Establishing Smart Service Systems is a Challenge: A Case Study on Pitfalls and Implications

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Abstract. The trend for 'servitization' reflects manufacturers' increasing efforts to offer services along with their physical goods. Organizations establish smart service systems with digitally networked products—e.g., cars, industrial machinery, or home appliances—as boundary objects that connect the organization with customers, offering them digital channels for communication and interaction. While anecdotal evidence indicates that many manufacturers fail to establish profitable services, few studies have traced the underlying causes for failure. We perform a revelatory case study at a global white-goods manufacturer to identify pitfalls and derive guidelines for establishing smart service systems. Based on interpreting qualitative data from interviews and additional organizational resources, we analyze how and why the manufacturer's efforts to establish pay-per-use services based on a smart laundry machine failed. While we provide insights that can guide management in establishing smart service systems, our findings also motivate updating concepts and methods currently discussed in service science.

Keywords: Servitization, Smart Service System, Digital Transformation, Service Engineering, Case Study

1 Introduction

Almost four out of five manufacturers acknowledge servitization is an opportunity for differentiation and growth [1]. Not surprisingly, many organizations seek to expand their product portfolio and establish smart service systems by equipping their physical products with connectivity and information processing capabilities, to transform these products into boundary objects that are situated at the customer interface [2].

Technological trends, such as drones, AI platforms, and immersive technology can offer great opportunities, but they can also increase the complexity of servitization. Hence, the transformation to become a service provider is more challenging than ever [3] and it might even jeopardize an organization's overall success. For instance, Siemens' service division "Siemens Business Services" turned out to be unviable [4]. Especially for manufacturers, resources and capabilities established in an organization can oppose innovation [5], since they may interfere with creativity and restrict the mindset for service development. Therefore, organizations need to overcome

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established structures, redefine their strategy, and promote change for transforming into service providers [6, 7]. Service logic reiterates that service providers cannot determine the value of their offerings for customers—in terms of the offerings' value-in-exchange—but they need to offer value propositions that attract customers to engage in value co-creation [8]. Value co-creation refers to joint and reciprocal interactions between multiple actors that integrate their resources and apply their competencies to create value [9] in a smart service system [10]. As a beneficiary, customers perceive and determine a service's value during its consumption (value-in-use) [8].

Service research reports successful service transformation projects [11–13], while few (if any) studies explored abortive smart service systems. Analyzing reasons for unsuccessful smart service systems is imperative, since many manufacturers conduct servitization projects and might, without proper guidance, reiterate the same mistakes. Hence, we set out to perform a single case study to investigate "*How and why do attempts to establish smart service systems fail?*". We analyze an organization's unsuccessful attempt to establish pay-per-use services based on using a smart laundry machine. The organization is an established manufacturer that is now trying to add value by offering supplementary services. By analyzing qualitative data from interviews and complementary data sources, we identify six pitfalls from which we derive implications and guidelines for implementing smart service systems.

From analyzing the case of an unsuccessful transformation, we add unique empirical insights to the emerging literature on smart service systems. We discuss why servitization is a systemic approach that goes beyond developing serviceoriented value propositions as additional units of output. Also, our findings provide an impetus for service research to update and refine theory, recognizing servitization as a transformation process. Further, we highlight that updating smart products and transforming organizational structures is vital for establishing a smart service system.

The paper is structured as follows. Section two provides a theoretical background of smart service systems and its engineering. In section three, we illustrate and justify our research method. In section four, we present our case and pinpoint the pitfalls of the smart service system engineering project. In section five, we interpret and discuss our findings to derive implications for establishing smart service systems. Section six summarizes our findings, identifies limitations, and sketches a path for further research.

2 Theoretical Background

2.1 Establishing Smart Service Systems as 'Servitization'

Organizations are under pressure to adopt new technology and develop "strategies that embrace the implications of digital transformation and drive better operational performance" [14]. Digital transformation is "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" [6]. Therefore, digital transformation exceeds the mere digitalization of products and services and requires organizations to redefine their strategic orientation and value propositions [15].

