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Making Sense of the Sustainable Smart PSS Value Proposition

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Making Sense of the Sustainable Smart PSS Value Proposition

Completed Research Paper

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Abstract

While academia attributes superior value potential to sustainable smart PSS (SSPSS), in practice, they are not widely implemented. To address this gap, we analyze how the notion of SSPSS value is constructed through sensemaking. Adopting a case study approach, we explore differences in organizational sensemaking. Moreover, we analyze how the three functional roles “digital innovation and technology”, “sustainability”, and “market” involved in innovating SSPSS make sense of the value proposition. We conclude that value is subjective and the value proposition of SSPSS is multi-faceted. Each facet is constructed through the interaction of organizational, functional roles, and individual sensemaking. At the organizational level, commitment, identity, and expectations influence the creation of shared meaning. At the functional role level, actors differ in their sensemaking based on the cognitive frames applied. At the individual level, subjective beliefs impact sensemaking. Hence, sensemaking is a multi-level process that raises the question of alignment.

Keywords: Sustainable Smart PSS, Value Proposition, Sensemaking, Functional Roles, Cognitive Frames

Introduction

Product-service systems (PSS) enable competitive advantage by combining products and services in one solution to enhance the customer experience (Häckel et al. 2021). With technologies such as digitally interconnected devices, for example, smart cars (Boldosova 2020) or smart washing machines (Beverungen et al. 2019), the competitive advantage of combining products and services into PSS has moved to the digital

age (Geissdoerfer et al. 2018; Paiola and Gebauer 2020; Tukker 2004). Integrating sensor-equipped products with data-driven services into one solution is defined as a *smart PSS* (Chen et al. 2020). Using this sensor-generated data to improve and extend customer services offers enormous potential for new business models (Zheng et al. 2019). Thus, manufacturers face the challenge of reshaping their traditional business models toward smartization and servitization (Li et al. 2020). This transition from manufacturing models to smart PSS models is relevant not only from an economic perspective but also from ecological and social perspectives (Liu et al. 2020).

The current academic literature underlines the importance of smart PSS for future sustainable development (Li and Found 2017). Research discusses smart PSS as a driver for sustainability and the UN Sustainable Development Goals (Leong et al. 2020), for example, in the transition toward a circular economy (Ingemarsdotter et al. 2019). The support of digital technologies allows for the collection of product lifetime information and the prediction of product condition and health status, fostering the optimization and automation of business processes, such as maintenance (Alcayaga et al. 2019). Moreover, smart PSS can overcome the sustainability challenges of non-digital PSS, such as improper PSS use that is detrimental to longevity, by monitoring user behavior (Bressanelli et al. 2018). Hence, smart PSS offer great potential to meet individual customer needs while contributing to sustainable development (Zheng et al. 2019). As we focus on the integration of sustainable and smart PSS, we will refer to *sustainable smart PSS (SSPSS)* in this paper, defined as smart PSS that offer customer value in a sustainable manner (Zheng et al. 2018).

In contrast to the value of SSPSS described in academia, SSPSS are not widely implemented (Ingemarsdotter et al. 2021). Hence, there is a gap between the value proposed in the literature and its implementation in practice. *Value*, however, does not mean the same to everyone in every context; for example, value is different for the user, organizations, and society (Ouden 2012). Values are the subjective notion of desirable conditions, and thus each stakeholder has a different understanding of what constitutes value (Breuer and Lüdeke-Freund 2017), depending on individual needs (Freudenreich et al. 2020). These divergent perceptions can form barriers to business model innovation (Egffjord and Sund 2020), such as SSPSS. While prior research within the information systems community explored subjective beliefs and actors' values regarding SSPSS (Paulsson et al. 2019), studies that support the internal analysis of SSPSS value propositions are missing (de Jesus Pacheco et al. 2019). Likewise, more research is needed to understand how to align different actors in the SSPSS innovation process (Reim et al. 2017). Moreover, while the term "smartness" is defined in academia, it is not explored in real-life settings (Alter 2020). Hence, more case studies, which generate real-life understanding (Yin 2014), are needed to explore SSPSS. Therefore, we adopt a case study approach to analyze the internal construction of SSPSS value propositions at two manufacturers. Beyond these practice-oriented gaps, we address a conceptual issue. In academia, the term sustainable value is not properly conceptualized, understood, or used, which is why it is crucial to differentiate between the levels of value analysis (Méndez-León et al., 2022). We contribute to conceptual clarity by focusing on the value proposition to better understand the term value in the context of SSPSS.

For the analysis, we use the sensemaking lens, an established theory in information systems (Hsieh et al. 2011; Tallon and Kraemer 2007), and sustainability management research (Hahn et al. 2014; Maon et al. 2008). *Sensemaking* addresses how organizations and the actors within them develop a shared understanding (Weick et al. 2005). It applies especially to situations of change and ambiguity, giving rise to conflicting interpretations or different value orientations (Weick 1995, p.93). Hence, change, such as the transition from a manufacturer to an SSPSS provider, offers a "particularly powerful occasion for sensemaking" (Maitlis and Sonenshein 2010, p.552).

