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Value Propositions in Service Systems Enabled by Digital Technology: A Field Based Design Science Approach

By Stefan Michael Genennig*, Angela Roth, Julia M. Jonas, and Kathrin M. Möslein

In the context of the digitization of business environments, organizations and processes are currently undergoing major changes. Digital transformation offers a high potential to develop new value propositions by using digital technology, but at the same time demands for the implementation of disruptive innovation in complex service systems. Thereby, it is crucial to find out how to make use of technology-enabled potentials and how to find a structured way to develop and design new value propositions, embedded in service systems. To support the development and design of value propositions, this paper designs the V^{di}P-developer as a framework for the systematic development of digitization-enabled value propositions in service systems. It considers the advancement of existing likewise the development of new value propositions. In particular, the V^{di}P-developer highlights the roles of digital technology in service systems and establishes a framework to consider both, digital technology and service systems, in the development of value propositions. Using a field-based design-science approach to research, this paper shows how the framework for value proposition building is iteratively developed, applied and evaluated as a joint initiative by researchers and practitioners. The designed artefact, the V^{di}P-developer, enables organizations to systematically improve and develop value propositions by bringing management perspectives and service design elements together in one compact framework.

1. Introduction

The impact of technological change on service provision and the effective use of technology in service settings has been approached by research for almost two decades (Bitner et al. 2000). However, during that time not only the importance of service, but also the role of technology changed in major ways (Daim et al. 2010). Today, service constitutes the largest segment in the economy of industrialized nations and is significantly increasing in every country (Breidbach and Maglio 2014; Davis et al. 2011). Technology, and especially digital technologies, became an essential part of companies' value creation and service provision (Cetindamar et al. 2009). This evolution reinforced the importance of service-oriented innovation (Akaka and Vargo 2014) and expanded the use of digital technologies in service development and execution (Barrett et al. 2015; Ostrom et al. 2010).

Digital technology connects entities with each other so that service provision and value propositions shift from a single company to service system offerings. Service systems are seen as configurations of people, technology, information, and other internal and external service systems

Stefan Michael Genennig is Research Associate of Information Systems – Innovation & Value Creation at Friedrich-Alexander University Erlangen-Nürnberg, Lange Gasse 20, 90403 Nürnberg, Germany,
E-Mail: stefan.genennig@fau.de
* Corresponding Author.

Angela Roth is Professor of Information Systems – Innovation & Value Creation at Friedrich-Alexander University Erlangen-Nürnberg, Lange Gasse 20, 90403 Nürnberg, Germany,
E-Mail: angela.roth@fau.de

Julia M. Jonas is Senior Research Fellow of Information Systems – Innovation & Value Creation at Friedrich-Alexander University Erlangen-Nürnberg, Lange Gasse 20, 90403 Nürnberg, Germany,
E-Mail: julia.jonas@fau.de

Kathrin M. Möslein is Professor of Information Systems – Innovation & Value Creation at Friedrich-Alexander University Erlangen-Nürnberg, Lange Gasse 20, 90403 Nürnberg, Germany,
E-Mail: kathrin.moeslein@fau.de

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(Maglio et al. 2009; Spohrer et al. 2007; Spohrer et al. 2008). These service systems evolve, interact and reconfigure to (co-)create value and ultimately aim to enhance service innovation (Kieliszewski et al. 2012; Maglio and Spohrer 2008). In this sense, individuals, groups, organizations, firms and even governments can be regarded as service systems as long as they can take action and apply resources. Value is created in service systems when its entities work together to improve common capabilities or act in specific situations or environments in a mutually beneficial way (Vargo et al. 2008). The use of digital technology can serve as enabler, promoter and improver of service systems and reinforces changes within the service innovation process (Spohrer and Maglio 2008; Vargo and Lusch 2017).

In service systems, value propositions request engagement of all connected actors and require them to make use of their competences (Chandler and Lusch 2015). The service systems are aligned to value propositions their entities offer (Peters et al. 2016). Common value propositions connect the different entities on a content-related basis (Vargo et al. 2008). The development of new value propositions serves as a crucial step in service design and value creation and is an essential element for downstream processes and activities (Pawar et al. 2009). Technology as an essential part of service systems has a great impact on companies' capabilities of interconnectedness among various entities (Cetindamar et al. 2016). The new digital technologies reinforce innovation and value creation within service systems and thus affect the alteration of their value propositions (Demirkan et al. 2011). Digital technology forces the advancement of existing or the development of new value propositions, for example through an altered composition of the service system's entities (Breidbach and Maglio 2016). In this sense, new digitization-enabled value propositions can evolve from already existing value propositions or emerge as new value propositions. Consequently, changes in the value propositions of a service system have significant impact on the service architecture and can change the configuration of actors, resources, and activities of value (co-)creation (Böhmann et al. 2014). Although the influence of digital technologies on service systems and especially on the development of new value propositions is frequently discussed in literature, existing frameworks for the development of value propositions lack on both, a service systems perspective and the consideration of changes through digital technologies. Moreover, current studies have not yet fully addressed value creation and innovation in service systems (Chandler and Lusch 2015).

The paper starts off with a selective literature review and the presentation of a theoretical framework to align the development of digitization-enabled value proposition in service systems. The paper proceeds with the empirically based design and evaluation of the framework for a systematic development of digitization-enabled value propositions in service systems. It concludes with implications, limitations and suggestions for further research.

2. Review of Relevant Literature: Digitization-Enabled Value Propositions in Service Systems

Based on the contributions of Vargo and Lusch (2008), the perspectives in service research have changed in the last decade. The promoted shift to a service-dominant view and a systematic approach entailed a science for service (Vargo and Akaka 2009). In a service-dominant logic, economic activity is best understood in terms of service-for-service exchange. Activities are the source of value and thus the purpose of exchange while goods are only occasionally used in the transmission of service (Skålén et al. 2015; Vargo and Lusch 2017). While an autonomous discipline for service has not emerged yet, the development puts emphasis on the transdisciplinary nature of service (Böhmann et al. 2014) and a systematic approach of service innovation (Spohrer et al. 2007). In this spirit, service systems are the basic abstraction of service science and provide a viewpoint for analysis in this field, e. g. to derive a scientific understanding or to generate management principles (Maglio et al. 2009). The orchestration of the mix of activities, actors and technology remains the major lever in service systems design and service innovation (Grenha Teixeira et al. 2017). Especially in the context of service innovation, the building and management of service systems remain a prevailing research topic (Benkenstein et al. 2017).

