström and Kowalkowski, 2009). Additionally, we meet recent calls for improving the understanding of customer interaction during the NSD process (Carlborg et al., 2014).

The key results of our paper include that the innovating firm has to plan and develop resources and capabilities during the innovation stages next to the service attributes which the customer receives later on. These resources and capabilities are needed for the delivery of the new service and are, consequentially, closely interconnected. Furthermore, we will show that for learning about and matching the necessary resources and capabilities of both actors, the company needs to consider organisational antecedents, communicative and collaborative skills as well as the processing and integration of new knowledge throughout the innovation process. Additionally, the evaluation of the customers’ cooperation willingness is crucial for the supplier to gain awareness of the clients’ resources and capabilities.

The remainder of this paper is arranged as follows: first, we review the current state of NSD research applying it to the context of industrial manufacturers. We then illustrate the distinction between the NPD and the NSD process whereupon we deduce several requirements for the latter. Next, we discuss our results which are ensued by concluding remarks.

2 Theoretical foundations

Below, we outline the need for industrial manufacturers to develop services before we illustrate how the process of NSD, in general, evolved from resting upon activities to competencies. We apply these more recent approaches to the context of industrial
manufacturers making use of a processual perspective. In order to ascertain how the participating actors generally influence corresponding innovation stages, we subsequently compare the characteristics of the NSD to those of the NPD process. Considering the results, we thereupon deduce various requirements for developing new services based on an extensive literature review.

2.1 NSD process for industrial manufacturers

Manufacturers increasingly experience a shift from solely offering products to also becoming service providers which are expressed in terms such as servitisation or service infusion (Benedittini et al., 2015). This trend arose due to needs of differentiation resulting from challenges including increased competition (Vandermerwe and Rada, 1988; Visnjic Kastalli et al., 2013). The establishment of a service next to the product business of manufacturers is thus connected with securing long-term growth and gaining competitive edge (Jacob and Ulaga, 2008; Vandermerwe and Rada, 1988).

In order to successfully innovate services, these firms have to dissociate from their initial product perspective. To date, it is not clarified how the innovation process needs to be adapted for this purpose. We, therefore, have a closer look at the insights of general NSD research in order to determine if and how certain approaches can be applied to the manufacturing industry, namely in a B2B context.

In the literature, NSD is generally described as the modification of a service concept involving different competencies from current operations (Menor et al., 2002). The depiction of the according development process was exposed to some changes over time. In the beginnings, academics held a structured process, i.e., a sequenced execution of activities, accountable for the success of new services (de Brentani, 1991; Froehle et al., 2000). The process of NSD was thus often based on the linear one for products by Booz et al. (1982). The contributions of Shostack (1984), Bowers (1989) as well as Scheuing and Johnson (1989) belong to these initial models (Edvardsson et al., 2013). Johnson et al. (2000) took a step forward by including non-linear elements within previously defined stages, e.g., by presenting them in a cyclic order.

More subsequently, academics could show that a formalised process is of less importance for NSD success in contrast to other factors such as market acuity (Menor and Roth, 2008). In line with this observation, process models were increasingly based on competencies of the innovating firm rather than on activities. Stevens and Dimitriadis (2005) designed an informal organisational learning process which is influenced by interactions with internal and external individuals and groups as well as infrastructure. Gottfridsson (2010) also focused on learning and described the NSD process as being iterative but relatively informal. His cognitive process is about creating knowledge and acquiring competencies to develop a new service. Syson and Perks (2004) considered the firm’s environment for the process of NSD and thus understood it from the perspective of network analysis. They claimed that managers should make use of their company’s relations within the NSD process. Despite these various endeavours, there is still no generally valid standard for the process of developing new services (Biemans et al., 2016). This lack may be attributed to the missing application of a processual perspective to such competence-based approaches resulting in vagueness about the requirements needed during certain stages.
Focusing on industrial manufacturers, we will adopt such a competence-based perspective for analysing their NSD process. Except for the contribution of Kindström and Kowalkowski (2009), research about industrial manufacturers is scarce in this context. The authors recognised the need for these firms to innovate services and determined NSD specific traits, critical aspects and challenges per innovation phase. However, they did not directly identify requirements in the sense of competencies necessary in order to successfully pass through certain innovation stages for the firm and its customer.