Many industries have changed radically, including the service sector [16]. The term '*servitization*' was first introduced in the late 1980s [17] to describe the "*shift from selling products to selling integrated products and services that deliver value in use*" [18]. Many organizations followed this path, offering products and services that jointly or distinctly provide value-in-use [17]. The successful transformation of Rolls-Royce from an engine manufacturer to a service provider in the 1960s [11] is a famous example. IBM's transformation from manufacturing IT hardware to offering services and software solutions [12] is another case in point. Apart from technology leaders, however, only 25% of manufacturers successfully managed their servitization [19].

Servitization is a complex transformation process since it presupposes acknowledging that '*service*'—and not physical goods or services as units of output that provide value-in-exchange—is the key to make value propositions to clients [20]. Service is "*the application of specialized competencies* [...], through deeds, processes, and performances for the benefit of another entity or the entity itself" [20]. By framing digital technology as materialized competencies to be used by actors that have agency [21], digital technology enables new configurations of resources and new value propositions [22]. Thereby, the role of technology is changing from an enabler—as an operand resource—to an actor for value co-creation—as an operant resource [23]—highlighting the need to conduct holistic development processes, considering the interaction of services and physical goods [24]. To capture the bond and complementarity of involved actors, operand, and operant resources for value creation, service needs to be conceptualized from a system's perspective [25].



Figure 1. Conceptualization of a smart service system ([2])

The 'service system' has been argued to be a basic abstraction in service science [25]. It is "a configuration of people, technologies, and other resources that interact with other service systems to create mutual value" [25]. Service systems become 'smarter'

as technologies increasingly permeate these systems [26], which become "capable of learning, dynamic adaption, and decision making based upon data received, transmitted and/or processed" [27]. Smart service systems (Figure 1) build on using smart products (featuring sensors, connectivity, unique ID, location, data storage and processing capabilities, actuators, and multi-modal interfaces), i.e., an IT artifact acting as the interface between different actors to enable information and knowledge transfer [2]. As a boundary object, smart products enable service providers and service customers to interact and integrate resources to produce individualized value propositions that create value-in-use for both [2]. Data obtained from smart products enable organizations to transform from a manufacturer to a solution-provider by shifting the line of interaction, i.e., adopting or passing customer activities to other actors of the smart service system [2]. Thus, the smart service system is "a theoretical lens through which digital value co-creation by service consumers and service providers can be understood, analyzed, and designed" [28].

2.2 Smart Service Systems Engineering

Smart service systems engineering is a normative process [29] for analyzing, developing, and implementing ideas for innovative services [28]. As opposed to service engineering [30], smart service systems engineering takes a systemic view, exploiting interactive and collaborative innovation through digital technologies [31]. Importantly, value is co-created in an actor network, spanning across organizational boundaries [32].

Previous research proposed a plethora of methods for service engineering [33], like (1) the method for engineering digitally enabled service systems (TRIGGER) [31], (2) recombinant service systems engineering approach [33], and (3) the specification for smart service systems engineering (DIN SPEC 33453). TRIGGER takes a systematic approach, starting from the overall socio-technical system to a narrower activity perspective, encompassing the reconfiguration of resources to design a value proposition [31]. The reconfiguration is performed by the *'liberation from constraints by digitization*'(LiCoDi), comprising the liquefaction and rebundleability of resources. The design of service systems is operationalized through resource density, i.e., variation of the available information, knowledge, and other resources [23]. LiCoDi comprises five activities: (1) liquefactions, (2) identification of competences, (3) unbundling, (4) re-bundling and enhancing resource density, and (5) maximizing resource density [31].