As Weick (1995) highlights, sensemaking is influenced by identity. Within the organization, *functional roles* characterized by comparable tasks define specific contexts in which people adopt different cognitive frames that guide the construction of meaning (Maitlis 2005). In the context of SSPSS, we can differentiate between a role identifying innovative value, a role identifying holistic sustainability, and a role identifying market opportunities (Liu et al. 2018). In this study, we refer to them as digital innovation and technology (DIT), sustainability (S), and market role (M). To address the research gap described above by applying the sensemaking lens, we pose the following two research questions:

RQ1: What drives organizational differences in sensemaking regarding the value proposition of SSPSS?

RQ2: How do different functional roles make sense of the value proposition of SSPSS?

We seek to understand the outcomes of internal value sensemaking to construct SSPSS value propositions as prerequisites for business model innovation. As we analyze manufacturers becoming SSPSS providers, the value proposition is internally constructed but not yet externally proposed, accepted, or evaluated by the customer (Maglio and Spohrer 2008). Therefore, we use the term *value potentials* to describe different types of values expected to be harnessed by realizing SSPSS (Widmer et al. 2018). We adopt an inside-out perspective, focusing on the roles within the organization and the value they perceive for external stakeholders. Thus, our level of analysis is the value for customers, society, and the environment, which constitute different value potentials that compose the value proposition of SSPSS.

Theoretical Background

The Value Proposition of Sustainable Smart PSS

According to Liu et al. (2018), the components of smart PSS are smart products, smart services, data, and experience. Smart components, technology, and analytics can offer additional customer value (Schüritz and Satzger 2016), driven by customer satisfaction (Schenkel et al. 2015). The smart services component allows companies to customize their value proposition, enhancing customer interaction and value co-creation (Häckel et al. 2021; Lusch and Nambisan 2015). As customer interactions and the information generated by digital technologies and analytics change the nature of the value offered when becoming an SSPSS provider, digital technologies redefine the value proposition (Wessel et al. 2021). Based on this interaction, the owner of SSPSS extracts benefits, such as money, cost savings, or word-of-mouth endorsements (Liu et al. 2018).

A sustainable value proposition addresses the trinity of economic, ecological, and social value (Evans et al. 2017; Schaltegger et al. 2012) and thus ensures simultaneous value creation for different stakeholders, including customers, the environment, and society (Baldassarre et al. 2017). Sustainable value can therefore be defined as maximizing “benefits while reducing damages in economic, social, and environmental terms” (Méndez-León et al. 2022, p.25). Sustainability research discusses PSS as one way to internalize these externalities based on changed ownership structures, which leads to greater corporate responsibility compared to product sales (Evans et al. 2017). A sustainable value proposition thus gives a more holistic answer to the question of what value is provided to whom (Bocken and Short 2016; Short et al. 2014).

An SSPSS value proposition still aims at superior customer value (Kristensen and Remmen 2019; Schüritz and Satzger 2016). Thus, our level of analysis is the value for customers, society, and the environment, which constitute different value potentials that compose the value proposition of SSPSS (Méndez-León et al. 2022). As the two cases we analyze are embedded in a B2B context, we distinguish between the value offered to B2B customers and their end users, such as manufacturing employees who use smart gloves, thus interacting with SSPSS. Additionally, it is vital to identify the information value that describes the capture of relevant data, such as insights on customer behavior, product use, or failure information (Schenkel et al. 2015). Moreover, from the sustainability perspective, value comprises the economic, environmental, and social dimensions (Schaltegger et al. 2012). Economic value includes, among others, profits, cost savings, and efficiency improvements. Environmental value comprises, for example, a lower carbon footprint, pollution prevention, and product recovery, whereas social value addresses equality and diversity, well-being, and health and safety at work (Evans et al. 2017; Schenkel et al. 2015).

The Sensemaking of Value within the Organization and by Different Roles

Sensemaking describes how actors within an organization give meaning to their collective experience (Weick 1995). Materializing meaning, sensemaking is a matter of communication, which constitutes the foundation for taking action, thereby causing organizations to evolve (Weick et al. 2005). Companies with strong sensemaking capabilities cope better with complexity and ambiguity, enabling competitive advantage (Neill et al. 2007). To reduce complexity and ambiguity, actors use cognitive frames to select, structure and construe information (Dutton and Jackson 1987). A cognitive frame is a “mental template that individuals impose on an information environment to give it form and meaning” (Walsh 1995, p.281). Regarding sustainability, Hahn et al. (2014, p.466) distinguish between the *business case frame* that aligns social and environmental values with economic values and eliminates tension, and the *paradoxical frame* that “accept[s] tensions and accommodate[s] conflicting yet interrelated economic, environmental, and social concerns, rather than eliminate them.” Moreover, in innovative environments, four different frames

can be identified: the *technological insight frame* describes affinity with new technologies, global trends, and government policies; the *latitude for strategic change frame* addresses the experienced need for co-creation and value networks; the *business model boundaries frame* refers to the scope of the value creation logic and strategic orientation; and finally, the *local identity embeddedness frame* relates to the extent of relational ties with the local ecosystem (Penttilä et al. 2020).