In order to meet this gap, we refer to Yadav et al. (2007) in the following who identified three stages, namely detection, development and deployment, as essential for innovating. This approach especially fits to our considered setup since these stages do not represent discrete events, like the activities-based phases formulated by other researchers (e.g., Johnson et al., 2000), but rather a process evolving over time (Blazevic and Lievens, 2008; Yadav et al., 2007). There are few authors who made use of these or similar stages to investigate an innovation topic, e.g., the roles customers can occupy in knowledge coproduction (Blazevic and Lievens, 2008; cf. Stevens and Dimitriadis, 2004), however, not for the purpose of creating an NSD process. In order to meet that gap, we first need to define how detection, development and deployment are generally determined which we achieve by contrasting the NSD with the NPD process in the following. Thereafter, the understanding of the characteristics of the processes enables us to identify various requirements for NSD during the stages.

2.2 NPD vs. NSD process

Both the NPD and the NSD process of industrial manufacturers are initiated when either the company itself or its client has an idea for a new product respectively service or identifies a specific problem whereby these occurrences correspond to the stage detection. Afterwards, the process of creating physical products varies from that of services. The actual development of new products (upper part of Figure 1) is mainly determined by the company’s capabilities (e.g., know-how) and resources (e.g., financial and technical equipment) as well as the client’s resources (e.g., financial means). The ensuing sale corresponding to the deployment stage is separate from the development process and, in this line, might require different capabilities and resources for both actors. In order to illustrate the distinctiveness of their assets, we label them diversely as can be seen in the upper part of Figure 1 (whereby the terms such as ‘type A’ solely serve to keep them separate and thus can be exchanged): while during the development of new products the firm’s resources and capabilities of type A are relevant, those of type B is necessary for the sale. The client’s resources can be labelled as such of type C for product development and such of type D for the sale (Figure 1) as they do not have to be equal to those of the firm. Since the development process and thus the developed value are not directly linked to the subsequent delivery of that (service) value, both parts are illustrated as single arrows in Figure 1 reflecting distinct sections. Our explanation becomes clear with an example from the logistics sector: let us assume that a truck is only partially filled because diverse kinds of goods need to be refrigerated differently during their transport. The present container, however, does not offer the possibility to demarcate areas resulting in a consistent temperature for the whole vehicle and consequently a smaller number of
goods types which can be transported at the same time. Thus, the idea is to create a container with several temperature areas which can be adjusted individually in order to avoid inefficiencies during transportation. It is the manufacturing firm’s task to work on a new prototype. Therefore, capabilities, e.g., know-how, are required to make use of new technologies which are implemented in this innovative container. Additionally, the firm needs appropriate resources such as machinery to actually build the new product. During the development, the manufacturer also has to keep in mind the financial resources of the client for creating an affordable product benefit. The client’s capabilities, however, can almost be neglected (the staff has to be able to work with the new equipment in the right way) since they are not necessarily related to the details of prototype development. Once the new container is on the market, it is distributed by the firm. This happens detached from the previous prototype creation namely by the sales department. Other capabilities (e.g., sales skills) and resources (e.g., personnel) than before might be required next to the consideration of the client’s resources such as the financial means and the number of drivers.

**Figure 1** Contrasting resources and capabilities in NPD and NSD processes

The mentioned process differentiates itself from that of services (lower part of Figure 1). One main difference concerns the relation between the development and the sale respectively delivery of the new product or service. In contrast to NPD, these two parts cannot be separated for NSD, i.e., the process of service value innovation is identical to the process of service value delivery. In more detail, within the NSD process, a firm creates the process which it performs with and for the client to generate value afterwards. We, therefore, illustrate both parts as a continuous arrow in the lower part of Figure 1. Another difference, resulting from the previous one, constitutes the extensive
inclusion of the client’s capabilities next to its resources during service development as well as delivery corresponding to the deployment stage. As expressed by the service characteristic inseparability, the performance of a service is driven by the quality of cooperation with the client (Sasser et al., 1978). The service is thus client-(segment-)specific because the innovating firm has to expect a certain kind of interaction. Transferred to NSD, knowledge about a customer segment’s idiosyncrasies is an essential part of the innovation process in order to design the delivery of the service accordingly. Thus, resources and capabilities of both the innovating company and its client are necessary for the NSD process. Summing up, we find that NSD is defined, in contrast to NPD, by only two types of resources and capabilities. In the lower part of Figure 1, it gets visible that those of type X, possessed by the innovating company, are relevant during both development and delivery of the service. Accordingly, resources and capabilities of type Y determine these two stages from the perspective of the client. The difference in these required tangible and intangible assets for NSD and NPD illustrates that process models for the latter cannot be simply transferred to the concept of service innovation and, thus, the necessity to create a distinct NSD process.

