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SOLUTION PROVIDER'S MICROFOUNDATIONS IN THE DEVELOPMENT OF PRODUCT-SERVICE INNOVATIONS

Tuomas Huikkola, Marko Kohtamäki, Rodrigo Rabetino, Hannu Makkonen, Philipp Holtkamp

ABSTRACT

Purpose: The present paper was set out to study how a solution provider manages organisational processes and routines to support product-service system (PSS) development.

Design/Methodology/Approach: This single-case study investigates in-depth one large international solution provider to understand the detailed microprocesses and routines shaping the microfoundations of product-service system development.

Findings: The study suggests that technology companies should consider creating a flexible structure to unleash many types of innovations instead of establishing tailored models to foster different innovation types and avoid falling into the exploitation trap of using innovation to only support the existing business without aiming for new explorative openings.

Originality/Value: The present study opens up the black-box of new product-service innovation (PSI) development model.

KEYWORDS: Product service innovations; new solution development; servitisation-based innovation

1. INTRODUCTION

The development of new product-service solutions has become increasingly important for technology companies to increase their value for customers (Cusumano et al. 2015). This transition from pure products to integrated product-service systems has been defined as *servitisation* (Vandermerwe & Rada, 1988), in which the development of novel product-service innovations (PSIs) plays a central role. When searching PSIs, solution providers develop organizational processes and routines to enable innovative behaviors to understand and facilitate the microfoundations of PSIs. An emerging literature on organizational microfoundations suggests that organizations should understand the behavioral mechanisms underlying organisational innovation to shape organisations that enable novel PSIs to emerge (Felin, Foss & Ployhart, 2015). Studies have defined microfoundations as “*the distinct skills, processes, procedures, organizational structures, decision rules, and disciplines—which undergird enterprise-level sensing, seizing, and reconfiguring capacities are difficult to develop and deploy*” (Teece 2007: 1319). Perhaps surprisingly, the existing servitisation literature has overlooked the microfoundations of PSIs.

Whereas the previous research has advanced our understanding about product development and service development as distinct phenomena, the literature on new service development (NSD) has mostly neglected the integrated character of product-service investments (Ulaga & Reinartz, 2011) by focusing only on service development (de Brentani, 1989) or product development *per se* (Santamaría et al. 2012). Because PSIs include elements from both customer-oriented service business and efficiency-oriented product business, they must be aligned during the solution design phase (Ulaga & Reinartz, 2011). There are also other differences between the NSD process and the NPD process, for instance, the NSD process specifically plays the roles of customers and other stakeholders in solution development. Moreover, NPD places greater emphasis on the prestudy and concept study phases, whereas in NSD, the launch and follow-up phases are emphasised (Kowalkowski & Kindström, 2012). Thus, very little is known about the innovation processes leading to new product-service systems.

The present study aims to understand the microfoundations of PSIs (Cusumano et al. 2015) by studying *how a solution provider facilitates PSIs by establishing organizational processes, structures, and practices*. The present study uses an in-depth single-case study to investigate a large solution

provider's PSI processes and the associated organisational practices. This study contributes to the intersection of the product-service innovation and microfoundations literatures by: 1) identifying the microfoundations of PSIs; 2) demonstrating the micro-processes and routines in PSIs; and 3) describing how the new innovation model can contribute to a firm's strategic renewal.

2. THEORETICAL BACKGROUND

2.1 Servitisation

Industrial services/solutions have attracted increasing academic attention (Raddats et al. 2019). Servitisation studies have demonstrated the increasing importance of effective bundling of products, services and software to develop customized integrated solutions (Ulaga & Reinartz, 2011).

Manufacturers search constantly for new sources of income from novel solutions since differentiation through pure technology/product development becomes increasingly harder (Rabetino et al. 2015). To address these challenges and escape the commoditization trap, manufacturers have started to sell total solutions (Huikkola et al. 2016), integrated solutions (Davies et al. 2006), tailored solutions (Landry et al. 2013), operations and maintenance (O&M) types of solutions, and even performance-based or outcome-based business contracts to their clients (Visnjic et al. 2018). The development of these types of solutions requires resources from both product and service business units (Ulaga & Reinartz, 2011).