Digitization and service systems

Research on service systems is emergent. Although some researchers address service systems in their work, there are various tracks for future research. As Böhmann et al. (2014) outline, evidence-based knowledge on real-world service systems is still in the making. Additionally, current literature lacks a general understanding of value creation and innovation in service systems (Ostrom et al. 2015). A predominant question for service systems in this context is how technology influences the ways in which value can be created (Vargo et al. 2008).

Through the use of digital technology, the exchange of resources is possible anytime and anywhere today (Ostrom et al. 2010). The technology-enablement refers to the usage of digital technology to connect entities within the service system (Breidbach et al. 2013). Digitization-enabled connotes in this context digital-technology mediated interactions between human actors, that often take place in knowledge-intensive business services (Breidbach and Maglio 2016; Glückler and Hammer 2011). The digitiza-

tion-enabled exchange among human actors represents the key differentiating factor compared to technology-generated self-services that do not include this element (Breidbach et al. 2013). In this vein, digital technology needs to be adequately deployed to manage these actors and to support digitization-enabled service innovation (Grenha Teixeira et al. 2017). The development of digitization-enabled value propositions constitutes the starting point in the line of action to purposeful service systems innovation.

According to Maglio et al. (2006), innovation in service systems can be categorized in four processual changes in the service system. (1) First, innovation can be fostered by the emergence of a completely new service system. (2) The second category is the connection of existing service systems to an emerging service system. (3) The third category targets new entities, which get connected to an existing service system. (4) The fourth category describes the distribution of current tasks to other existing entities as well as the allocation of new tasks to the involved stakeholders of the service system (Maglio et al. 2006). Digital transformation is assumed to provide leverage points for innovation enablement in all four categories. The interactions in service systems, including the exchange of resources, can take place at micro level (e. g., dyadic interactions), meso level (e. g., organizations) and macro level (e. g., countries)(Vargo et al. 2008; Akaka and Vargo 2014). The analysis in this paper is conducted on a meso level.

In this vein, the integration of digital technology in service systems can constitute a trigger for service innovation(-Daim et al. 2010; Höckmayr and Roth 2017; Lee and Park 2009). These inherent innovation potentials of digital technologies likewise lead to altered value propositions (Kindström et al. 2013; Peters et al. 2016). In this sense, especially the structured development of digitization-enabled value propositions for service innovation in service systems (Akaka and Vargo 2014; Breidbach and Maglio 2016) still requires more scientific attention. Although there are general contemplations of value propositions in service systems (Chandler and Lusch 2015), the impact of the digital transformation on service systems' value propositions remains largely untouched.

Value proposition development in a digitization and service systems context

A survey conducted by IBM already in 2006 found that in terms of operating margins companies successfully focused on the innovation of value propositions rather than direct innovation of products or services (Amit and Zott 2012). Accordingly, comparisons of innovation frameworks conducted by Hartmann et al. (2014) identified value propositions to be present in all of their analysed works, while other components, such as key resources, key activities, or cost structure, were excluded in certain models (Hartmann et al. 2014). Value propositions play the key role in companies' offerings (Reymen et al. 2017) and consequently, the concept of value propositions is widely used in academia as well as by practitioners (Anderson et al. 2006). Literature suggests to start service and business model innovation with the development of the value proposition and confirms the influence of technological innovations on value propositions (Johnson et al. 2008; Cortimiglia et al. 2016). Nevertheless, there is a strong need for "new strategic frameworks that are aiming at deliberately harnessing unique capabilities of digital technology that are embedded into [services] to gain competitive advantage" (Yoo et al. 2010, p. 730).

A structured review of existing frameworks for the development of value proposition conducted within this research project (see *Fig. A1* in the appendix) reveals that there are several existing frameworks, but mostly with a dyadic character and a simplified perspective. None of the frameworks comprises technology or data as an important fragment of value proposition and almost all miss out a service systems perspective. Moreover, all frameworks remain in a customer-company perspective and do not consider the (eco-)systems behind value propositions. Despite the large amount of research dedicated to identifying and creating value proposition frameworks, there is still a lack of research which focuses on the use of digital technologies to alter value propositions into digitization-enabled value propositions and a transformation of this into applicable frameworks. Moreover, the adaptation of value proposition frameworks on digitization related alterations lags behind. Even though there are single elements in some existing frameworks that are still relevant in the development of digitization-enabled value propositions, an encompassing solution is non-existent. Consequently, there is no framework supporting organizations in a structured formulation of digitization-enabled value propositions.

Building on these observations, this paper explores value propositions in service systems enabled by digital technology and asks the following research question:

> *How can digitization-enabled value propositions in service systems be systematically developed?*

A framework for the systematic development of digitization-enabled value propositions in service systems is therefore designed and evaluated. The following section outlines the applied research method, which involves the selection of companies and participants according to the field-based research aimed at addressing these research questions.

3. Research Method

To develop a framework for the development of digitization-enabled value proposition ($V^{di}P$-developer), this paper is following a design science research (DSR) approach (Peffers et al. 2007; Walls 2013). Originated in information systems, DSR is considered a valuable method to advance service research and innovate service innovation (Beloglazo et al. 2015; Ostrom et al. 2015). DSR is reflected as suitable method due to its technology background and its focus on designing methods and frameworks for the development of new solutions for complex problems (Gregor and Hevner 2013). This article emphasizes the complexity of the development of digitization-enabled value propositions by combining management perspectives and service design elements.

Following Gregor and Hevner (2013), DSR can contribute even to highly mature application domains through the evolvement of new artefacts. While service design practitioners may create new services that solve specific problems at the recipient side, DSR generates novel models and frameworks that advance the process of service design and service research fields through its iterative process of conceptualization and validation (Grenha Teixeira et al. 2017).

Following Hevner et al. (2004), the DSR method encompasses two main activities that are performed iteratively: building and evaluating. The new artefact is constructed in the building phase (always considering its specific purpose) and is assessed in the evaluation phase (with attention to its successful performance). Both process activities require an iterative approach which involves design science and social science (Peffers et al. 2007). Therefore, qualitative research can be one part of the DSR method to consolidate the context and to evaluate the artefact (Hevner et al. 2004). This article uses qualitative research based on Corbin and Strauss (1990) to evaluate the usefulness of the $V^{di}P$-developer (Corbin and Strauss 1990). For the general framework design, the six steps of the DSR Methodology Process Model by Peffers et al. (2007) have been applied:

1. Identify the problem & motivate: A literature review on digitization-enabled value propositions in service systems, as well as a structured review of existing frameworks to develop value propositions supported the problem formulation and motivation. Hereby, the fundamental importance of digitization-enablement as a key factor for developing new value propositions (Breidbach and Maglio 2016; Grenha Teixeira et al. 2017) and the promising approach of combining technology and service design for innovation (Ostrom et al. 2010; 2015) was brought to light.