Recombinant service systems engineering focuses on the phases and activities for the structured design of a value proposition [33]. Foundational premises are that (1) service systems are socio-technical systems, (2) the engineering process relies on associating, dissociating, and adding resources, (3) the engineering process includes access to external resources and transfer of ownership of physical goods, and (4) it is an agile process [33]. A problem or opportunity triggers the engineering process, proceeding with three sub-processes, (1) service system analysis, (2) service system design, and (3) service system transformation [33]. The sub-processes are linked by a decision point, in which the engineer continues or repeats them [33].

The DIN SPEC 33453 [34] presents a standardized process model for the agile, flexible, and fast development of smart service systems in an industrial context [34]. The engineering process encompasses three phases, which can be performed in any order: analysis, development, and implementation. In the analysis phase, ideas for new services are identified, which are then examined from the customer's point of view and prioritized regarding their feasibility and cost-effectiveness [34]. The development phase encompasses design decisions, resulting in a (minimum viable) value proposition [34]. Finally, the service system is implemented, i.e., technically and organizationally established, such that the value proposition can be offered to customers [34].

3 Research Method

3.1 Research Design

To shed light on the phenomenon of '*how*' and '*why*' the establishment of some smart service system can fail, we choose a single case study design. Our rationale for performing a single-case study is twofold. First, we investigate a revelatory case [35], which enables us to gain unique insights into how and why establishing a smart service system failed. Therefore, we conduct a criterion-based case selection approach [36]. In this regard, we look for an organization that recently established a smart service system (C1), is a traditional manufacturer (C2), and a large company with established corporate structures (C3). Second, a single case study design facilitates an in-depth exploration of a contemporary phenomenon within its context [37, 38]. Overall, we accompanied the organization two years (2017–2019), having multiple informal conversations.

We gather data from multiple sources [35], including files that document the smart service system engineering process, artifacts, secondary data from sales, field notes, and internal presentations since interpreting and triangulating different types of data strengthens the quality of our evidence [11]. Further, we conduct interviews with six key informants (Table 1) that we select carefully [35] to obtain both current and retrospective insights into the phenomenon [39]. We conduct a purposeful and maximal variation sampling strategy. The informants have senior roles in the service system's design and were involved in the different development phases of the smart service system. We divide the sampling process in two phases, whereby the first phase constitutes the basis for the second. Each semi-structured interview lasts 25–60 minutes. We conduct five interviews face-to-face and one via telephone. We audiotape and transcribe them to provide an accurate rendition of the interviews [35].

Person	Position	Age	Experience (yrs)	Duration (min)
V1	Head of Innovation Potentials	39	11	49:30
V2	Director Dishwashers & Digital Products	51	17	60:00
V3	Project Manager Digital Innovations	35	3	56:07
V4	Product Manager	49	20	30:36

Table 1. Overview of informants and interviews

V5	Head of Connected Appliances	41	5	50:34
V6	Head of Software Engineering	51	16	25:08

3.2 Data Analysis

As a systemic procedure for analyzing the case study data, we follow a systematic inductive approach for qualitative data analysis by Gioia et al. [39]. We perform data triangulation to carefully examine the case, corroborate the findings, and strengthen the construct's validity [35]. Four different unbiased researchers code the data to obtain data validity. Thereby, we perform first- and second-order analysis and data structure development, which serve as a content substrate for deriving propositions [39].

For the first-order analysis, we perform open coding by clinging to the phrases and terms provided by the informants to distill categories [40]. With axial coding, we screen the data for similarities and differences among the categories [41] to reduce the categories' quantity. Thereby, we look at the deeper structure of the data and give those categories phrasal descriptions [39]. In the second-order-analysis, we look at emerging concepts for understanding and explaining the phenomenon of the case until we achieve *theoretical saturation* [39]. Subsequently, we aggregate the second-order concepts, we design a data structure [40] that pinpoints the pitfalls of establishing smart service systems. By extracting concepts from the data, we show our results' relevance and transferability [39].