On the *individual* level, sensemaking comprises the three sequential capabilities of scanning, interpreting, and responding (Daft and Weick 1984; Thomas et al. 1993). At the *organizational* level, these three capabilities are placed in a context of interaction, in which information needs to be exchanged between individuals with different backgrounds, knowledge, and values (Hutt et al. 1988). In this context, three types of shared meaning shape the sensemaking process: *commitment*, such as through a strategy or vision, *identity*, which constitutes an anchor for the collective construction of meaning, and *expectations*, which influence the analysis of cues from the environment and thus the meaning constructed (Maitlis and Sonenshein 2010).

If values are codified and pursued by a corporate vision or value statement, they become prescribed normative guidance (Breuer and Lüdeke-Freund 2017), thus creating a public *commitment* and facilitating a new organizational meaning and identity (Maitlis and Sonenshein 2010). *Organizational identity* explains how employees make sense of what the organization claims to be (Corley and Gioia 2004; Gioia and Thomas 1996). Thus, it is closely related to *employees' identity* and self-conception, shaped by their beliefs about the corporate image (Weick 1995, pp.19–24). During organizational change, identities evolve and are replaced significantly (Corley and Gioia 2004). While this can lead to existential problems and resistance to change, an identity crisis can be overcome by believing in one's capacity (Maitlis and Sonenshein 2010). This shows that individual and social sensemaking are intertwined and hard to separate, as the alignment of individual activities based on collective practices, such as shared meaning and common values, results in collective action and social sensemaking (Weick 1995, p.6). Lastly, *expectations* about what will happen in the future relate to the cognitive frames adopted as a point of reference to filter environmental cues (Walsh 1995). Weick (1988) argues that actions precede cognition, which implies that talking disseminates cues onto which meaning can be inferred. However, increasing confidence about the constructed meaning can be detrimental to sensemaking if individuals fail to update meanings (Maitlis and Sonenshein 2010). Expectations become a self-fulfilling prophecy, for example, the perception of the plant as unimportant leads management to prioritize cost savings over safety (Weick 1988, 2010). Hence, commitment, identity, and expectations are crucial factors for collective sensemaking in situations of change. In this context, adaptive sensemaking is necessary, which implies revising interpretations based on new information enabled by information collection and knowledge transfer (Maitlis and Sonenshein 2010).

According to Weick (1995, p.23), sensemaking relates to the need to “confirm one's self.” The related questions of identity refer not only to the level of the organization but also to *functional roles* and *individual identity* within the firm. Taking the individual sensemaking perspective, people influence the innovation process due to their different backgrounds and values (Freudenreich et al. 2020; Li and Found 2017). The multiple *cognitive frames* they bring into the innovation process influence the sensemaking of an organization (Neill et al. 2007). As individuals with comparable activities across organizations assume different roles in the sensemaking process (Maitlis 2005), we differentiate between three functional roles involved in innovating SSPSS: A role identifying innovative value for smart PSS, a role identifying holistic sustainability, and a role identifying market opportunities (Liu et al. 2018). We analyze the cognitive frames they apply to understand how they construct the value proposition of SSPSS. In this study, we refer to them as digital innovation and technology (DIT), sustainability (S), and market role (M).

Acknowledging the relevance of cognitive frames and functional roles in constructing the value proposition that guides business model innovation (Da Fernandes et al. 2020), we define *organizational value sensemaking* as a collective activity in the innovation process in which different functional roles discuss the value potential that a new business model creates. As divergent value perceptions can constitute a barrier to business model innovation (Egffjord and Sund 2020), it is highly relevant to develop a pronounced understanding of creating shared meaning when innovating SSPSS. To research this interplay, we analyze the organizational context of the cases to understand how commitment, identity, and expectations on the organizational level can provide guidance in creating shared meaning for actors in the innovation process. We explore how the three functional roles apply their cognitive frames and make sense of SSPSS value potentials, encompassing B2B customer value, end-user value, information value, economic value,

ecological value, and social value (Méndez-León et al. 2022; Schenkel et al. 2015; Schüritz and Satzger 2016). We aggregated and visualized these elements derived from the literature in Figure 1.