2. Define objectives for a solution: The overall goal of the $V^{di}P$-developer is to support practitioners along the systematic development of digitization-enabled value propositions. Thus, a management perspective is chosen. Additionally, service research gets promoted by taking a service systems perspective, considering SDL as the fundamental basis of exchange and emphasizing the altered role of technology.

3. Design and development: During development of the $V^{di}P$-developer, the theoretical foundations supported the unification of management contributions and service science. Regarding research methodology, DSR was followed throughout this research with the support of qualitative research to develop the applications and to evaluate the framework. The elements of the $V^{di}P$-developer were mainly derived out of intensive interaction processes between several researches and practitioners and were partly inspired by existing value proposition frameworks as well as some approaches for value proposition development in literature. First, two workshops to iterate the respective form of the framework together with nine interdisciplinary researchers and two innovation managers of a component manufacturer have been implemented. In this way, both the relevance of the emerging framework for the research field and its subsequent practical applicability were taken into account already in the development phase. Subsequently, the framework was iteratively developed and formed in three workshops with different companies. A total of 23 participants took part in these workshops. The detailed characteristics of the participants can be found in appendix (see *Fig. A2*). Finally, three feedback cycles with altogether 70 practitioners gave the framework its final polish. In these feedback cycles, the framework was applied to a company-specific situation at the respective status and then checked for its applicability. The feedback was then incorporated into the iterative revision of the framework.

The design of the $V^{di}P$-developer follows the design research criteria by Forlizzi et al. (2008): process, invention, relevance, and extensibility. First, this research project details the design process so that it can be replicated and improved. Additionally, the quality criteria of qualitative research have been applied with increased focus on procedural reliability (Wrona and Gunnesch 2015). The invention and relevance have been identified by a sound literature review, showing that there is a lack in research about the purposeful use of technology for service innovation in service systems. This highlights the relevance and novelty of the $V^{di}P$-developer, being a framework for the development of digitization-enabled value propositions in service systems and supporting the overall service innovation activities in organizations. Extensibility refers to the leverage of the artefact to different application situations and challenges. The use of the $V^{di}P$-developer in different organizations with different strategic objectives tests its extensibility to other contexts. *Fig. 1* outlines the research

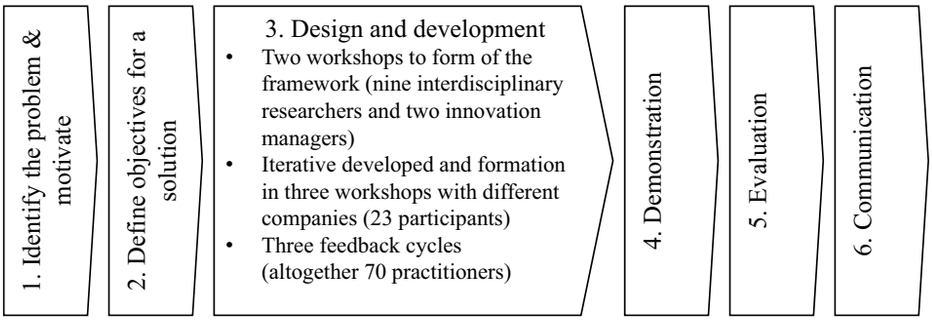

Fig. 1: Outline of the research process

process and summarizes the activities carried out in step 3.

4. Demonstration: The V^{di}P-developer was demonstrated by its application to solve the identified problem. The V^{di}P-developer was applied in different organizations and settings, showing how the framework supports the development of digitization-enabled value propositions. After its application, qualitative interviews and focus groups were used to study the experiences at the use of the V^{di}P-developer.

5. Evaluation: The V^{di}P-developer was evaluated using the criteria of DSR (Hevner et al. 2004) and qualitative elements. Including feedback circles to the workshops and interviewing participants subsequent to the workshops, the experiences with the implementation of the V^{di}P-developer have been collected and assessed. Following Gregor and Hevner (2013), the evaluation is discussed after presenting the applications in the application section.

6. Communication: Scholarly and professional presentations and publications have been selected to spread the V^{di}P-developer in the targeted audience. So far, the framework was repeatedly discussed with both practitioner and academic audiences.

The next section introduces the structure of the V^{di}P-developer, followed by the three application samples. Later, the framework is evaluated and research contributions are detailed.

4. The Digitization-Enabled Value Proposition (V^{di}P-)Developer

Fig. 2 shows the final digitization-enabled value proposition (V^{di}P-) developer that was deducted from the research process. The V^{di}P-developer is presented as a framework with eight boxes for a step by step development of digitization-enabled value propositions. A consecutive completion of the boxes, starting with box one and ending with box eight, is recommended but not necessary. Each of the boxes contains specific interrogations according to the intended problem-solving approach. The left part of the V^{di}P-developer focuses on the recipient side of the digitization-enabled value proposition while the right part of *Fig. 2* applies to the whole service system. The segmentation in two parts should be understood as emphasis rather than a clear separation.

As a design framework, the applying organization can use the proposed V^{di}P-developer to identify viable digitization-enabled value proposition alternatives by answering the respective questions with the applying situation-related perspective. The title of some boxes of the V^{di}P-devel-

The digitization-enabled Value Proposition (V^{di}P) developer

Recipient	Pains	Gains	Solution	Technology & Data	Partner
Who will be targeted by the new digitization-enabled solution?	**What are the pains of the potential recipients of a digitization-enabled solution?**	**What are the gains of potential recipients of a digitization-enabled solution?**	**What is the offered digitization-enabled solution?**	**What digital technology and what data is used for the solution?**	**Who else is involved at the solution creation and delivery?**
Existing or new recipient? B2B or B2C? How can the recipients be concretized?	Is there a specific problem situation? What barriers keep the recipients from adopting a solution?	Which improvements would make the recipients happy? What would increase the likelihood of the adoption of a solution?	Is there an answer on the pains or a solution to increase gains? Is there solution potential form the key resources or key activities of the service system?	What digital technology will be deployed for the solution? What data is necessary and is this data accessible?	Existing or new partners? What new partners emerge through the change in technology?

Recipient benefit	Unique characteristics
What are the specific benefits for the recipients of the digitization-enabled solution?	**What are the unique characteristics of the digitization-enabled solution?**
How is the digitization-enabled solution relieve pains or exceed gains of the recipients? How can the recipients perceive the specific benefits?	How can the service system differ themselves form other solutions? What are alternative solutions and how does the solution differentiate from existing solutions? How can the advantages of the digitization-enabled solution over other solutions be proved?