4 Case Study on Smart Service Systems Engineering at Snow

4.1 Identifying the Smart Service System

We conduct the case study on a servitization project at a large white-goods manufacturer, which we call 'Snow' in this paper. Snow offers high-end laundry machines and a pay-per-use service, based on a smart laundry machine (Figure 2).



Figure 2. Smart service system for the pay-per-use laundry service (instantiated from [2])

Snow strived to design value-added services to complement one of their new laundry machines. This machine is a smart product that can be used as a boundary object to establish a smart service system [2]. More precisely, the smart laundry machine is equipped with a Wi-Fi connection and features sensors to collect, send, and receive data. Data collected and stored include device codes, error data, and engine codes, enabling remote monitoring, remote diagnosis, and data analytics for each machine. However, data was neither stored nor processed on an aggregated level, as would have been necessary, e.g., to identify usage patterns or optimize machine use. Each machine has a unique product ID and a digital display that serves as a user interface.

4.2 Identified Pitfalls from Establishing a Pay-Per-Use Laundry Service

We summarized the informants' statements and developed a coding table (Figure 3) to derive a data structure [39]. With the aggregated dimensions, we stipulate 'how' and 'why' the introduction of a pay-per-use laundry service turned out to be unsuccessful. Analyzing and discussing the pitfalls enables the deduction of implications for improving the development of smart service systems and giving hints on how to prevent re-iterating the same mistakes in other servitization projects.



Figure 3. Coding table (structured in line with [36])

The first phase of the servitization project started in 2015 when Snow initiated a university student project for developing the idea of establishing a pay-per-use service for their laundry machines. In the second phase (starting in 2016), Snow refined this idea by developing first prototypes, setting up a price model, and conducting a pilot project to assess consumers' acceptance rates. The study revealed that students were unwilling to use the smart laundry machine because they perceived it as too expensive. As a result, *"it came out that [developing a pay-per-use service] might be a good idea, but it won't be successful on that market,"* V3 says.

Nevertheless, in late 2016, the product management asked the digital innovation department to develop a new service that would complement their new laundry machine. They intended to present the new service at the next international trade fair as an innovative highlight. However, at that time "the smart product was in essence already completed [and could not be adapted any further]" V1 states.

Pitfall #1: Snow's product management department triggered the innovation process, perceiving pay-per-use services as an additional sales object that complements and adds value to their existing laundry machine.

The development project itself was performed iteratively, starting with brainstorming and collecting ideas. Initially, "we analyzed which data we can retrieve from the smart product and whether we can use it or not," V1 says. Smart service systems engineering included activities of analysis, design, and implementation, however, "recycling or refurbishment of the laundry machine after the contract has ended has not been considered at developing the smart service system.", V2 states.

Snow used different methods for developing the smart service system, including the business model canvas. Several challenges related to using the methods occurred, as V1 admits: "*If you read the whole description of the business model canvas, you still don't know how to use it.*" V2 confirms that "*the problem in the business model canvas was that the value proposition was not defined properly.*" In fact, the value proposition was a "*flat-rate service package*," V3 says. By paying a fee for each washing cycle, customers saved the purchase of a laundry machine and received free delivery and installation, and a consumption-driven delivery of free detergent cartridges based on usage data. Through a mobile app and a web-based application, customers could monitor their washing cycles, energy and water consumption, the account's balance, and receive a push notification about their finished laundry.

Even though Snow used common methods for service engineering, they did not set up the endeavor as a formal service engineering project. As V3 states, "specifications often came orally and were not fixed in a requirements and functional specification document." Then, the team broke down the specifications into work packages. Thereby, they relied on existing structures and procedures of product engineering processes, but "with the existing departments, we brought in existing thinking" V1 states. Interdisciplinary collaboration between the departments was perceived as difficult, as they "needed to practice the cooperation as a cross-functional team," V5 says.

Pitfall #2: Snow's innovation team did not set up a formal project for developing the smart service system. They were overstrained with applying methods for service engineering.