For an example we again draw on the logistics sector: the manufacturing firm which has developed the container for its client in the foregoing example aims to provide corresponding new services as well, e.g., the sale of the container could be bundled with IT-related trainings or the personal support of a firm’s expert. In order to create successful service solutions, the service innovator, i.e., the manufacturing firm, has to be able to see things from the client’s perspective including its resources and capabilities, such as if and to what extent the personnel is able to handle the container. In contrast to the NPD process, knowledge about the capabilities of the client is of relevance to offer new services which fit to its needs and demands. Thus, during the process of development in which the delivery of the new service is created, capabilities and resources of the manufacturing firm, as well as its customer, have to be well coordinated.

In general, the idea of integrating the client has already been subject to the development process of new services (e.g., Alam and Perry, 2002; Melton and Hartline, 2010) whereby previous contributions did rarely go beyond considering the client as input factor for that process or depicting the relevance of a company’s collaborating competencies. However, other than for NPD which is mostly based on lead users’ assets, such a client integration is not sufficient for NSD in the context of industrial manufacturers since the cooperation between the firm and its customer, due to the inclusion of its capabilities throughout the whole process, is necessary for every single delivery of the service later on.

A current approach adopting a similar position is the S-D logic introduced by Vargo and Lusch (2004). It sees services as fundamental to economic exchange with customers and partners as co-creators of value whereby value itself is determined in the context of its beneficiaries (Vargo and Lusch, 2004, 2008; Vargo et al., 2008). Makkonen and Komulainen (2014) applied the S-D logic for defining the NSD process as a matching one between actual and emerging needs as well as actual and emerging technologies. The matching is not executed by a firm alone but based upon an open-ended inter-organisational interaction (Makkonen and Komulainen, 2014). It is associated with an inclusion of the participant value for developing the new service next to the innovating firm’s value.
Despite these considerations, it is, until now, not clarified which characteristics of actors participating in the NSD process enable its successful execution. Adopting the S-D logic and thus the focus on customers as co-creators, we, therefore, deduce certain corresponding requirements for both actors from the literature below.

3 Requirements for the NSD process

Taking into consideration the above-identified idiosyncrasies of NSD, we specify the requirements of the company and its client for innovating services. We thereby make use of separating the NSD process into detection, development and deployment since the requirements respectively their manifestations might not be the same for each stage. For identifying these, we conducted an extensive literature review. We concentrated on contributions in the area of service innovation as well as focused on such which considered one or more stages in the NSD process. For our search, we referred to journals covering service and innovation management, marketing as well as general business administration. Additionally, we made use of the platform Google Scholar.

Our subsequent explanations result from the respective summaries in the Tables 1–3. Each table represents a stage adopted from Yadav et al. (2007) also made visible in the respective first columns. Per table or stage, we divided our findings by actor (column 2) and topic or requirement (column 3). Finally, we exemplarily provided some insights into our results by making use of quotes which reflect the requirements (column 4).

The main goal of detection (Table 1) is to create various ideas out of which a new service is developed afterwards (Blazevic and Lievens, 2008). This stage is thus about connecting with people within the firm as well as external ones to detect technological trends, to learn about the client’s current needs and problems (Lievens et al., 1999; Makkonen and Komulainen, 2014) and especially to establish relationships with the customer in order to gain knowledge about the respective segment’s capabilities and resources later on since these determine the development and delivery of the offering. As a precondition, it is of importance to create an innovative culture (Eisingerich et al., 2009; Stevens and Dimitriadis, 2005) which allows employees to spend time talking to each other about potential ideas and to transfer the innovative spirit to the company’s external environment motivating the client to participate in innovation projects for diversified idea generation (Ackermann et al., 2015; Lievens et al., 1999). Therefore, its willingness to share know-how and cooperate is crucial next to the company’s respectively the employees’ ability to work together as well as with the client (Bettencourt et al., 2002; Oliveira and von Hippel, 2009; Ordanini and Parasuraman, 2010). Reaching the goal of this stage is supported by a structured collection of information (Vermeulen et al., 2005) in order not to lose ideas as well as by a continuous analysis of this information such as drawing conclusions from the company’s and the client’s experiences (Magnusson, 2009).