Fig. 2: The digitization-enabled Value Proposition (V^{di}P-) developer

oper rests on elements of existing frameworks. Even though the contents of these boxes have been completely reworked and aligned to the service system and digitization context, the familiarity of some key words is still an anchor in later use. In the following, the eight boxes are explained in detail, building on the relevant components of the workshops and feedback cycles and on the underlying and supporting literature.

The boxes of the V^{di}P-developer

(1) Recipient: This box serves to discuss the addressee of a possible digitization-enabled solution. It defines the starting point for the development of the digitization-enabled value proposition and serves as foundation for the following steps. In the workshops as well as in the feedback rounds, a recipient-focused approach was clearly preferred, which sees the identification of possible recipient groups as a starting point. Nevertheless, it is well aware that these can still adapt and change in the further course of the framework.

This is also in line with single elements of some existing value proposition frameworks. In the value proposition builder of Barnes et al. (2009, p. 60), the definition of the "market" implies the first of their six step model where the target group of customers gets defined (Barnes et al. 2009). This approach goes along with the value proposition canvas (Osterwalder et al. 2014, p. 8) in which the definition of the targeted customer segment is the task to start with. Moreover, Alter (2013) gives the service recipient a dominant position in his value blueprint. In his framework the customer value and the customer activities are defined in detail (Alter 2013). The presented frameworks also propose the definition of the service recipient as starting point.

The wording is adapted to "recipient" to sharpen the service focus and the system view of this framework, taking the encompassing view of service within service systems (Chandler and Lusch 2015). In this work, the recipients will be rather considered as the customer or user. The recipient identification is the key question of this box: *Who will be targeted by the new digitization-enabled solution?* Further possible sub questions that lead to a better understanding address the separation between existing and new recipients, a distinction between B2B or B2C interactions and a possible categorization of recipient groups.

(2) Pains: The idea behind the following boxes "pains" and "gains" is already known from an existing framework – the value proposition canvas (Osterwalder et al. 2014) which discusses in one of its elements the general pains and gains of potential recipients. The V^{di}P-developer slightly dissolves from this framework as the recipient activities are not in the focus of this box and the pains have already a clear solution orientation, differing from the customer segmentation view of the value proposition canvas. Additionally, the results of the workshops revealed to separate the two elements "pains" and "gains" and to work out a sharpening of the content.

Despite a generic collection of pains, the clear recipient definition of box one keeps a focus on digitization-enabled pains. Consequently, it is recommended to define the recipient in advance and to elaborate box one beforehand. Together with the next box, this action helps to define the digitization-enabled solution in the following steps and supports the definition of the recipient benefits in box six in the ongoing process. Box two explores the question *"What are the pains of the potential recipients of a digitization-enabled solution?"* Supporting questions to be answered are what specific problem situation exists and what barriers refrain the recipients from adopting a solution.

(3) Gains: Box three can be regarded as counterpart of the antecedent box. Like box two it is inspired by the value proposition canvas (Osterwalder et al. 2014) and takes up the idea of the value proposition builder (Barnes et al. 2009), but again differs in its general alignment. Step three builds the value experience by collecting perceived customer benefits and deducts the costs of their creation. As the costs might already be covered in box two (pains), the recipients' pure gains are the focus of this box. It aims to answer the question*: What are the gains of potential recipients of a digitization-enabled solution?* This might raise the chance of the adoption of a possible solution.

(4) Solution: This box (pre)defines the digitization-enabled solution. It has been positioned at this point to allow the essence of the previous boxes to flow into the solution finding process. Being one of the core elements of every value proposition development process, this step is also partially present in existing frameworks. In the value proposition canvas it is addressed in the "product and services" box (Osterwalder et al. 2014). In the value proposition builder it is named "offerings" and it is explained as the product and service mix the company is selling (Barnes et al. 2009). Nonetheless, these frameworks take a product-service mix view while still sticking to a product centric orientation. The V^{di}P-developer takes the service-dominant view and names this box "solution" keeping in mind that products may be used as service enabler (Barile and Polese 2010; Ostrom et al. 2015; Vargo and Lusch 2008). Moreover, through its formulation, the V^{di}P-developer is able to approach both, technology driven (address customer job and gains) and market pulled (react on customer problems and pains) solutions (Osterwalder et al. 2014). In fact, the framework makes no distinction between the two streams. Therefore this box poses the following question: *What is the offered digitization-enabled solution?* Possible solutions might be a result of the pains and

gains. The key resources and key activities are part of one additional sub-question, keeping in mind that solutions might also originate from specifics of the organization. If organizations have a clear pre-set solution beforehand, the "solution" box can constitute a starting point in the V^{di}P-developers' application, too. The remaining boxes of the V^{di}P-developer are then used for specification and structuring of the solution retrospectively.

(5) Technology & Data: In this box, the implicated technologies are chosen and necessary data to be used for the development of value proposition is defined and collected. These steps are so far missing in other value proposition development frameworks. They have been added here as a result out of argued practical needs and research perspectives during the workshops. The joint treatment of technology and data issues was seen as essential, as technology and service are closely related (Daim et al. 2010) and the use of technology for innovation has to be conducted purposefully (Breidbach and Maglio 2016). The selected technology entails specific tasks and influences the decisions within the following boxes, e. g. the consultation of additional partners and new entities to the service system (Essén 2009). Additionally, the digital transformation leads to potentials for data usage in service provision (Schüritz et al. 2017). In data-driven services, technology constitutes the source for data. The box collects the deployed technology and the used data by exploring the question: *What digital technology and what data is used for the solution?* It collects all technologies and evaluates the accessibility of the conceived data.

(6) Partner: Box six collects the involved entities in the provision of the digitization-enabled solution. In this point the V^{di}P-developer is following the logic of the service business model canvas, which integrates an encompassing partner perspective into value proposition development (Zolnowski et al. 2014). After the recipients have been selected in step one, the "partner" box serves to identify all connected entities of the service system participating in the service provision (Spohrer and Maglio 2008). The approach was also endorsed by the practitioners in the workshops, who appreciated the overview of the entire group of internal and external partners in this box. Although this view is not present in most value proposition frameworks, it is partly included by Golnam et al. (2014) who integrate the network of all parties involved in their value map framework. The value map incorporates a distinction between the actors of service provision, including all organizations and connected suppliers, developers and others, and the service recipients (Golnam et al. 2014).To collect all entities of the service system involved in value proposition, the V^{di}P-developer explores in this box the following question: *Who else is involved at the solution creation and delivery?* In this context "else" refers to all other entities except the actual editing party. This may imply other entities inside as well as outside the organization. In this box, all existing and new partners get collected. New partners might come along with new technologies and might require extended data analysis.

