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# Using Service Dominant logic to assess the value co-creation of Smart Services

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**Abstract.** The digital transformation of industrial firms is providing opportunities to improve efficiency, design new value propositions and re-engineer their business models. With the adoption of digital technologies in combination with the use of data, firms can develop new smart services for their internal or external customers, enabling new value co-creation opportunities and, possibly, leading to a competitive advantage. Nevertheless, assessment of the impact of smart services in financial and organizational terms, and the way to reach such a competitive advantage, is problematic for firms. The challenge firms are facing is that the value created through smart services consists of many small improvements which add up rather than a single point of value. This paper introduces the background literature research, then presents and discusses the results from a use-case where the application of enabled smart services was developed. The outcomes show that digitization can support both internal value creation and the development of new customer value propositions based on servitization and allow non-manufacturing firms to develop new value propositions through smart services.

**Keywords:** Smart Services, digital servitization, smart connected products, S-D logic.

## 1 Introduction

Digital technologies (i.e. sensors, cloud computing, machine learning, artificial intelligence, etc.) can create new connections within a business ecosystem and, in combination with big data, enable new value co-creation opportunities and processes [1]. In particular, research shows a growing interest in the digital transformation of industrial firms shifting towards a service business focus (servitization) [2] and existing literature defines this shift from traditional/non-digital offering (goods and services) of manufacturing firms, with the implementation (adoption and use) of digital technologies, as digital servitization [3]. Even if many studies have addressed the role of digital technologies [4], there are many examples of manufacturers that no longer sell products, but rather provide advanced services, smart services, and digitally-enabled

product service solutions [2]. The literature agrees that technology-driven innovations can facilitate differentiation of the company's offering, thus bringing a new opportunity for capturing value in highly competitive markets [2]. Still, too little attention is given to how the value of Smart Services can be assessed according to the theoretical premises of service science and Service Dominant (S-D) logic. This paper challenges some views of the actual research and sheds further light on this argument. Findings from the analysis of a use case study are discussed in order to answer the research question (RQ):

“How can value co-creation be assessed and captured along the Data2Action smart services development process?”.

This research aims to answer this question using an inductive theory building from a case approach. The paper is structured as follows: first, a literature review of the key concepts of Smart Services and value co-creation through the lens of S-D logic; then, the research methodology used to answer the RQ with the results from the use-case; finally, the findings are discussed and conclusions made.

## **2 Literature review**

The context of the paper is industrial Product-Service Systems (industrial PSS), and this limits the scope of the literature review to within this complex B2B environment. The outline of how firms can gain financial benefits from digitally-enabled industrial PSS has recently been described in the literature [5]. The papers identify that organizational shifts are needed for digital servitization to enable the creation and delivery of the collaborative value propositions that can be developed with industry 4.0 technologies. The new value propositions are often predicated on existing industrial PSS augmented with smart services supported through value co-creation and value co-delivery. Such co-creation within the ecosystems experienced in industrial PSS has been further described [6], where three different literature streams were compared to describe the ecosystem and value co-creation processes. As such, the literature review aims to define Smart Services and then define value co-creation according to S-D logic so that the RQ can be answered.

### **2.1 Smart Services**

Smart, connected products enable functions and have capabilities referring to monitoring, control, optimization and autonomy [7]. They allow the development of Smart Services, which are pre-emptive product-support services that can be delivered more efficiently and quickly due to hard field intelligence and connectivity [8]. This concept encapsulates more than just technology: it also refers to a more customer-centric view and strategy to transform technology into services with added value from the customer's point of view [9]. In particular, with the concept of servitization [10, 11], it refers to the commercialization of digital services within Industrial PSS.

## 2.2 Value co-creation according to Service Dominant logic

S-D logic is a meta-theoretical framework based upon ten foundational premises that define its conceptual domain [12]. It provides a novel perspective that calls for a re-thinking and re-evaluation of service innovation [13]. According to the principles of S-D logic [12], value is (co-)created through simultaneous and continuous interactions among a wide set of dynamic operant (active) resources, which form ecosystems of service offerings and exchanges. In this context, technological changes can play a key role. Digital technologies can create new connections and interactions within a service ecosystem, enabling new value co-creation opportunities and processes in different spatial and temporal settings [1].

## 3 Research Methodology

The process of assessing the value of smart services based on S-D logic is complex, so it is essential to use a qualitative approach [14], since that gives the possibility of gaining an understanding of managerial actions and processes in real-life organizational settings [15]. In particular, since research in this domain is in its preliminary stage, we adopted an inductive theory, building from the case approach [16]. In particular, we decided to use a single case study since we found the selected case particularly revelatory [17]. No research protocol was used, the data collection of the use-case has been done through direct observation and open questions (what, why, how). The observation took place during weekly development sessions with the industrial partner. These were both face to face and online meetings, during which the researchers could ask questions.