Even if the team attempted to structure their development project appropriately, they did not carefully consider the customer as a co-creator of value. V1, admits "we developed [the service] without taking customers' needs into account." V2 adds that even if the project's objective was "to reach out to new customer groups for Snow," the specified customer group drifted throughout the project, i.e., Snow switched between students, high-income employees, temporary workers, and again to students.

Pitfall #3: Snow considered customers as passive recipients of the service as value-in-exchange, instead of recognizing them as active co-creators of value-in-use.

Snow chose to distribute their new service via an established sales channel—retail stores to which they had contracts for selling washing machines before—such that *'everyone'* could buy the smart laundry machine. However, contracting a pay-per-use

service turned out to be much more time-consuming and complex for sales agents than selling the laundry machine as a product. As V1 states, "selling a washing machine took sales agents five minutes for 40 percent margin compared to 30 minutes consulting required for selling a pay-per-use contract for 40 percent margin". As a mystery shopping test revealed, sales agents did not offer the pay-per-use service regularly, due to a lack of proper incentives and increased effort.

Pitfall #4: Snow offered the new service via established sales channels, simultaneous to selling identical laundry machines. For sales agents, selling laundry machines was more productive than offering pay-per-use services.

For their laundry service, Snow established three different pricing models for low, medium, and high usage. Through a Wi-Fi connection, the machine transmitted usage data to a cloud, where the data should be stored and processed for invoicing. While Snow intended to implement an automated invoicing process, in fact, two working students needed to manually compile and mail the invoices, because the laundry machine was a standard product that was not conceptualized to implement a pay-per-use service, leading to data transmission problems and inaccurate invoicing.

Pitfall #5: Snow developed the pay-per-use service without properly considering implications on back-stage processes and technical properties of the smart product.

Snow launched the smart service system in November 2017, reacting to deadlines that were set by the management. While the laundry machine was developed over a period of five years, the smart service system itself was set up within nine months. V3 reports that their "management wanted to have something at a certain point in time, actually no matter what," since the smart service system should be presented at a trade fair. Since then, Snow "sold seven laundry machines in half a year" admits V3. In the meantime, Snow had withdrawn the smart service system from the market.

Pitfall #6: External deadlines rushed Snow's smart service engineering process, leading to finishing the endeavor without adequately defining the resulting service system or its implementation.

5 Implications for Research and Management

The pitfalls at Snow exemplify *how* and *why* the establishment of a smart service system can fail. Hence, we used the pitfalls and incidents of Snow for proposing transformation guidelines to establish a smart service system. Further, we derive theoretical implications for updating and refining theory (Table 2).

Table 2. Pitfalls, illustrations, and guidelines for establishing smart service systems

Pitfalls	Description 0	Guidelines
Product-	The smart service system.	Theory: Conceptualize an integrative approach for
centered valu	ewas designed around a	service engineering that outlines how to synchronize
proposition	smart product,	the life cycles of all elements in a smart service
	considering the service	system.

	as an additional sales \bullet	Management: Consider smart products as boundary
	object and neglecting	objects for information and knowledge transfer
	customers' expectations.	between actors for the mutual benefit.
Limited	The organization was.	Theory: Provide simple, agile, flexible, and hands-on
awareness	aware only of a subset of	methods and tools that companies can easily apply.
and high	existing methods and •	Management: Use best practices as guidance for
complexity of	was overstrained with	smart service systems engineering. Build
methods	their application.	ambidextrous capabilities to establish services
		successfully.
Customers'	Insufficient definition of \bullet	Theory: Specify the roles, functions, and activities of
role and	the extent to which	specific actors in a value network in smart service
function	certain actors are	systems engineering methods.
unclear	involved in the co-•	Management: Integrate customers as both, co-
	production and co-	producers of service and co-creators of value, and not
	creation of value and	as passive recipients of value-in-exchange.
	their assigned activities.	
Missing trans	 Establishing a smart • 	Theory: Extend engineering methods by adding a
formation	service system evoked	transformation and management phase.
phase	side-effects, conflicting•	Management: Consider servitization as a holistic and
	with internal structures	systemic change process that might require breaking
	or undermined existing	up established organizational structures and
	business models.	processes.
Decoupled	The organization failed.	Theory: Specify methods for holistic smart service
smart service	eto integrate backstage	systems development that prescribe aligned frontstage
system	and frontstage activities,	and backstage activities, and boundary objects.
	to establish consistent•	Management: Services are not an add-on for existing
	interactions in their	products. Smart service systems are developed by
	smart service system.	recombining new and old elements innovatively.
Incongruous	Actors involved in the.	Theory: Provide formal procedures for aligning the
goals	engineering process had	goals of different stakeholders in a service system.
	incongruous goals that •	Management: Consider servitization efforts as holistic
	were conflicting.	business-transformation projects that require
		sufficient autonomy, governance, and budget.