2.2 New Solution Development

Service or solution innovation has been defined as the "rebundling of diverse resources that creates novel value for the beneficiaries themselves or in their assets, activities, and processes in a given context" (Kowalkowski & Ulaga, 2017: 149). This definition also encompasses product-service systems (PSS) by incorporating customers as active participants in the service innovation process (Tuli et al. 2007).

In manufacturing companies, service units have typically been considered more similar to money-generating units rather than innovation-generating units. Manufacturing companies are not accustomed to allocating resources to service development initiatives. Therefore, no budget has been created for the development of new services. Services have emerged through daily operations rather than as a result of intentional and systematic processes. Hence, new service development is a novel issue for manufacturers, and the development of new services has lacked systematic processes and models, unlike traditional product development or R&D work.

The extant service marketing and management literature has recognised that product development is generally back-heavy and requires resources for technology development and prototyping, whereas service development is generally more front-heavy, requiring resources for market introduction and piloting phases (Kowalkowski & Ulaga, 2017). The extant NSD literature has identified general processes for new service innovations. For instance, Zeithaml and Bitner (2003) developed a model consisting of front-end planning and implementation phases. In front-end planning, firms must address the questions related to a firm's overall mission and strategy when generating new ideas. In concept development and feasibility analysis, firms must be aware of the potential market demand and answer the question of whether the concept is feasible from a business perspective. In the implementation stage, firms need to consider whether they have accounted for all factors affecting service delivery through prototypes and market testing. When introducing concepts into markets, firms must identify key problems related to service delivery and customer perception.

Product-service innovations (PSI) include elements from both NPD and NSD. As NPD is described as back-heavy and NPD as more front-heavy (Kowalkowski & Ulaga, 2017), PSI should be more balanced in terms of the focus areas in each phase. In the ideation phase, NSD should include black-box types of innovations (typically developed by focal company personnel such as engineers) and white-box types of development from the customer end (e.g., field personnel, such as salespeople and technicians).

In the conceptualisation phase, PSI requires a wide range of collaboration between the manufacturing and service units because PSI innovations affect both CAPEX and OPEX units (Oliva & Kallenberg, 2003). Hence, in the incubation phase, it is already important to have cross-functional collaboration within the firm to ensure that different business viewpoints are included (Porter & Heppelmann, 2015). In practice, this may be problematic because some service innovations may hinder product sales, and some product innovations may hinder future service sales. In the testing and development phase, developing prototypes and minimum viable products (MVP) and piloting them with the customer are critical steps to ensure the idea's initial functionality and potential acceptance. In PSI, these activities could include, for instance, simulations, games, and physical prototypes to assess how valuable customers perceive the idea to be and to identify potential bottlenecks relevant to the innovation. In the productisation (execution) phase, the solution will be industrialised, meaning that it will have a price tag and process description so that it can be sold and delivered both internally and externally. After this, the solution will be ready to be marketed, sold, and revamped.

2.3. Microfoundations and product-service innovations

Eisenhardt & Martin (2000) identify, for instance, cross-functional R&D teams, NPD routines, knowledge-transfer routines and different performance measurement systems as important microfoundations of dynamic capabilities. Thus, microfoundations revolve around the routines of scanning, screening and imagining opportunities (Teece, 2007). While some individuals within companies may possess the needed cognitive and creative skills, researchers have suggested that firms should be able to embed these market-scanning, interpretative, and creative processes within the management system that enables firms to systematically gather technical information, monitor customer preferences, and shape opportunities to develop new solutions (Teece, 2007). In today's high-velocity business environment (Bingham, Eisenhardt & Furr, 2007), top management needs to be careful when allocating resources to discover and search for new opportunities, as management attention is a scarce resource that should not be directed to every opportunity or threat that search efforts reveal (Teece, 2007).