The second stage (Table 2) is about the new service’s respectively its delivery’s development (Blazevic and Lievens, 2008; Yadav et al., 2007). This is achieved by (re-)combining the company’s existent and new resources and capabilities (Skålén et al., 2015) as well as by synchronising them to those of the client (segment) since it is of no use to create a service that the latter is either able to develop itself or not able to make use of. For this purpose, an evaluation of a segment’s idiosyncrasies is necessary as a precondition for optimally involving the customer later on. The (re-)arrangement of the
company’s resources and capabilities is determined by an organisation’s innovation strategy in order to align the (creation of the) new service with the organisation’s business context and portfolio (Edvardsson et al., 2013), e.g., to deliver the service in combination with existent ones to the same or similar clients. Additionally, an exchange between employees of various departments to combine information and know-how as well as to reduce uncertainty about the service’s peculiarities is required during development (Stevens and Dimitriadis, 2004). For evaluating the clients’ features as a prerequisite to align the service to them, cooperation between both actors is crucial (Salunke and Weerawardena, 2014; Skålén et al., 2015) since customers and product developers judge value differently (Witell et al., 2011). Besides, various people work at the creation of the service at different times and places in the development stage. These circumstances make it central to carefully document results during the progress of innovation development. Coordinating gained internal and external information as well as making resources and capabilities of the company and its client visible allow to refine and to build upon them (Stevens and Dimitriadis, 2004). A structured documentation thus also supports the creation of a consistent understanding of that service (Nicolajsen and Scupola, 2011).

Third, the goal of the deployment stage (Table 3) is the delivery of the new service. Thus, the firm’s resources and capabilities which have been recombined in the previous development stage are duplicated and adjusted to the respective client environments (Blazevic and Lievens, 2008). Additionally, previously evaluated idiosyncrasies of the customers are being made recourse to here implying that the focus is now on individual ones instead of general client segments. These tasks require organisational flexibility (Bitran and Pedrosa, 1998) which is reflected by the ability of employees to work with new actors and to communicate the benefit of the service adapted to the client’s backgrounds (Lievens et al., 1999; Stevens and Dimitriadis, 2004). This actual adaptation is only possible with collaboration between the actors which allows the company to utilise the respective client’s resources and capabilities (Blazevic and Lievens, 2008). The deployment of the service is supported by recording its individual elements resulting in consistent know-how about them. On the one hand, this transparency facilitates their presentation to the client (Kindström and Kowalkowski, 2009). On the other hand, with an exact knowledge about its elements, the service can better be adapted to the client’s background (Salunke and Weerawardena, 2014). A successful execution of these requirements results in a learning process through which information is processed, client environments are understood and adaptations of the service can be allocated to these backgrounds accordingly (Stevens and Dimitriadis, 2005).

4 Consolidation of requirements

Our process for NSD considers the idiosyncrasies which we identified in Figure 1, namely that it is determined by resources and capabilities of both the innovating company and its client. Hence, in order to build new services which correspond to the customer’s needs or even create such, tangible and intangible assets of both actors have to be understood. For this purpose, we deduced several requirements for NSD, i.e., for detection, development and deployment, from the literature.

All three stages contain firm-related antecedents for innovating, from establishing an innovative culture and strategy during detection and development to providing flexibility
for aligning the service during delivery (Tables 1–3). Thus, innovation and innovative activities need to be supported by management and enabled by organisational conditions throughout the NSD process.