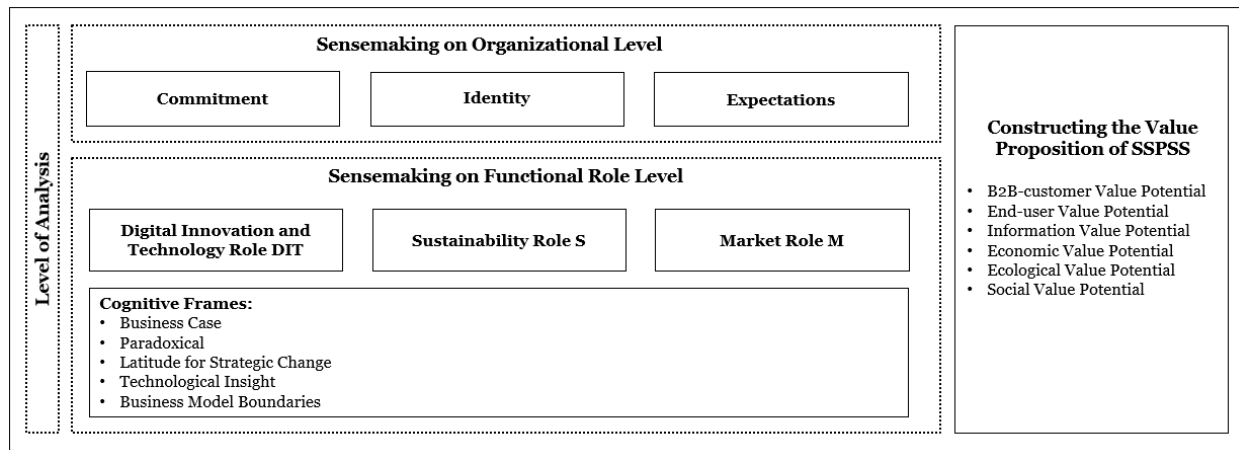


Figure 1. Constructing an SSPSS Value Proposition

Author’s Illustration based on Hahn et al. (2014), Maitlis and Sonenshein (2010), Penttilä et al. (2020), Schenkel et al. (2015), Weick (1995)

Method

Given the paucity of research on the value sensemaking process of SSPSS, we use a case study approach to provide in-depth insights into the real-world context (Eisenhardt 1989; Yin 2014). This paper employs a comparative format to analyze two manufacturing companies operating in a B2B market. Choosing the manufacturing sector operating in the B2B market is useful, as SSPSS are trending in this branch according to literature (Boldosova 2020; Chen et al. 2020; Häckel et al. 2021). The context of the two cases is highly relevant, as understanding what constitutes value is embedded in particular contexts (Breuer and Lüdeke-Freund 2017). We applied several criteria to select our two cases. First, in alignment with the research question, we looked for manufacturers on a transition path to becoming SSPSS providers. Second, the companies required an explicit commitment to sustainability. Third, we sought out companies that faced comparable drivers and barriers, so we selected two cases from the same industry. Fourth, we selected companies embedded in different contexts: While both organizations operate in the same sector, they differ in their offering (holistic polymer offering vs. polymer niche) and their size. As these differences could impact the transition toward becoming an SSPSS provider, both cases offer new insights.

Alpha is a family-owned polymer processing and manufacturing company with a comprehensive product range. *Alpha* has 20,000 employees worldwide, and its headquarters are based in the regions of Germany, Austria, and Switzerland. One of the company’s strategic fields of activity focuses on the progressive digitization of products, services, and production. *Alpha* claims to pursue a long-term perspective for future generations as a family business. Sustainability is anchored in the corporate strategy of committing to people and the environment.

Beta is a polymer processing and manufacturing company focusing on safety gear, with 3,000 employees worldwide. *Beta* is a family-owned company with headquarters in the regions of Germany, Austria, and Switzerland. One of their main strategic focuses for future competitiveness is the development of new digital products and services. Based on its safety focus, *Beta* emphasizes the social dimension of sustainability in its corporate mission. Building on this mission, *Beta* extends its responsibility to care for the environment. While the company operates in the B2C and B2B markets, we focus exclusively on the B2B context.

Data Collection and Analysis

We conducted ten semi-structured interviews per case embedded in the context of further secondary material (organizational documents and reports). We collected 20 interviews in total and reached theoretical saturation (Bryman 2012; Creswell and Creswell 2018). Regarding the interview sample, we

ensured that the selection of interview partners was in line with the identified roles of digital innovation and technology (DIT), sustainability (S), and market (M) and balanced the positions between the two case companies. Thereby, we display the perspectives of the three roles introduced previously. An overview of the interviews is provided in Table 1. The main interview topics addressed the value potential of SSPSS, the relevance of digital technologies and sustainability, and the structure of the innovation process.