(7) Recipient benefit: The formulation of the clear recipient value as benefits is the essence of this box. The V^{di}P-developer uses box seven to substantiate the clear benefits of the digitization-enabled solution. The workshop participants saw this box as the starting point for following discussions, for subsequent marketing activities and as a conclusion of the recipient perspective of the V^{di}P-developer. This box was also inspired by existing frameworks like the value proposition builder (Barnes et al. 2009) who targets benefits and the recipient's value of the solution as one element. This view is also part of the first swim lane of the value blueprint (Alter 2013) and gets expressed in the value map (Golnam et al. 2014). In the V^{di}P-developer the box focuses on the following question: *What are the specific benefits for the recipients of the digitization-enabled solution?* This can be an answer to the recipients' pains or exceed the recipients' gains. In addition to that, the formulation of approaches to enable these benefits for the recipients can also be part of this box.

(8) Unique characteristics: The last box of the V^{di}P-developer focuses on the unique characteristics of the digitization-enabled solution. This box was designed to reflect the developed solution. It is also a summary of step five and six of the value proposition builder (Barnes et al. 2009) in which it targets "alternatives & differentiation", as well as "proof". The "alternatives & differentiation"- step represents the differentiation from other solutions and the characteristics that make the solution better than other offerings. "Proof" underpins the arguments by collecting the substantiated credibility and believability of these points (Barnes et al. 2009). With this box, the V^{di}P-developer purposefully amalgamates existing elements in a new sense giving way and goes much further than other frameworks for value proposition development which stop after the general solution development. By claiming a proof for the developed solution components, the V^{di}P-developer ends with a sparring element for critical reflection. Consequently, the "unique characteristics"-box constitutes a recap of the solution features and explores the following question: *What are the unique characteristics of the digitization-enabled solution?*

Creating value propositions with the V^{di}P-developer

To apply the V^{di}P-developer a systematic approach is recommended. According to Hartmann et al. (2014), general analysis can be either descriptive, prescriptive, or predictive. This view of analysis – originated in data analytics – can be carried to the act of value proposition development. Descriptive analytics describe the current state of

what is happening or has happened so far. Prescriptive analytics aim to provide guidance on how to best proceed or fix a problem. Predictive analytics combine past knowledge with models and learning to predict what will happen in the future. Taking this approach as the perspective of analysis, the V^{di}P-developer is completed three times with one of these perspectives at a time on the way to value proposition development. It starts with a status-quo analysis and the capturing of the current situation, guided by the question: *How is the situation right now (descriptive)?* In a second cycle, the possibilities of improvement will be gathered, contributing to the question: *How can the situation be better (prescriptive)*? Finally, the last cycle combines the status-quo with all possibilities and identifies the preferred solutions: *How will the situation be (Predictive)?* This last cycle is the essence of the V^{di}P-developer and derives new value propositions. This approach is particularly suitable in situations where the organization has no pre-existing solution in mind and aims to make use of the digital transformation. The more knowledge of future developments exist beforehand, the less assumptions have to be made in the solution selection. If individual boxes – like "recipient, "technology & data" or even "solution" – are predefined in advance, the three-step process described above can be shortened. In this case, the empty boxes are filled in orientation on the predefined elements. The process described above has proven itself in the application of the framework in practice. The developed results were more substantiated and the way to get there was well-founded.

In addition to its actual application, upstream and downstream activities can support the V^{di}P-developer. Building a suitable recipient definition for the first box of the V^{di}P-developer, the application of a creativity support tool for recipient analysis, e. g. the personas service design tool (Pruitt and Adlin 2006), can facilitate the entry to the V^{di}P-developer. In the same vein, the collection of accessible key resources can establish a basis for the following value proposition development (Osterwalder et al. 2014; Zolnowski et al. 2014). Moreover the clear formulation of the problem situation according to the problem definition template of Kimbell (2015) or fishbone diagrams, can support the start of the V^{di}P-developer.

The formulation of a positioning statement, e. g. the common framework by Moore (Moore 2006), constitutes a suitable method to recap the results of the seven boxes of the V^{di}P-developer. With the expressed statement the developed value propositions become more replicable and tangible. To be successful, the digitization-enabled value proposition must "fit". This means that is has to respond to a specific job-to-be-done of a targeted recipient (Johnson et al. 2008). In this context, frameworks to identify and match the jobs-to-be-done, e. g. the universal job map (Bettencourt 2010), can provide guidance and ensure the consideration of all relevant points. Fitting to the specific job-to-be-done, the value proposition has to act as one part of a strong business model (Osterwalder et al. 2014). *Fig. 3* provides an overview of possible upstream and downstream activities.

Thus the V^{di}P-developer presents a framework for the conception phase of digitization-enabled solutions and supports the encompassing development of new value propositions. In the following, the developed value propositions have to undergo the subsequent steps of the development process, e. g. service design & process system design, service testing & pilot run and commercialization (Alam and Perry 2002).

5. Application and Evaluation of the V^{di}P-Developer

Often, conceptual frameworks lack a practical proof and do not show how executives might benefit from them (Payne and Frow 2013). Responding to this concern, we now illustrate how three companies used the V^{di}P-developer to derive new value propositions to their business to evaluate and refine the framework.

The three companies intended to develop a digitization-enabled service, solving a complex issue by the purposeful integration of digital technology into their connected service system. All of them are manufacturing companies, one component manufacturer (company 1), one system manufacturer (company 2) and one plant manufacturer (company 3). Altogether, the V^{di}P-developer was applied in six settings, with two iterations at every company. In all

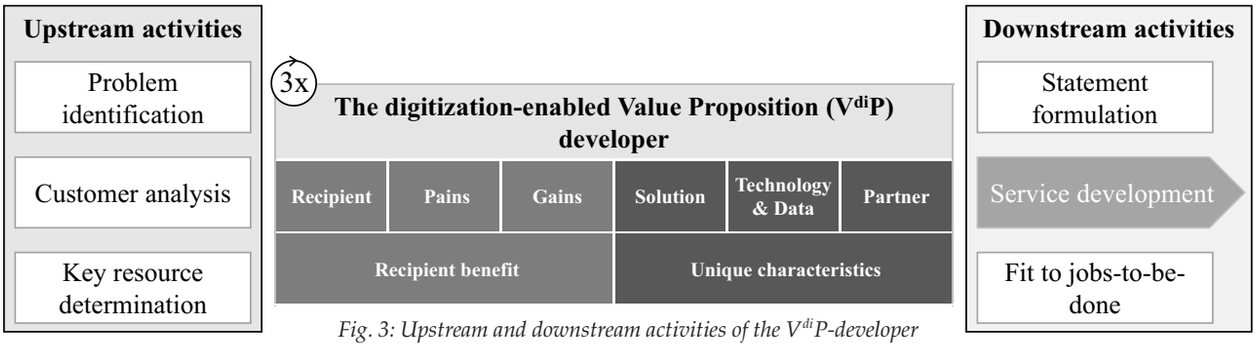

Fig. 3: Upstream and downstream activities of the V^{di}P-developer

The digitization-enabled Value Proposition ($V^{di}P$) developer

Motive component manufacturer (**Company 1**): Development of value propositions for an energy savings service