Table 1 Requirements for the detection of new service ideas

<table>
<thead>
<tr>
<th>Stage</th>
<th>Actor</th>
<th>Requirements</th>
<th>Literature-based evidence for these requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Company</td>
<td>Innovative culture</td>
<td>“[F]irms [need to] develop an internal culture that welcomes […] innovative processes” (Eisingerich et al., 2009, p.354; cf. Stevens and Dimitriadis, 2005)</td>
</tr>
<tr>
<td>Detection</td>
<td>Communication of innovativeness/integration of employees and customers</td>
<td></td>
<td>• “[T]he goal of the communication of innovation should be to confront all stakeholders […] from an early stage” (Ackermann et al., 2015, p.402)</td>
</tr>
<tr>
<td>Collection of ideas</td>
<td></td>
<td></td>
<td>• “The quality of internal communication during the planning stage is crucial for new service performance” (Lievens et al., 1999, p.39; cf. de Jong and Vermeulen, 2003)</td>
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<td></td>
<td></td>
<td></td>
<td>• “[T]he participation of contact personnel seems to be a […] driver of service innovation” (Ordanini and Parasuraman, 2010, p.12; cf. Rubalcaba et al., 2012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• “[U]sers will tend to be the first to develop […] services” (Oliveira and von Hippel, 2009, p.19)</td>
</tr>
<tr>
<td></td>
<td>Company</td>
<td>Previous requirements important for: Discerning of technological trends and anticipating market needs</td>
<td>“NSD can be seen as the identification and matching of actual and emerging needs and technologies” (Makkonen and Komulainen, 2014, p.19; cf. Lievens et al., 1999)</td>
</tr>
<tr>
<td>Client</td>
<td>Willingness to cooperate</td>
<td></td>
<td>“[T]he client openly communicating information […] [is] critical in the early stages of a project” (Bettencourt et al., 2002, p.110; cf. Nicolaisen and Scupola, 2011)</td>
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<td></td>
<td></td>
<td></td>
<td>In the fuzzy front end, user involvement enhances “a company’s technology knowledge with vital use knowledge” (Magnusson, 2009, pp.591–592; cf. Blazevic and Lievens, 2008; Stevens and Dimitriadis, 2005)</td>
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Table 2 Requirements for the development of the new service respectively its delivery

<table>
<thead>
<tr>
<th>Stage</th>
<th>Actor</th>
<th>Requirements</th>
<th>Literature-based evidence for these requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Company</td>
<td>Innovation strategy</td>
<td>• “[M]anagers underestimate the role of having an NSD strategy and aligning NSD projects with internal resources and capabilities” (Edvardsson et al., 2013, pp.38–39)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internal and external collaboration (who can contribute to solving which possible service)</td>
<td>• “The confrontation of divergent points of view on the same problem led to modifications of the initial framework” (Stevens and Dimitriadis, 2004, p.1079)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Documentation of service creation progress</td>
<td>• Producing effective client solutions “requires service providers to possess superior client-focused knowledge” (Salunke and Weerawardena, 2014, p.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development of a consistent understanding of the new service</td>
<td>• “[V]alue propositions must be evaluated from the perspective of the customers’ value creation” (Skålén et al., 2015, p.138; cf. Bettencourt et al., 2013)</td>
</tr>
<tr>
<td></td>
<td>Client</td>
<td>Willingness to cooperate</td>
<td>• “Without such formal presentation of ideas [in the development stage], people could not react and […] contribute to the improvement of the draft” (Stevens and Dimitriadis, 2004, p.1079)</td>
</tr>
<tr>
<td></td>
<td>Company</td>
<td>Previous requirements important for: Combination of existent and new service elements</td>
<td>• “The dialogue and the experimentations contribute to the development of a common understanding of what the method can be used for” (Nicolajsen and Scupola, 2011, p.372; cf. Stevens and Dimitriadis, 2004)</td>
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</tbody>
</table>

Another aspect which occurs in all stages is collaborative activity, either for the goal of heterogeneous idea creation during detection, for elaborating a new service which is also and predominantly perceived as valuable by the client during development, or for implementing various configurations of that service depending on differing client environments during deployment (Tables 1–3). The necessity of this competence illustrates that exchange between actors, both internally among employees as well as externally with the customer, is a basis for innovating. In the Tables 1–3, we can see that
the collaboration does not merely involve teamwork but also communication between the various actors, e.g., during deployment employees need to be able to communicate the benefits of the new service according to the needs of the respective client (Table 3). Despite the fact that communication is an indispensable part of collaboration, it is thus also necessary for itself. As it is also visible in the three tables, the exchange is dependent on the cooperation willingness of the client illustrating that the customer’s idiosyncrasies are an integral part of the NSD process.