Alpha	Beta	Role
Interviews with Alpha	Interviews with Beta	
A1 Director Technology Platform (57 min)	B11 Director Digital Innovation (53 min)	DIT
A2 Head of Technology Innovation (58 min)	B12 Digital Innovation Manager (59 min)	
A3 Director of Science Relations (49 min)	B13 Head of New Business Development (79 min)	
A4 New Business Development Manager (62 min)	B14 Junior Business Development Manager (62 min)	
A5 Head of Sustainability Management (53 min)	B15 Head of Sustainability Management (48 min)	S
A6 Recycling Technology Manager (52 min)	B16 Director Sustainability (56 min)	
A7 Sustainability Manager (86 min)	B17 Sustainability Manager (40 min)	
A8 Director Smart Product (67 min)	B18 Director Product Group Management 1 (60 min)	M
A9 Health and Safety Manager (55 min)	B19 Director Product Group Management 2 (59 min)	
A10 Head of Market Innovation (58 min)	B20 Director Market (60 min)	
Organizational documents of Alpha	Organizational Documents of Beta	

Table 1. Overview of Data Collection
Digital Innovation and Technology (DIT), Sustainability (S), and Market (M)

Using the qualitative approach detailed by Creswell and Creswell (2018), we analyzed the data by combining deductive and inductive approaches (Figure 2). Based on our literature review, we predefined code categories for the different types of value potentials. Complementing these deductive categories with inductive subcategories derived from the interview analysis, we identified various forms of value potentials. Aggregating and summarizing our results into the three elements of commitment, identity, and expectations allowed us to understand the differences in SSPSS value sensemaking of *Alpha* and *Beta*, thus answering RQ1. On the functional role level, we connected these findings with the cognitive frames outlined in the theoretical background, thus answering RQ2. Two research team members conducted the coding process and discussed emerging differences to ensure consistency and validity.

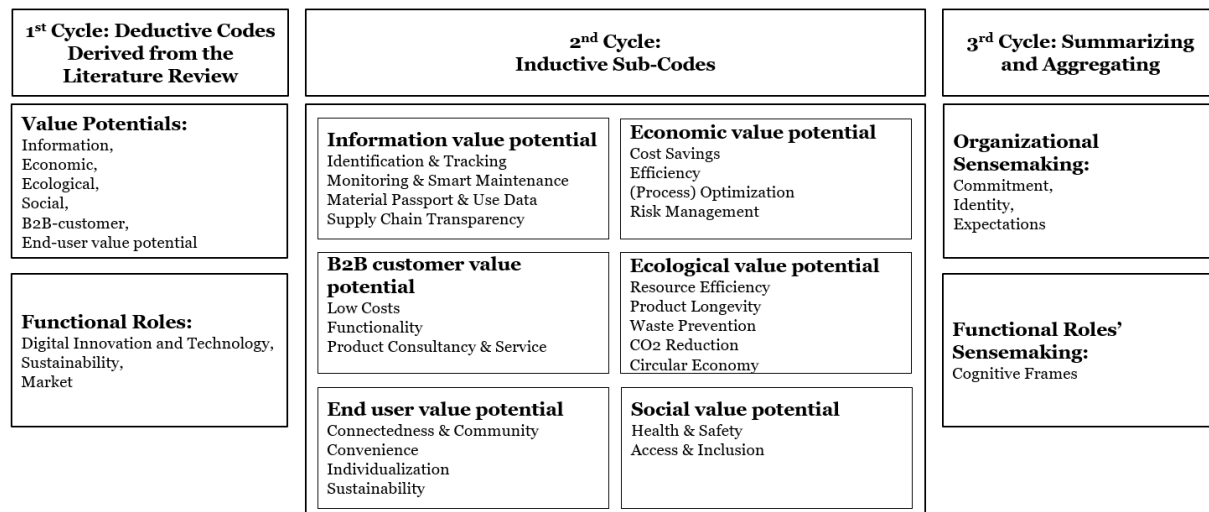


Figure 2. Coding and Analysis Process

Results and Discussion

In the following, we synthesize and critically reflect on our findings. First, we address RQ1, shedding light on the organizational differences of *Alpha* and *Beta* in their sensemaking of SSPSS to create shared meaning. Second, we dive deeper into the organization by understanding how the three roles of DIT, S, and

M make sense of the value proposition of SSPSS, answering RQ2. Thus, we first reflect on the organizational context of the cases before diving into the individual roles' sensemaking, and the cognitive frames applied.

Organizational Sensemaking: Creating shared meaning

In this section, we analyze the organizational sensemaking of *Alpha* and *Beta* to understand how the value proposition of SSPSS is constructed during business model innovation. We distinguish between the three key components of *commitment*, *identity*, and *expectations* to create shared meaning through adaptive sensemaking (Maitlis and Sonenshein 2010).