Academic discussion about microfoundations attempts to address how micro factors are related to macro conditions. These micro-macro links are at the core of the discussion of microfoundations (Barney & Felin, 2013), and extant studies have investigated these links through both quantitative (Mazzucchelli et al. 2019) and qualitative methods (Del Giudice et al. 2017). In the innovation context, Mazzucchelli et al. 2019 identified seven microfoundations of strategic innovations. Three of these microfoundations were related to individual characteristics, namely, individual attention to detail, creativity, and openness, and four were related to individual knowledge-sharing behaviors, namely, individual motivation, control, ability, and engagement. Therefore, the existing microfoundations literature has acknowledged the need to study the antecedents, processes, and effects of these microfoundations on the micro-macro axis. The purpose of this paper is to assess the need for a new innovation model, the processes and practices related to this new model, and possible outcomes of the new innovation model initiative. Hereby, we build on Teece's (2007: 1319) definition of microfoundations: *"The microfoundations of dynamic capabilities—the distinct skills, processes, procedures, organizational structures, decision rules, and disciplines—which undergird enterprise-level sensing, seizing, and reconfiguring capacities are difficult to develop and deploy"*. This approach acknowledges that there are organizational processes, procedures, structures, and disciplines that either enable or hinder firms in the face of change. Therefore, microfoundations attempt to open up this black box of the micro-macro axis.

3. RESEARCH METHODOLOGY

3.1 Research design

This study uses an extended case study method to develop an in-depth understanding of how a solution provider utilises a flexible product-service innovation method when developing new solutions. The present study analyzes the case of an industrial solutions provider. We selected this company because it is one of the leading solution providers in its sector, offers customized solutions for global

markets, and has been active in initiating new innovation processes. Thus, the company provides a powerful case of Product-Service Innovation (Siggelkow, 2007) and an opportunity to develop interesting insights into the microfoundations of solution development (Eisenhardt & Graebner, 2007).

3.2 Data collection & analysis

We utilised an extended case study method to reconceptualise and extend the extant theory on NSD. This approach utilizes an iterative approach by juxtaposing data and theory in each iteration, forcing the researcher to seek additional data and explanations to rebuild additional concepts and theories (Eisenhardt & Graebner, 2007).

To analyse firm's product-service innovation processes and practices in detail, we conducted altogether 23 executive interviews between years 2016 and 2019. This gave us insight into firm's key challenges, opportunities related to establishment of new innovation model. First, we conducted a literature review on servitisation-based innovations and new service development. Based on results derived from this phase, we crafted our initial questionnaire template for manager interviews. After the first interviews, we were able to receive case firm's development model for product-service innovations. Based on this, we revamped our questionnaire template to follow the strict modes used by the case company. Next, we utilised this template to develop a better understanding of processes and routines under each development mode. Initially, we interviewed managers responsible for general model development. Moreover, we discussed the holistic model with several managers to confront the practices.

Based on the data, we identified 12 second-order themes related to origins and triggers of new innovation model development (challenges faced in the old model; breaking path dependency; executive support), new model establishment (the new model's four processes: ideation, incubation, transformation, growth), managers' responses to the new model (shared language; becoming more customer-centric and flexible; increased clock speed), and outcomes (development of growth businesses; emergence of new innovations). Because of space limitations, we discuss in this paper four key processes in solution development, namely 1) collecting ideas, 2) incubation, 3) transformation, and 4) productisation.

4. FINDINGS

4.1 Collecting ideas (phase 1)

Ideation refers to sensing new opportunities in the markets (Teece, 2007). These opportunities can be *exploitative* or *explorative* by nature, depending on whether they contribute to taking advantage of existing business and processes or exploring new opportunities outside the firm's current scope (Birkinshaw & Gibson, 2004).

Our respondents highlighted that the most important aspects of the ideation phase are to involve as many people as possible in ideation, encourage people to express and share their ideas, and create a culture that does not hinder or discourage people from presenting and generating ideas. Respondents stated that most ideas will be rejected at this point because they might be duplicates, overexploitative, or inferior. Managers had created a rule of thumb related to the number of ideas that will eventually lead to final execution. Based on interview data, only 1-2% of ideas will eventually be productised and sold to clients. This means that the organisation needs to generate an abundance of ideas that can enter the pipeline in order to generate new solutions to be sold in the future.