Table 3 Requirements for the delivery of the new service

<table>
<thead>
<tr>
<th>Stage</th>
<th>Actor</th>
<th>Requirements</th>
<th>Literature-based evidence for these requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment</td>
<td>Company</td>
<td>Organisational flexibility</td>
<td>“The challenge is to design a service system for reproducibility but with flexibility to recognise and adapt to differences” (Bitran and Pedrosa, 1998, p.187)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Demonstration of the service’s benefits; openness of employees, also to motivate the client to participate in shaping the new service</td>
<td>“The creation of awareness […] and realistic expectations […] among the potential customers are positively related to the quality of external communication” (Lievens et al., 1999, p.39; cf. Bower et al., 2000; Wyatt, 2000)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>“[Employees] had to exchange information and know-how in order to achieve a good performance” (Stevens and Dimitriadis, 2004, p.1080)</td>
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<td></td>
<td></td>
<td></td>
<td>“Knowledge coproduction by customers and the resulting increase in organisational knowledge also influences perceived service quality” (Blazevic and Lievens, 2008, p.149; cf. Stevens and Dimitriadis, 2005)</td>
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<tr>
<td></td>
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<td>Recording of the new service’s components</td>
<td>“[A]chieve synergies through economies of repetition [by investing] in organisational routines to codify such knowledge” (Salunke and Weerawardena, 2014, p.4; cf. Kindström and Kowalkowski, 2009)</td>
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<td></td>
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<td>Comprehension of the service’s components and the client environments</td>
<td>“Operations had to learn the proposed rules and to adapt them to the local context so that they could be efficient” (Stevens and Dimitriadis, 2005, p.187)</td>
</tr>
<tr>
<td>Client</td>
<td>Willingness to cooperate</td>
<td></td>
<td>Passive and active informants, as well as bidirectional creators, are important for the deployment of a new service (Blazevic and Lievens, 2008)</td>
</tr>
<tr>
<td>Company</td>
<td>Previous requirements important for: Diffusion of the new service</td>
<td></td>
<td>“Deployment refers to the exploitation of additional features and improvements to existing features of the launched […] service” (Blazevic and Lievens, 2008, pp.148–149)</td>
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The mentioned exchange between actors implies a continuous processing of information. Consequently, it is also of high importance to render this information, the corresponding activities and the existing and emerging elements of the new service visible in order to make the respective proceeding comprehensible for all participants. These requirements turn up in all our stages from collecting ideas during detection and documenting the progress of developing the service until recording its elements during deployment (Tables 1–3).

The NSD process can be depicted as consisting of learning loops (Stevens and Dimitriadis, 2004, 2005; Tables 1–3). These happen all the time in case communication and collaboration are performed enabled by organisational preconditions, and by making service ideas as well as their elements visible: while during detection, conclusions from experiences for idea generation have to be drawn, the development of a homogenous understanding of the new service is achieved before it is recognised how its single elements can be allocated to different client environments during deployment. With our conjunction of this requirement to the previously mentioned ones, especially to the collaborative activities, we follow the argumentation of Miles et al. (2000) stating that collaboration builds the precondition for new ideas and insights whereby that knowledge acquirement is again the basis for learning (Eisenhardt and Santos, 2002; Huber, 1991). This is in accordance with other findings such as that learning is not a formal process but a social one in which the required knowledge is created through the interaction of all actors (Gottfridsson, 2014; Van de Ven, 1986).

We have three remaining requirements which are each assigned to one individual stage of the NSD process. The last one in detection is about identifying market needs and technological trends (Table 1). It results from the preceding requirements in that stage (Table 1). In the development stage, we identified the combination of existent and new service elements as a final requirement (Table 2). The previous ones are again necessary for exerting this requirement. Finally, the diffusion of the new service results from the preceding requirements during deployment (Table 3).

Summarising, the innovating firm has to take into account organisational antecedents, internal collaborative and communicative activities as well as the processing and integration of knowledge throughout NSD. Additionally, the assessment of cooperative skills of the clients is crucial for innovation success in order to offer the supplier insights into their resources and capabilities. Following these requirements results in the successful completion of the three innovation stages by learning about, building up, and matching resources and capabilities of both actors.