Commitment

Commitment to follow a certain path, e.g., through a strategy or vision, provides guidance to action (Breuer and Lüdeke-Freund 2017) and facilitates organizational meaning (Maitlis and Sonenshein 2010). At *Alpha*, the strategic importance of sustainability has increased over the last years, and organizational structures are built to operationalize the sustainability strategy (S). This is more developed in departments where B2B customers require sustainability (S, DIT). There is one working group focused on sustainability led by the head of sustainability management, comprising sustainability managers from different departments and purchasing, strategy, and communication functions to foster sustainability management (S). Note that the M role is not part of this group. Interviewees described sustainability as an informal culture that is not (yet) codified based on corporate values such as quality, longevity, and resource efficiency (S, DIT). However, *Alpha* is working on specific guidelines to implement a sustainability strategy in product development (S). While the company claims to be committed to sustainability, interviewees felt it failed to live up to this claim in everyday life (S, M). Many interviewees reported that the company and its environment were conservative regarding digital innovation and technology (S, M). Moreover, one interviewee stated that the lack of commitment from top management to create new structures aligned with smart goals is a barrier: "It is like applying a plaster and when it does not stick, but comes off, nobody cares to apply it again." (M). Thus, we conclude that while *Alpha's* commitment to SSPSS is increasing, it has not yet penetrated the organization deeply. The implicit prevalent corporate sustainability understanding is rather tied to a quality focus, referring to the longevity and efficiency of products.

At *Beta*, sustainability was recently identified as a major future trend, and different product management departments are required to create sustainability innovation (M). Moreover, a new business development role for sustainability was created to specify sustainability goals for innovation (DIT). Furthermore, a working group on sustainability, with members of sales, sustainability, quality management, product management, and the director of digital innovation, discusses various issues, such as the EU taxonomy and sustainability labels (S). Likewise, SSPSS is a strategic topic. There is also a working group on technologies where technology management, product management, and marketing are represented, led by the director of digital innovation, to scout new materials and technologies (DIT, M). Moreover, the company developed and updated a corporate digital strategy (DIT). While their customers can also be quite old-school (M), the target of the DIT role is: "Sustainability, well, if the product can guarantee that in some form, but that's not the priority. Priority, specifically from our department, is that we can present ourselves digitally, [...] earning a digital euro, that's our goal." (DIT). Hence, *Beta* demonstrates a strong commitment to sustainability and digital technologies reflected in the product and service development goals and the respective strategies. However, the last quote also shows that there is no alignment between the roles and responsibilities of DIT and S, not considering smart PSS as a facilitator of sustainability.

Identity

Identity explains how employees make sense of what the organization claims to be (Corley and Gioia 2004; Gioia and Thomas 1996). At *Alpha*, the interviewees portrayed no coherent identity regarding SSPSS. Some had the impression of being and remaining a manufacturer integrating digital technologies into products rather than moving to services (S). Others thought the company was on a transition path to becoming a provider of smart solutions (DIT). As there is no shared identity regarding SSPSS yet, ambiguity exists on the positioning between IT-enabled transformation and digital transformation (Wessel et al. 2021). Moreover, we identified an issue regarding the changing identity of the M role. *Alpha* is working on convincing the M role of sustainability's relevance. One interviewee shared, "there are also some who [...]"

simply say [...] we can't sell waste to the customer. [...] Our director really must convince sales to go to the customer and say [...] we would also like to have your waste." (S). Hence, the shift toward offering SSPSS and using recycled materials seems to contradict the M role's identity as a high-quality manufacturer. As discussed earlier on commitment, some sustainability attributes are considered quality features. However, sustainability becomes irrelevant if these are perceived as detrimental to quality. For this reason, the S role stated that the ultimate test of whether the implementation of a sustainability strategy is complete is if sales understands and applies it, which is not yet the case at *Alpha* (S). This role further suggested including the M role in sustainability and innovation management to understand the needs when interacting with B2B customers (S). Thus, the M role has not integrated a sustainability understanding into its identity. Capacity building could facilitate this identity transition as suggested by the S role. We analyze the M role and this identity issue in more detail in the section on the different role's sensemaking.

At *Beta*, awareness of the changing business environment was generally high. Interviewees from all three roles mentioned that *Beta* transitions from offering products to services enabled by digital technologies, mainly the service of safety (S, DIT, M). This suggests a shared identity regarding smart PSS. Likewise, interviewees mentioned that *Beta* is well positioned regarding sustainability, going beyond competitors and regulatory requirements (S, M). The next step is "to move away from sustainability strategy toward a sustainable strategy." (S). Many interviewees explained the importance of sustainability for the future as *Beta* is a family business that keeps future generations in mind (S, DIT, M). Hence, the organizational identity as a long-term-oriented family business matches the sustainability claims, and the shift toward becoming an SSPSS provider underlines the corporate identity of providing safety. The S role also highlighted the importance of educating, especially the M role, to create awareness of sustainability, such as the different emission scopes, to explain the ecological and economic value potentials to B2B customers (S). Thus, *Beta* recognized the need to foster capacity building for sustainability, and is already working on its implementation (e.g., through an internal wiki). Sustainability management skills are supposed to become a key competence through training. As one interviewee explained, "We would like to do competence building and promote swarm knowledge in the company so that all employees who want to find out about it also get the chance." (S). Digital transformation is also supposed to become a key competence at *Beta* (S). Hence, *Beta* started implementing educational capacity building to facilitate the identity change induced by becoming an SSPSS provider for all employees, especially the M role.