Motive system manufacturer (**Company 2**): Development of value propositions for an energy savings service

Motive plant manufacturer (**Company 3**): Development of value propositions for a maintenance and spare part solution

Recipient	Pains	Gains	Solution	Technology & Data	Partner
Company 1: end-users of the offered components **Company 2:** users of a specific product of the system manufacturer **Company 3:** manufacturers with new plants manufacturers with existing plants that need regular maintenance of wear parts	**Company 1:** Downtimes and manufacturing costs data- & knowledge-diffusion **Company 2:** high operating costs **Company 3:** regulatory requirements (as the plant manufacturer operated in a highly regulated industry) fast software aging permanent plant availability	**Company 1:** security improvement, predictability, efficiency, image enhancement and flexibility **Company 2:** efficient maintenance, seamless operation and a monetization of thermal energy (a by-product of the operation) **Company 3:** all-hour spare part availability	**Company 1:** machine check-up micro services enabling energy efficient operation **Company 2:** new business operation of the system manufacturer who acts as distributor of operating materials and energy on an own platform **Company 3:** spare part tracking that enables a digital tracking of the exact position of the spare part in the delivery process permanent stock check on an operator interface and central spare part management for all customers	**Company 1:** cloud infrastructure and tablets **Company 2:** platform and a matching software physical resources (e.g. the connection between platform and software) **Company 3:** platform as database and digital marketplace data analysis platform	**Company 1:** departments in the company infrastructure providers, companies for data preparation and analysis **Company 2:** platform distributor and software developers suppliers (e.g. for gas but also for the infrastructure) **Company 3:** software developers, platform provider, companies for data preparation and analysis suppliers and customers

Recipient benefit	Unique characteristics
Company 1: reduction of downtimes and an energy efficient machine operation	**Company 1:** focus on energy efficiency and the certification of the latter by the component manufacturer
Company 2: revenues for thermal energy and discounted gas purchase and energy efficiency by a decreased waste of energy through the disposal	**Company 2:** system manufacturers' knowledge of gas consumption and thermal energy wastrel market power of service provider to obtain a better price and the access to the device control to install the solution
Company 3: lower capital costs as well as decreased personal costs higher plant availability and synergy effects over multiple plants	**Company 3:** transparent warranty and supply conditions manufacturer's plant know how that is not imitable by its competitors

Fig. 4: Application of the $V^{di}P$-developer in three organizations

three companies, the $V^{di}P$-developer was used as a boundary object to bridge between the different groups. The points presented in the following part of the paper constitute the most essential points of the $V^{di}P$ developer's application and can be regarded as a first estimate. The results of the application can be found in *Fig. 4*.

Application at a component manufacturer (company 1)

The main motive for the component manufacturer was the development of value propositions for an energy savings service. The developed digitization-enabled solution is a machine check-up containing micro services that enable energy efficient operation at machine commissioning and operation. During the value proposition development, especially the partner box was intensively discussed within and between the groups. Finally, the required partners were identified as departments in the company and new partners at the infrastructure provision level (knowledge provider; infrastructure data; supply chain data), in the data analysis process (consultancy in the data selection; data transformation; data mining) and during the service setup (cloud platform; programmer). Despite the structuring function of the $V^{di}P$-developer, in this case the framework paved the way from brainstorming to consensus.

Application at a system manufacturer (company 2)

Also for the system manufacturer the development of value propositions for an energy savings service was the leading motive for the application of the $V^{di}P$-developer. The solution is an incremental new business operation of the system manufacturer who acts as distributor of operating materials and energy on an own platform. The manufacturer sells gas to his users and in return buys their thermal energy for reselling. The required technologies consist of a platform and a matching software. The platform should act as intermediary and the software is needed to identify price optimum for buying and selling the resources through matching commodity exchange prices.

As the system manufacturer developed a new business model in the solution box, the $V^{di}P$-developer assisted in the ascertainment of the value proposition of the new business model. In this way the framework fostered both, creativity and the following structuring.

Application at a plant manufacturer (company 3)

The development of value propositions for a maintenance and spare part solution was the main motivation of the plant manufacturer. The developed digitization-enabled

solution is a spar part tracking that enables a digital tracking of the exact position of the spare part in the delivery process and a permanent stock check on an operator interface. The plant manufacturer enables the solution through a central spare part management for all customers. Cost savings are realized by cumulating spare part orders over numerous plants.

During the application of the V^{di}P-developer, the company was very detailed in the description of its digitization-enabled solution. This also led to a quick but detailed formulation of the recipient benefits and the unique characteristics. All three companies used the V^{di}P-developer in a successive manner, starting with the recipient box and concluding with the recipient benefits and the unique characteristics.

Evaluation

Following a DSR approach, the V^{di}P-developer was evaluated on its usefulness for supporting the development of a digitization-enabled value proposition. Following the recommendations of Hevner et al. (2004), the framework was validated through six applications in three different organizations. These applications provided a test of the framework in real-world context and ensured its' comprehensibility, applicability and expedience.

Compared to the other companies, the first company had the most undefined objectives beforehand. This resulted in large differences in the specificity of the results of the V^{di}P-developer. Nevertheless, the first round of applications led to two very concrete solutions. In a subsequent discussion, the pros and cons of the respective results were discussed and finally a final value proposition was developed from the essence. The *"clear service mindset"* (c1, wsp4) and the *"targeted use of technology and especially of already available data for new value propositions"* (c1, wsp2; wsp5) were mentioned as strengths of the framework. One point of criticism from the first company was the perceived need to generate a quick solution. One employee expressed the desire for *"several loops that make it possible to adapt the later solution again and make it more concrete"* (c1, wsp3). From the following feedback, refinements of the structure and the wording of the tool were made. At the beginning, the framework suggested a gradual application. The discussion in company one showed that it is important to be able to move freely in the framework and so the former numbers of the individual steps were removed for more flexibility. In addition, the three-step approach described above was included as a critical reflection step in the development of the solution.