To collect these ideas, the company uses both physical boxes and the social media tool to solicit ideas from both firm's personnel and external partners, such as universities, start-ups, customers, and suppliers. One particular challenge case firm faced was that innovations tend to come from the same groups or people. This is understandable because some are more innovative, creative, and idea-rich than others. On the other hand, the key question for case firm was to encourage all personnel to contribute.

Once the ideas have been collected, people are encouraged to comment on them. This community discussion is meant to iterate these ideas within a larger group of people. The goal of this practice is to give fuel to ideas, to make them more powerful by involving more people in the ideation phase. At

the case firm, the tailored social media tool was utilized to comment on and evaluate ideas. Personnel were active in this phase, as managers noted that employees had made substantial contributions to different ideas.

To evaluate the feasibility of ideas, case firm utilised the *business model canvas* (Osterwalder & Pigneur, 2010) throughout the innovation process to refine the idea on its way to the execution phase. When reaching the decision phase in ideation, our respondents unanimously responded that the majority of ideas (~90%) will be rejected at the venture board. Therefore, at this stage, firm evaluates whether the idea has value potential that is worth pursuing further.

4.2 Incubation (phase 2/optional)

Incubation is an optional process and is meant to address the following question: Has the idea been validated to build a minimum viable product (MVP)? First, the validation needs to be conducted in collaboration with customers: would the idea make sense for them? Second, the validation needs to be conducted from the focal company's perspective: would the idea be economically reasonable?

To address these questions, case firm utilised market research to validate whether there is business potential for the idea. Firm also utilised the service design approach in this phase to drive the process. Small prototypes are intended to increase flexibility in the process. Therefore, solution provider can use simulations to understand the potential of the solution. The key idea behind this phase is to make sprints and obtain fast results about the idea's potential feasibility – everything has been designed to increase the organization's flexibility. On the other hand, the incubation phase has been designed to give extra resources and capabilities to the process owner or initial ideator.

One benefit for an organization from a new innovation model is to increase its overall clock speed. One respondent stated how case firm was able to develop the same business concept in just three weeks when it normally would have required 6 months. Thus, incubation facilitates an organization's learning curve by producing preliminary results on the idea, testing the idea more quickly, and obtaining instant feedback on its functionality, thus following the iterative feedback-loop type of learning (Thomas, Sussman & Henderson, 2001).

4.3 Transformation (phase 3)

In the transformation phase, the key goal is to determine whether the MVP's value, urgency, and complexity have been adequately validated internally and externally to roll out and continue larger-scale development. The first practice is handover to a dedicated transformation team. Thus, the development of the MVP is at the center of the transformation phase. The decision of whether the concept should go into production or be rejected depends on the validation: is there a need for the solution and is it economically viable? At this point, there must be a clear indication of demand. There has been an incentive to make the process more agile, and one practice adopted with this goal in mind is to use smaller-scale models, such as those created by 3D printing, before scaling up.

Overall, governance and the need for solution verification increase remarkably in the transformation phase. At this point, the solution needs to be validated, and this validation dictates whether the concept will be revamped or rejected. On the other hand, compared to the incubation phase's decision-making process, the venture board's decision-making is less influential in the transformation phase – the key criterion at this point is the solution's validity both internally and externally.

4.4 Productisation (phase 4)

As only 1-2% of the ideas go on to the growth phase according to interview data, they have already gone through many processes and evaluation rounds. At this point, the concept has been validated and verified both internally (e.g., in financial terms) and externally (e.g., customers have expressed willingness to buy this solution). To ramp up a novel solution, a focal company needs to train its personnel, especially its salesforce, to sell this solution to dedicated clients. Additionally, firms must consider how the solution is produced, productised, and how new solutions will be bundled into existing offerings. Is it seen as a bundle or as an add-on item? These considerations increase complexity

within the organization as separate units and functions within the firm need to be convinced about the new solution; how will it be produced, sold, and delivered?