Expectation

Expectations about what happens in the future relate to the cognitive frames adopted as a point of reference to filter environmental cues (Walsh 1995). At *Alpha*, communication on digital innovation and technology is still experienced as difficult due to a silo mentality and lacking internal cooperation (M, DIT). *Alpha* pushes information exchange now, but in the past, "each department competed with other departments. Everyone wanted to be ahead of the pack, so people stayed in their silos and tried not to leak anything." (DIT). Moreover, there is no continuous information flow regarding B2B customer needs from the M role to the DIT role (DIT). Hence, we conclude that information exchange for creating SSPSS value propositions could benefit from more pronounced channels and increased frequency to talk SSPSS into existence (Weick 1995). Management mainly makes decisions based on financial data (S, DIT, M), and relevant criteria are market potential and feasibility (DIT). As innovation objectives are solely economic, including time, money, and quality, sustainability is an add-on that needs to be argued for (M). This suggests that *Alpha* applies a business case frame focusing on economic value. This focus could lead to overlooking other environmental cues. At the same time, the technological insight frame is rather narrowly applied, which can be explained by the low commitment to the SSPSS transition. Likewise, *Alpha* uses the latitude for strategic change frame in a limited manner, which might result from the silo mentality still embedded in the minds of employees grasping on to familiar meanings and the unclear positioning on digital transformation.

At *Beta*, the DIT role stated that it is challenging to bring the relevant actors together to develop the value potentials of SSPSS (DIT). However, "the biggest inhibitor of innovation are still silos [...] and] the lack of agility options." (DIT). This suggests that the importance of information exchange on SPSS is clear within the organization; however, adopting the operational structures is still lagging. Major actions, such as gates within the innovation process, are decided by a strategic management group consisting of key management functions, such as the CEO and the directors of digital innovation, product management, and sales based on economic value (M). Moreover, *Beta* introduced an internal CO₂ price because "what does a ton of CO₂ mean? This seems highly unreal because it is not physically comprehensible, so how can I identify with it?"

(S). This underlines the relevance of sustainability, especially CO₂ emissions, at *Beta*. According to sensemaking theory (Weick 1988), this guidance influences employees' cognition and will likely lead to better recognition of CO₂ saving potential. Even though *Beta* includes a variety of roles with different perspectives and despite its strong focus on social value, *Beta* applies a business case frame at the organizational level. However, the technical insight frame seems to be rather broadly developed, focusing on the future relevance and potential of new business opportunities supported by digital technologies. Likewise, *Beta* applies the latitude for strategic change frame recognizing its changing identity.

Summary RQ1: Reflection and Discussion

Regarding *Alpha*, we conclude that their commitment is limited, and there is no shared corporate identity on SSPSS. This suggests that *Alpha* is currently reinforcing its organizational identity as a high-quality manufacturer (Wessel et al. 2021), supported by digital technologies and sustainability. In contrast, at *Beta*, there is a common understanding of the organization's strategic commitment to becoming an SSPSS provider, with the corporate vision of sustainability and digital technologies serving as normative guidance (Breuer and Lüdeke-Freund 2017), creating a shared identity (Maitlis and Sonenshein 2010). This suggests that *Beta* is on a path of digital transformation (Wessel et al. 2021) by becoming an SSPSS provider, which is underlined with a new identity claim. This has already translated into first steps, for example, creating a sustainability position within the business development. Regarding the expectations, our findings reveal the need for aligning individual activities to achieve a shared understanding of the environment (Weick et al. 2005). The lack of communication between the different roles engenders a fragmented and oversimplified view of SSPSS, as individuals might overlook information inconsistent with the cognitive frame applied (Hahn et al. 2014). Hence, establishing a communication infrastructure between the different roles to become aware of the cognitive frames applied and deduce collective action is crucial (Kaplan 2008; Neill et al. 2007). Enabling information exchange and knowledge transfer, i.e., adaptive sensemaking (Maitlis and Sonenshein 2010), fosters iterating the creation of meaning by integrating new information. This can help to overcome blind spots and barriers to business model innovation (Egffjord and Sund 2020) and create a shared understanding (Weick et al. 2005). Likewise, more capacity building is required to support the identity transition. In addition, it is important to realize that decision-making is also a form of diffusing meaning (Weick 1995), emphasizing the choice of decision criteria and the arguments for or against a decision. *Alpha* and *Beta* so far evaluate SSPSS value propositions based on the business case frame focusing on economic and B2B customer value. Applying Weick's argument suggests that decision-makers at *Alpha* and *Beta* need to reflect sustainability and smart elements in their criteria to align decision-making with the strategic commitment to SSPSS, thus conveying a holistic picture.

In this paper, we define organizational value sensemaking as a collective activity in the innovation process, where different internal roles construe the value potentials that a new business model creates for various stakeholders. This leads to the question of how organizations can create an environment that facilitates shared sensemaking. We argue that the construction of the SSPSS value proposition can be explained by understanding the organizational alignment on commitment, identity, and expectations. Thus, analyzing the embeddedness of the innovation process in the corporate context helps to clarify the current status of a shared organizational understanding. For example, an internal CO₂ price represents an additional decision criterion to costs and thus leads to the alignment of expectations.