In companies two and three, the specifications of intended solutions were more concrete and thus the acquired results of the groups were much more similar. The highlighted positive aspects of the framework were the recipient orientation and the match of the solution with technology and data. One workshop participant stated: *"By taking the customer's perspective and identifying concrete needs, we were subsequently able to develop many possible solutions. The match with our existing data enabled an early feasibility assessment"* (c2, wsp1). The feedback-based changes in the framework were therefore fewer and related to modifications of the wordings and explanations of the boxes. At first the desired contents of the boxes were explained by detailed descriptions as there was a wish for a more concrete designation of the intended field contents (c2, wsp3). This has been changed into questions after the first two iterations. The adjustments became less after every application of the V^{di}P-developer. The subsequent extensive feedback rounds led to minor changes to the wording of the explanations and questions and suggested (based on feedback of company 1 and 2) and translating the framework into the respective native language of the users (based on feedback from the subsequent feedback cycles with practitioner groups). Rather, the feedback rounds showed the usability of the V^{di}P-developer in real-world settings and proved its structuring characteristics in this context.

The design research criteria after Forlizzi et al. (2008) were evaluated through the feedback received by the organizations. This evaluation focused on the outcome of the V^{di}P-developer (relevance and extensibility) and on the framework characteristics (process). A continuous assessment of the application was evaluated in a stepwise manner throughout the whole process and its result.

Supporting activities amplified the application of the V^{di}P-developer by setting the stage for its implementation with familiar elements beforehand und afterwards. The organizations used either a problem identification framework or a framework for the identification of key resources in advance. Companies that first collected their data treasure then made it easier to assess the feasibility of the possible value proposition. Company 3 appreciated this as *"a good entry into the framework"* (c3, wsp2). Neither advantages nor disadvantages were identified for one or the other approach, as the best fit depends on situational circumstances. However, this is not a constraint, for example, Company 1 *"lost sight of the existing data and developed new value propositions independently of this"* (c1, wsp1). All three organizations formulated a positioning statement in consequence of the application of the V^{di}P-developer. As the statement consists of several elements of the V^{di}P-developer, the formulation was performed fast and efficient and the organizations benefit from the succinct summary.

Finally, all organizations appreciated the supporting characteristics of the V^{di}P-developer and its contemporary perspectives of technology influence and service systems. The consideration of only dyadic offerings in other frameworks have been identified as an essential lack of existing

models, what is in vein with the adaptions of Zolnowski et al. (2014). The separation into a recipient and a service system side supported the organizations in the consideration of all connected entities.

6. Discussion

The aim of this paper is to design a framework for the development of digitization-enabled value propositions in service systems. A DSR field-based research process was used to design the artefact and to identify the best fitting process steps. In this regard, engaging researchers and practitioners in the design and evaluation of the DSR project has operationalized this research. The designed framework is the first framework to consider two essential elements in the value proposition development, a service system perspective and the influence of technology and data. Through its clarity, the V^{di}P-developer is fostering the discussion in academia and can be applied easily by practitioners.

Scientific discussion

According to Gregor and Hevner (2013), the V^{di}P-developer can be regarded as improved solution in a known context. The development of new value propositions has always been the core of entrepreneurial activities (Anderson et al. 2006; Frow and Payne 2011). However, as the influencing factors altered with the growing digitization of corporations and solutions, adaption to practice has been driven by external factors and new emerging problems. These shifts are picked up by various research streams, but often lack a clearly defined destination route. The V^{di}P-developer considers itself as an improvement of frameworks for developing value propositions by its expedient and contemporary perspectives.

Since Maglio et al. (2008) have highlighted the particular importance of value in service systems, numerous publications have been published in this regard. However, there is still a need to consider technology for the further development of service systems and, in particular, frameworks that capture and map current developments. With the integration of a management perspective, a service science perspective, and particularly the consideration of the strong need of the targeted use of technology for innovation in service systems (Daim et al. 2010), the framework developed in this paper is creating a deep synergy between various research streams. It reflects the significance of new digital technologies for the innovation processes and the value creation in service systems (Demirkan et al. 2011). Activities taken by one actor within a service system affect the service system as a whole (Breidbach and Maglio 2014), which was underpinned by the applications of the framework in the companies. This is supporting the four categories for innovation in service systems brought forward by Maglio et al. (2006). The framework structures the adaptions in service systems enabled by the digital transformation and thus also paves the way to altered value propositions. The V^{di}P-developer ensures the comprehensive observation of the digitization-enabled value propositions for the service system through a holistic approach in its application.

A second problem the V^{di}P-developer is approaching is the targeted use of the possibilities of digitization, especially digital technologies and data. The implementation of new digital technologies constitutes an enabler for the new value propositions and thus an enabler for service innovation in the service systems. In this context, the conclusions drawn from the application of the V^{di}P-developer help to find answers to the question posed by Vargo et al. (2008), how information technology influences the ways in which value can be created. The V^{di}P-developer closely connects technology use with value propulsions and constitutes the first framework with this characteristic.

In addition, the framework has opened up new perspectives in the management of digital technologies with its service innovation focus (Lusch and Nambisan 2015). Since the technologies are taken into account with a clear sense of purpose, the V^{di}P-developer, for example, opens up the question of in-house development or external procurement of the required technologies and data from the very beginning. This strengthens the system perspective within the context of technology management.

Managerial implications

The exemplary application of the V^{di}P-developer underlined its intelligible design and adaptability in corporate context. All three companies reallocated the partners within and connected to their organizations to provide the digitization-enabled solution and used digital technologies to connect the entities of the service system (Breidbach and Maglio 2016; Vargo et al. 2008). Moreover, innovation was driven by a new orchestration of the mix of activities, actors and technology, and was enabled by the integration of new digital technology to the service system (Grenha Teixeira et al. 2017). The improvement of the service systems predominantly took place in two of the four categories of Maglio et al. (2006) and either addressed the creation of completely new service systems or the connection of existing service systems to new service systems. The resulting value propositions varied from adaptions of exiting services to the creation of incremental new service offerings.

Human interaction remains present in all solutions. In this effect, the definition of technology-enablement could be adopted and the remarks of Breidbach et al. (2013) were supported. Especially in the knowledge-intensive solu-

tions, the presence of physical interaction next to digital parts of the solution supported the explanations of Breidbach and Maglio (2016). Additionally, digital technology enabled the provision of new solutions in all six cases. The use of digital technologies has become an essential part for service provision and supply (Demirkan et al. 2015). All three organizations strived to use a digital platform to offer the new value proposition.