Figure 1 below presents case firm’s new innovation model and its associated practices. It shows that when progressing in the model, organizational support, governance, risk, and strategic value increase in each phase. It also shows that in the ideation phase, idea screening and sensing are key processes. In the incubation phase, (customer) value identification is a key process, and in the transformation and growth phase, value quantification and verification become essential. The model itself gives room for flexibility and is not meant to be exhaustive but provides general structure and guidelines for proceeding with the idea and concept.

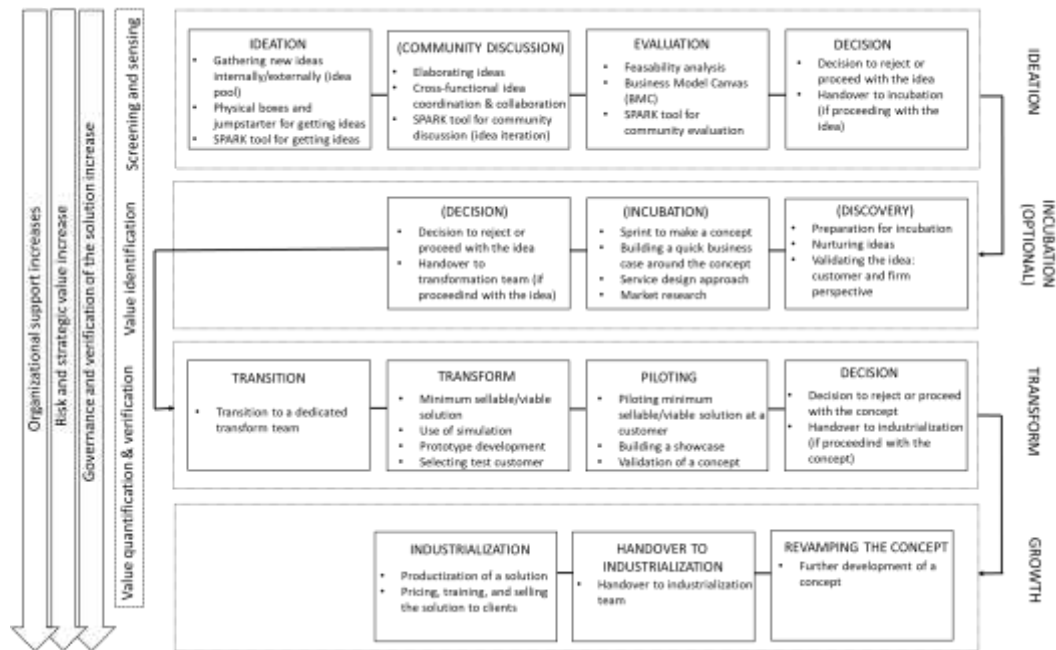


Figure 1: New product-service innovation model and associated practices.

5. DISCUSSION

The increased importance of services and software has forced manufacturers to question their existing innovation models, which are typically product-oriented (Kowalkowski & Ulaga, 2017). To address new challenges, technology companies have renewed their processes and routines to foster not only new product and service development but also solution development models and activities. To facilitate these bundled innovations, manufacturers can establish a flexible and holistic innovation model that considers product, service, process, and business model innovations. To manage such innovations, firms must establish clear processes, procedures and decision-making rules. The present study has investigated these microfoundations, micro-processes, and routines to drive this change through an extended single-case method.

5.1. Theoretical contribution

This study investigated one relatively large Finnish solution provider, and focused on the product-service innovation process the firm used to address the question of microfoundations in bundled innovations. The study’s contributions are threefold. It: 1) identifies the microfoundations of PSIs; 2) shows the micro-processes and routines in PSI; and 3) describes how the new innovation model can contribute to a firm’s strategic renewal.

As a first theoretical contribution, we identified altogether 12 second-order themes related to the origins and triggers of new innovation model development (challenges faced in the old model; breaking path dependency; executive support), new model establishment (new model's four processes: ideation, incubation, transform, growth), managers' responses to new model (shared language; becoming more customer-centric and flexible; increased clock speed), and outcomes (development of growth businesses; emergency of new innovations).