## 4 Case description

The case study is a company with a printing-as-a-service business model [18]. In order to guarantee the profitability of contracts, the company has to assure that the right amounts of spare parts and consumables are sent to the customer in time, to fulfil the service level agreement. For this reason, the service department is in charge to validate the orders coming from the customers and manage and optimize the resources in the field. The participants who collaborated were from the service department of the firm, responsible for the delivery of printing-as-a-service. As a team, they wanted to understand how to develop new Smart Services using the data collected from individual printers. Their focus was the order fulfilment system and how they could improve customer experience and at the same time drive out cost (i.e., waste or inventory).

The Data2Action model [18] gave us the structure to understand the problem, ideate solutions, build prototypes and test the prototypes. The model integrates aspects of S-D logic and Service Design approaches, and in this case the focus is on the key tools used to discover and describe value (co-)created for the potential Smart Services that were developed.

The tools used to identify value are shown schematically in Fig 1. The rating matrix tool was used to rate solutions from the ideation phase in terms of their business value and the feasibility of developing them to a running solution. The rating matrix with its two dimensions - value and feasibility - provided justification and structure for the selection of ideas. The ratings from the team were qualitative and included tangible and intangible value dimensions of the service. Iterations were required to support the convergence of agreement with the positioning of the solutions on the rating matrix. The case/actor matrix was used to identify the context of the problem and the actors involved. This gave the team a tool that allowed them to understand who was involved in a prospective solution, as well as describing the context of the problem. The S-D logic framework was then used as a proxy for the smartness of the solutions according to S-D logic axioms [19]. Some of the data in the table was in effect a copy/paste from the case/actor matrix and supported the five-point scale used when grading the different solutions. For the value assessment three iterations were conducted, as the understanding of the value and the effectiveness grew with every iteration, giving the project team more confidence when selecting the solutions to develop into Smart Services.

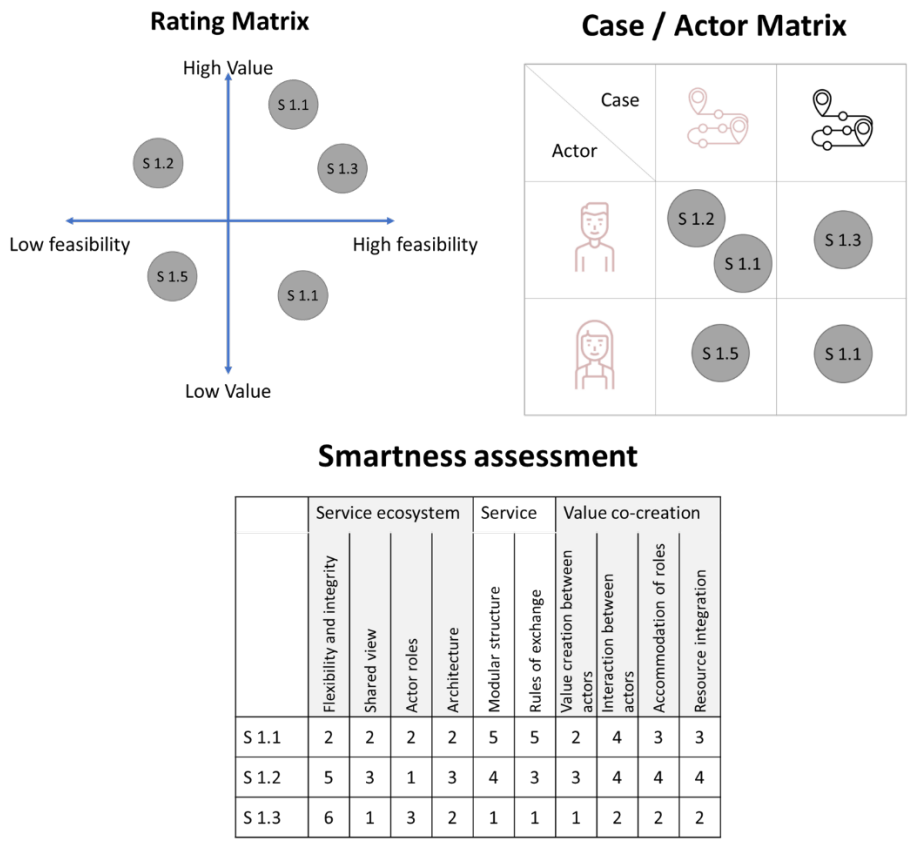


Fig. 1. The three tools used to help identify the value co-creation.

The process for value assessment was iterative and consisted of many tools, all of which provided some information needed for decision making. The value aspect of the matrix (in which the ideas were rated) was the contextual understanding that was developed with customer journey mapping, avatar journey mapping and ecosystem mapping [20]. The value recipient (the actor) was described as a persona, and the actor value was described with the customer value proposition. The relationships between context and actor were summarized in the case actor matrix. With each iteration the context and the actor value propositions became clearer. As the maturity of context and value proposition grew, the confidence for decision making grew. The case actor matrix helped assess the smartness of an idea based on the S-D logic framework, and this supported the value assessment.