In addition, the use of data was an essential part of many new value propositions created with the V^{di}P-developer. Due to its distinct perspective, the V^{di}P-developer supports the development of value proposition for future data-driven services (Schüritz et al. 2017). Particularly in the feedback rounds with practitioners, the interweaving of technology and data showed up, which makes the combination of both elements in a V^{di}P-developer box particularly advantageous.

Concluding, the V^{di}P-developer supports the course from divergence to convergence. This was particularly present in application settings with participants that had diverse backgrounds. In these cases the framework was used for idea generation first and for consensus-building after. Often different digitization-enabled solutions have been generated in a first step, followed by a discussion to identify the most promising solution to continue with. In general, the framework represents a structured way to lead to convergence.

7. Conclusion, Limitations and Further Research

As "the real power of value proposition thinking is in the process" (Barnes et al. 2009, p. 53), this paper designed a process framework for the systematic development of digitization-enabled value propositions. To achieve this structured development, the relevant components of digitization-enabled value propositions in service systems have been identified based on a literature review and practice. As current frameworks for value proposition development lack on an encompassing view and neither unite digitization-enabled solutions with specific recipient needs, nor consider the system behind service provision, the V^{di}P-developer constitutes the first framework considering the alterations through digital transformation as well as service systems in value proposition development. The encompassing consideration of all relevant elements of digitization-enabled value propositions is the particular characteristic of the V^{di}P-developer framework.

As a result, not only the recipient but also the service system perspective are included in the framework. The recipient perspective considers the definition of the specific recipient of the new value proposition, the recipients' "pains" and "gains" and the derived recipient benefits by the new digitization-enabled solutions. The service system perspective includes the first formulation of the digitization-enabled solution, the used technology and data for its realization, the connected partners and the summarization of the solution in a collection of its unique characteristics. By tailoring these components to a structured process with consecutive process steps, the designed framework supports the structured development of digitization-enabled value propositions in service systems. The identification of suitable upstream and downstream activities supports the integration of the framework to organizational practice. The design and iteration of the framework, the V^{di}P-developer, followed a DSR process with the aid of qualitative research (Corbin and Strauss 1990; Peffers et al. 2007).

In this research project we focused on the design of the V^{di}P-developer. The framework was then applied in three manufacturing organizations for further evaluation and demonstration. Its generic formulation and open structure suggest the fit to numerous settings and situations when it comes to the development of digitization-enabled value propositions in service systems. Nevertheless, the framework has to be evaluated by additional workshops and discussions in the future. In the course of this, also different sectors and settings need to proof its broad applicability and its advantages over existing frameworks. Additionally, the alterations to general service development, triggered by the digital transformation, have to be identified in further research projects. This would support the merger of the V^{di}P-developer with its following processes.

This paper also explored numerous upstream and downstream activities of the V^{di}P-developer. The design of these supporting elements was not the focus of this research project. Especially the close link to the identified, but also other activities will support the targeted use of the V^{di}P-developer in organizational practice.

The present study takes a service systems perspective on a meso level. As changes are expected on a micro level perspective, the additional entities involved, for example in-house departments, have to be considered in a next step. As service systems are seen as self-contained and self-adjusting systems, the changes in the processes of all entities constitute one research implication (Akaka and Vargo 2014). Therefore, the findings provide a first step of analysis and deliver deep insights of one group of entities.

Appendix

Frameworks	Customer / Recipient focus	Service orientation	Partner consideration	Service System consideration	Technology consideration	Data consideration	Supports VP development
Buyer Utility Map (Kim & Mauborgne, 2005)	++	+					+
Customer Fulfillment Lifecycle (Hamilton, 2013)	++	+					+
Deconstructing the Value Proposition (Payne & Frow, 2014)	++	+	+	+	+		+
Design Space for Value Facilitation (Alter, 2013)	++	+					+
Needmining (Kuehl, 2016)	++	++				+	+
Value Blueprint (Alter, 2013)	++	++	++	++			++
Valueprop Checklist (Horton, n.d.)	++	+					+
Value-Focused Enterprise Model (Barnes, Blake & Pinder, 2009)	++	+	+				++
Value Map (Osterwalder et al., 2014)	++	+	+	+			+
Value Proposition Builder (Barnes, Blake & Pinder, 2009)	++	+					++
Value Proposition Canvas (Osterwalder et al., 2014)	++	+					++
Value Proposition Framework (Kambil, Ginsberg & Bloch, 1996)	++	+	++				+
Value Stream Discovery (Cooper, Vlaskovits & Ries, 2013)	++	+					+
Value Stream Loop (Rother & Shook, 1999)	++	++					+
Value Stream Mapping (Rother & Shook, 1999)	++	+	++	+	+		+
*Service Business Model Canvas (Zolnowski et al., 2014)	++	++	++	+			++
V^{di}P-developer	++	++	++	++	++	++	++

Fig. A1: Characteristics of Value Proposition frameworks

Company	Workshop participant	Professional role
Company 1 (c1) *Component manufacturer*	Participant 1 (wsp1)	Technology & Innovation Manager
	Participant 2 (wsp2)	Head of Digital Strategy & Management
	Participant 3 (wsp3)	Digital Products Department
	Participant 4 (wsp4)	Service Strategy Department
	Participant 5 (wsp5)	Production Innovation Department
	Participant 6 (wsp6)	Technology Development Department
	Participant 7 (wsp7)	Head of IT-Innovation
	Participant 8 (wsp8)	Product Manager
	Participant 9 (wsp9)	Strategy and Business Management
	Participant 10 (wsp10)	Controlling Department
	Participant 11 (wsp11)	Technology Development Department
	Participant 12 (wsp12)	Sales Representative
Company 2 (c2) *System manufacturer*	Participant 1 (wsp1)	Head of Spare Parts Logistics
	Participant 2 (wsp2)	Senior Manager Service Development
	Participant 3 (wsp3)	Service Development Department
	Participant 4 (wsp4)	Sales Representative
	Participant 5 (wsp5)	CRM Department
Company 3 (c3) *Plant manufacturer*	Participant 1 (wsp1)	Head of Service Development
	Participant 2 (wsp2)	Head of Maintenance & Spare Parts
	Participant 3 (wsp3)	Business Development Department
	Participant 4 (wsp4)	Service Development Department
	Participant 5 (wsp5)	Service Development Department
	Participant 6 (wsp6)	CRM Department

Fig. A2: Workshop participants

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Keywords

Value Proposition Development, Service Systems, Digitization-Enabled Innovation, Service Systems Management, Design Science