As identified in *pitfall 1*, Snow—like other manufacturers—viewed services as marketable sales objects to complement an otherwise unchanged product portfolio [10]. Our data reveal that defining a value proposition based on pre-existing physical products led to prejudiced, unclear, and drifting conceptualizations of value and customer segments. However, since service refers to resources offered to customers— irrespective of identifying them as physical goods or services [8]—organizations need to substitute product-based thinking with solution-based thinking. Therefore, value propositions need to be carefully described, since they subsequently guide a service system's design, including smart products [30]. Consequently, smart products shall be considered as boundary objects, enabling new ways of information and knowledge transfer. In addition, the whole lifecycle of value creation needs to be taken into

account, including the recycling or replacement of smart products at the end-of-life. Research can refine existing methods and models by providing an integrative approach that outlines how to synchronize the life cycles of all elements in a smart service system.

Research provides a plethora of methods and tools that enable the analysis, design, and implementation of smart service systems [33]. However, our data (cf. *pitfall 2*) indicate that Snow found these methods too complex, fragmented, and time-consuming to use. We show that a lack of awareness of tools and methods and poor knowledge about their application can jeopardize a smart service systems engineering endeavor. While organizations might have innovative ideas, they may fail at implementing the smart service system, e.g., if they skip activities required for analysis and design, such as the proper definition of a business case or establishing a value network [34]. Hence, there is a need for proposing methods, which are easy to handle, describing detailed case studies that serve practitioners as best practices for conducting their projects.

As identified in *pitfall 3*, customers were considered as passive recipients of valuein-exchange. Since the role and function of customers in value co-production and cocreation [42] is insufficiently defined, organizations often find it difficult to allocate their resources in establishing smart service systems. The same applies to Snow, which performed customer surveys, but did not consider customers as active coproducers of service. This unclear specification resulted in uncertain responsibilities and an under-evaluation of important customer feedback, negatively impacting their consideration of value-in-use. We recommend developing frameworks and models that clarify, which actors are involved as co-producers in designing value propositions and assign activities in the service systems engineering process accordingly. Further, we urge management that customers need to be treated as both, co-producers of service and co-creators of value, and not as passive recipients of solutions in a valuein-exchange logic.

As indicated in *pitfall 4*, Snow attempted to build new services on existing internal and external structures. However, establishing a new smart service system is an extensive transformation project that requires breaking up of existing structures and realigning them with new ones accordingly. Transforming structures to account for new value propositions might turn out profound enough to conflict with existing value propositions. For instance, establishing additional sales channels for pay-per-use contracts might lead to irritating current sales partners, putting Snow's success with selling washing machines at risk. For example, Snow's distribution channel, which was established to sell goods and not services, was one major factor for their inability to sell pay-per-use contracts to customers. Furthermore, due to inappropriate structures and processes in the organization's financial department and technical restrictions that could not be solved by the IT department, Snow had to work around established structures, e.g., in their invoicing process. This phenomenon is insufficiently addressed in the service research literature, since most methods assume a greenfield approach for establishing a new service, neglecting undesired side-effects on current structures or solution portfolios in an organization. Especially large and established manufacturers may be unable to transform at once and need guidance on