Effectiveness is an axis on the matrix that tries to identify how easily an idea could be prototyped or developed. Technical aspects, knowledge, and resource (data) availability can play a role in moving the idea along this axis. The effectiveness can also be related to costs. The technical people in the project team drive the rating for this axis. The Source Target Link matrix from the D2A associated ideas with the data and the analysis methods systematically revealing if the idea was do-able or not.

In early stages the matrix is based on purely qualitative data but, with the increased context development, potential value proxies are identified and translated into KPIs, providing stronger arguments for project decision making.

## **5 Discussion**

The discussion is broken up into four sections, the first describes the importance of the input to the process. It then moves on to consider the process of the assessment of the value of the solution based on S-D logic, identifying the challenges as well as the benefits of the approach taken. It closes with discussing the research question and putting it into an industrial implication.

### **5.1 Input stage**

During the development of solutions to the umbrella case of printing-as-a-service, the development group learned that there was not just one value proposition idea but many, depending on the context[21]. The clarity of the ideas for solutions (the output from the ideation phase) was critical for the input to the value estimation of the solutions. Visualizing the solutions gave clearer contextual understanding of the proposed solutions, and this is supported by the literature [22].

### **5.2 Assessment of the value of the solution based on S-D logic**

The rating matrix was a tool for the initial value discussions for a solution. The lack of a formal scale gave the team an opportunity to discover the value and integrate their views of tangible and intangible value creation. The value here was for the bene-

ficiaries identified in the solution idea. The relative scale improved with each iteration, as ideas were modified and improved.

The case/actor matrix allowed the context to be described in a standardized way, and for the actors to be clearly identified. A simple graphic was used – based on the sketch developed in

the ideation phase – to communicate the context in a simple and unambiguous way. This is according to value in context [23], because context frames the value creation, according to S-D logic. However, it is often challenging for the development team to initially frame the contextual aspects effectively from multiple perspectives and to clearly identify the beneficiaries. The team in this case were from one general cultural group (i.e., Italian) and so their views may vary from people from other cultural groups [24]. This would mean that there would have to be a re-confirmation of value within other cultural contextual settings.

The smartness rating assessment provides a simple checklist that is based on S-D logic that the development team can use as a check. This in effect operationalizes the S-D logic axioms and foundational premises into a form that can be applied in an industrial setting. The value of doing the assessment after the actor/case matrix is that some of the information can be directly taken over and assessed in more detail using the framework. The five-point Likert-scale (1-5) provides a pragmatic approach to the scoring. In general, the higher the scoring the more likely it is that higher value was co-created with the beneficiary. The value here is captured from both tangible and intangible aspects.

Iterations are important [25] and the return to the rating matrix provides the opportunity to move the solution in both the x and y directions. Each iteration also improves the description of the solution in terms of its value and the effort to develop it, while also supporting convergence.

### **5.3 Assessment of the research question**

The developers have used a process that has allowed them to identify on a relative basis the value co-created by different actors for a beneficiary within the context of a Smart Service. It does not mean that the value identified will be created and delivered, as this is only in effect a proxy to the value. However, it is closer to the value in use than the traditional value-in-exchange model used by many manufacturers and supports a move to value-based pricing. The model proposed is shown in Fig. 2 and the authors recommend that at least three iterations are required to get convergence on a solution.

### **5.4 Industrial implications**

The industrial implication is that a model that has been tested on one case, could be supported with development of Smart Services, and addresses concerns identified in the literature [25]. This is important, as the application of S-D logic can be difficult for manufacturing firms. The two business axes of efficiency (cost saving) and effectiveness (potentially new value propositions) need to be integrated into the approach.

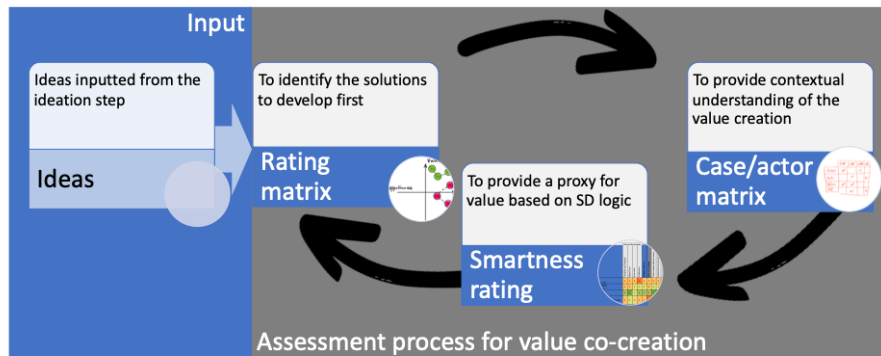


Fig. 2. The value discovery and identification process.

## 6 Conclusions and recommendations

This single case study has shown that with digitally-enabled Smart Services it is possible to use a process to discover and identify value co-creation according to the axioms and foundational premises of S-D logic. A process that assesses the proposed solution in an iterative process is able to provide an approach to identify tangible and intangible value.

This is, however, only a single case study, which thus limits the applicability of the findings. It is therefore recommended that multiple case studies are undertaken to test and further develop the process.

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