The second theoretical contribution relates to the demonstration of micro-processes of PSI, i.e., the illustration of these micro-level processes and practices, which are utilized to support PSIs. Thereby, this study extends the extant literature on servitisation by describing how product-service innovations emerge and are managed at the corporate-level. Holistic framework for PSI's include four key phases: 1) ideation, 2) incubation, 3) transformation, and 4) growth. In ideation phase, routines include tools for gathering new ideas such as physical development boxes, jump starter, and use of social media tools. Another important routine was related to the elaboration of ideas that contain elements of cross-functional collaboration. This cross-functional collaboration is an important enabler of PSIs since bundled innovations have impacts on both OPEX and CAPEX businesses. To evaluate an idea's feasibility, a firm can establish frameworks and tools, such as *business model canvas* or *value proposition canvas*, to evaluate them better. The incubation phase is optional and provided to afford additional resources to the developer. Analogy would be reminiscent of "nitro innovation," boosting an individual developer to develop it further with additional help. In the transformation phase, the key idea is to build and pilot a concrete prototype (whether physical or digital; minimum viable product, MVP). In the last phase, growth process, a solution's productisation related issues, such as pricing and training, become increasingly important. Identifying these practices can help other solution providers to benchmark processes and associated practices related to bundled innovations.

As a final theoretical contribution, this study shows the need to establish an enabling flexible structure to generate increased numbers of ideas through the organization. Enabling flexible structures makes it possible for firms to learn, innovate, and generate wealth beyond traditional hierarchical control (Adler, 1999). In contrast, enabling a flexible structure would be a coercive (rigid) structure (Adler & Borys, 1996) that would represent traditional hierarchical control to manage innovations. Although this model has been typically used in a negative manner, coercive structure provides needed guidance and more clarified responsibilities within the organization to drive innovations (Adler & Borys, 1996). We found that corporations tend to use flexible structures to manage PSIs. Hence, firms balance between coercive and enabling structures as optimal mechanisms to drive and manage bundled innovations. Moreover, a unified innovation model can help firms to break free from the silos of innovation generating (CAPEX) and money generating (OPEX) units. Instead of developing tailored models for different types of innovations (product, service, process, or business model innovations), our findings suggest that single flexible model might prevent firms from overinvesting in exploitative businesses and help it to increase its innovation scope toward explorative businesses (Sirén, Kohtamäki & Kuckertz, 2012).

5.2 Managerial contributions

This study demonstrated how product-service innovations emerge and are managed in a relatively large international solution provider. Managers from different business disciplines can benchmark this framework and associated practices.

Managers can also identify key bottlenecks related to bundled innovations. Managers need to break the efficiency logic of pure product and service innovations and highlight the logic of collaboration between the units to generate life-cycle rather than instant benefits. This leads to reconsideration of optimal structures for driving PSIs. When SBUs use coercive structures to emphasize efficiency benefits, corporations use enabling flexible structures to take advantage of both logics, hence motivating distinct units to collaborate and contribute to firm-level advantage, potentially with at the cost of SBU advantage. As with any business, developing product-service innovations should generate more customer value compared to alternative options in which customers buy products and services separately. Moreover, this collaboration should be incentivised within the firm, for instance, by

establishing incentives that support cross-functional collaboration and bundled innovations. Moreover, our findings suggest that corporations could consider creating a flexible, “one-size fits all” framework for innovations rather than establishing separate, tailored innovation models for different types of innovations, whether they are product, service, process, or business model innovations. This may be challenging to initiate because needs are different in different types of innovations. Finally, our findings suggest that managers could formulate different rules of thumb related to resource allocations for different types of innovations. By following Google’s 70/20/10 rule, technology companies in mature industries can use similar guidance when deciding how to allocate resources to existing business, emerging business, and out-of-the box business development initiatives. This type of heuristic comes from experience, and the distribution of resources and investments may depend on a firm’s industry-specific conditions and the urgency of renewal requirements. This would simplify the guidance and make innovations more flexible and manageable through s systematic structure.

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