5 Conclusions

In this paper, we introduced a new process for innovating services in the context of industrial manufacturers. We first generally determined the NSD process emphasising its distinctiveness and thus the inadequacy to transfer process models from NPD to NSD. We found that, in order to successfully innovate services, the supplier needs to plan and develop resources and capabilities throughout the innovation stages next to the service attributes which the customer receives during service delivery. These resources and capabilities are essential for the delivery of the new service and hence closely linked. Based on these insights, we conducted an extensive literature review deducing requirements for NSD.
5.1 Theoretical implications

This study broadens the scope of the NSD process literature in the context of industrial manufacturers. We illustrate that, during the innovation stages, the firm has to develop resources and capabilities required to deliver the new service later on. Thus, our research highlights the need to dissociate from a pure product-oriented perspective when analysing the development of new services. Besides, this study shows that the supplier should empathise with customers in order to evaluate their resources and capabilities, and correspondingly to stimulate their willingness to cooperate, during service delivery.

Referring to the S-D logic, the topic of co-creation was already applied to service innovation (Makkonen and Komulainen, 2014). However, to date, it was not specified which requirements the supplier should focus on during NSD enabling a successful cooperation with the customer by optimally empathising with corresponding client segments. By taking in a process perspective we identified certain requirements, along with the three innovation stages, which are needed to learn about and match the resources and capabilities of both actors. In more detail, we could show that the supplier has to consider internal organisational antecedents, collaborative and communicative activities as well as the processing and integration of knowledge throughout the innovation process. Furthermore, the assessment of the willingness of customers to cooperate continuously and thus enabling the supplier to gain awareness about the clients’ resources and capabilities is crucial. With our study, we thereby add specificity to the S-D logic in the context of industrial manufacturers.

5.2 Managerial implications

The fact that our paper is based on theoretical considerations is not opposed to the deduction of practical implications. Managers in industrial manufacturing firms need to consider that they cannot apply their NPD procedure to NSD. They should understand that next to the service product development where services attributes have to be defined the firm has to plan and develop the resources and capabilities needed for the later service delivery in an NSD process. Besides, management should consider the comprehensive inclusion of the corresponding resources and capabilities of customers.

5.3 Reflections on further research

After several decades of research in the field of service innovation, academics recently stressed that still, no generally applicable NSD process exists (Biemans et al., 2016), although it has been identified as a success factor for innovation efforts years ago (Johnson et al., 2000). With our approach developed above, we took a step forward in order to close that gap in the context of industrial manufacturers. However, the topic of the NSD process still leaves room for further research.

A first possibility includes broadening our results by making use of the dynamic capabilities theory. Dynamic capabilities are competencies existent within a firm’s management team allowing them to create, extend or modify that firm’s resource base (Helfat et al., 2007; Teece et al., 1997). This approach is especially important for analysing services and their innovation. Intangible products, rather than physical ones, are closer to capabilities which are embedded within an organisation (den Hertog et al., 2010). Throughout the last years, several authors applied the concept of dynamic
capabilities to services and the topic of NSD resulting in dynamic service innovation capabilities (DSICs). These differ from the capabilities in the present study. Here, we considered zero-level or ordinary capabilities which are employed in a stationary process and necessary for an organisation to keep producing and selling its products. First-level capabilities are the dynamic ones (Winter, 2003). These are necessary in order to change or reconfigure the zero-level capabilities (Zahra et al., 2006). An examination if and how such capabilities are relevant for the development process of new services is lacking until now. The utilisation of DSICs for this process, especially in the context of industrial manufacturers, would bring us closer to answering the question which kind of capabilities actors need to possess in order to comply with our identified requirements and consequentially to successfully execute NSD.

Second, in our process, we depicted the perspectives of one innovating firm and its client. Broadening the point of view by including other firms, e.g., suppliers of data infrastructure in an industry 4.0 context, respectively cooperation partners would be a fruitful approach for further research since it is known that inter-organisational links enhance innovation (Goes and Park, 1997). Hence, a potential extension would be to investigate complementarities between requirements, i.e., their effect on the completion of innovation stages in case they are distributed among several partner firms.

Author contributions

All authors contributed equally to the paper.

References


A capabilities-based service development process