how a structural change can be accomplished step-by-step. Likewise, current methods lack the ability to identify and evaluate this trade-off, limiting their explanatory power and practical applicability. For theory, this finding re-affirms the need to conceptualize servitization as a transformation project and to treat smart service systems engineering as a systemic change process that requires an organization to rethink and re-organize its internal structures. Hence, we propose to include transformational activities in the service engineering process for the successful establishment of smart service systems.

Research suggests to holistically design a smart service system based on recombining resources [31, 33]. As indicated in *pitfall 5*, Snow rather focused on designing frontstage and backstage activities around an existing smart product, not considering that establishing service might require modifications regarding the properties of the laundry machine itself. From a smart service system's perspective, smart products are boundary objects that connect service providers with their customers. Service system providers must implement compatible frontstage and backstage processes that allow for integrating service consumers' and service providers' resources, enabling co-creation of value [28]. Our study revealed that unsynchronized backstage, frontstage, and customer activities limit the value-in-use. Service providers need to take an integrated perspective, considering the interaction of service providers and customers, based on using a smart product as a boundary object.

As indicated in *pitfall* 6, the goals of different actors involved in value co-creation were not aligned properly. In our case, Snow rushed the engineering process due to deadlines imposed by management even though the project team would have needed additional time to develop the smart service system more in detail. We conclude that service engineering can be a fuzzy and complex endeavor that is subject to management decisions or other corporate and legal requirements occurring in the project's organizational environment. An organization that seeks to establish a smart service system must adopt a new institutional logic [43] and might undergo tremendous efforts to transform itself [7], since servitization is an ambidextrous change process [44]. Top-down decisions must be in line with organizational structures, norms, and culture, while employees must change their mindset and behavior to enable new service in day-to-day business. We suggest revising and enhancing existing methods for remedying conflicts and aligning the needs and goals of different stakeholders in a smart service system.

6 Reflection and Future Research

We performed a revelatory case study to analyze '*how*' and '*why*' establishing a payper-use laundry service failed. Our results provide rich insights into the pitfalls that are associated with establishing smart service systems. Theoretical implications point at a need to update methods and tools for engineering and transforming smart service systems. A major issue is to identify to what extent smart service may conflict with pre-existing value propositions, organizational structures, and processes. Current methods tend to view service engineering as a green-field activity that does neither interfere nor conflict with an organization's structures and processes. Our case study revealed that this assumption cannot be taken for granted. For Snow, offering a smart service while continuing to sell products turned out to be unsuccessful.

From a managerial angle, Snow's failure to establish a pay-per-use service based on its smart laundry machine had multiple reasons. Obviously, the organization failed to recognize customers as active co-creators of value; they did not set up the endeavor with proper project management, and inadequately considered methods and tools for smart service systems engineering. These insights highlight a need to be more mindful of service engineering approaches, while future research needs to simplify and integrate existing smart service systems engineering methods and make them easier accessible for practitioners, e.g., through providing examples of their application.

Pitfalls less obvious highlight the disruptive potential that establishing a smart service might have on selling products and established organizational structures. Inspired by our case study, we state that servitization is a transformation process that very likely comes without a return ticket. Successfully establishing smart service systems entails transforming product-focused structures that, once abolished, cannot be re-established. The point is that while Snow did not succeed in establishing their pay-per-use laundry service, the organization is still very successful in selling its smart laundry machines. Quite likely, not establishing the service at the expense of their traditional product-selling business was a wise strategic decision under this condition.

Plenty of research opportunities emerge from this case study. Besides updating methods and tools for smart service systems engineering to account for (undesired) side-effects and contextual factors impacting the design process, we need to identify, which organizations benefit from establishing smart service projects and which will be better off with keeping their product-focused structures.

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