The Sensemaking of Value by Three Different Roles

To gain insights into the value sensemaking of the three different roles, thus answering RQ2, we examine their perceptions of the SSPSS value potentials, including B2B customer value, end-user value, information value, economic value, ecological value, and social value. We relate these perceptions to the cognitive frames applied, influencing the selection and evaluation of information (Hahn et al. 2014; Penttilä et al. 2020).

Digital Innovation and Technology (DIT) Role

Interviewees within this role are specialists in designing technological applications and innovative solutions for SSPSS. This role highlighted the importance of using technology to create value for B2B customers. In this context, they also emphasized the information value potential to generate user insights. Hence, information value is perceived as an opportunity to leverage B2B customer value potential. This fits the cognitive frame of technological insight regarding technology as a crucial business opportunity and the

cognitive frame of latitude for strategic change, recognizing the need to transform corporate offerings toward customer-integrated solutions (Penttilä et al. 2020).

At *Alpha*, the DIT role aims to push information flows to overcome the lack of communication. This suggests that this role is key in establishing information exchange and knowledge transfer regarding *expectations*. Moreover, while the organization lacks *commitment* to digital technologies, the DIT role's *identity* aligns with the transition path to becoming a provider of smart digitalized solutions. Regarding the value proposition, the role focuses on B2B customer value built through information value that translates into economic value. Social, ecological, and end-user values are secondary. Involving the B2B customer and adapting the products to customer requirements are highly important for the DIT role. One interviewee described the opportunity for product identification and the provision of material and maintenance information to optimize production, maintenance, and return processes. Another interviewee stated, "We expect to receive better [insights due to] the analysis of what we use and when we use it [...], to prevent stealing of products and to reduce waste." (DIT). Thus, the ecological and social values are only leveraged when they go hand in hand with economic value or if the B2B customer explicitly requires it. As one interviewee outlined: "Every decision that is made has to be economically sustainable." (DIT). As this role describes the potential of social and ecological value only in combination with economic value, we can argue that this role tries to align these values, eliminating tension. This suggests that the business case frame is applied in combination with the technological insight frame and latitude for strategic change frame.

At *Beta*, the role also outlined the challenge of bringing the relevant actors together and emphasized the importance of information exchange. Hence, in this case, DIT employees also assume a critical role in establishing information exchange and knowledge transfer regarding *expectations*. However, in contrast to *Alpha*, *Beta* demonstrates a strong *commitment* to digital technologies, and the *identity* of the DIT role matches this commitment. In line with *Alpha*, digital technologies and the information value they create should translate into B2B customer value and end-user value, as one interviewee described: "[We want to use] technology not because of technology but to fulfill user needs." (DIT). The role shared that transparency in the supply chain combined with the provision of material information and tracking enables circular supply chains and resource efficiency. "We aim for transparency [...] to provide opportunities for sustainability contexts like returning products." (DIT). This shows that the DIT role at *Beta* employs the technological insight frame. Moreover, this role differentiated between B2B customer and end-user value and expressed conflicts between the two. While B2B customer value is mainly driven by economic value, focusing on cost savings, the end user is concerned with convenience, health, and safety. Recognizing end-user demands and adopting technology-driven and customized solutions are crucial in the frame of latitude for strategic change. As the DIT role is aware of the different customer and end-user demands and tries to provide a holistic solution, we argue that this role adopts the frame of latitude for strategic change more strongly than *Alpha*. Hence, the organizational commitment at *Beta* and the role's identity seem to support change more strongly. In contrast to *Alpha*, this role at *Beta* recognizes conflicts between the customer and end-user values and economic, social, and ecological values when trying to manage these values in coexistence, suggesting the paradoxical frame. Our findings indicate that the DIT role's identity at both companies supports the transition toward developing SSPSS. However, at *Alpha*, there is a mismatch between the role's identity and the organizational commitment. Moreover, at both companies, information exchange for sharing DIT's expertise and thus creating shared expectations is lacking. Therefore, there is no alignment between the different levels of sensemaking, impeding a shared understanding of SSPSS.

Sustainability (S) Role

Interviewees within this role are sustainability experts within the organization. While this role at *Alpha* highlighted ecological value potential, at *Beta*, this role equally emphasized social and ecological value potential. However, in both cases, the interviewees lamented that B2B customers' decision criterion of low cost is the main barrier to realizing these values, as sustainability often requires higher costs. This suggests that the role adopts the paradoxical frame, which describes the juxtaposition of economic, environmental, and social concerns, even if contradictory (Hahn et al. 2014). Moreover, the role employs the frame of technological insight with a high awareness of trends and latitude for strategic change due to a recognized necessity for a sustainability transformation.

The S role at *Alpha* recognized the need for a new organizational *identity* and digital transformation, although not directly involved in the current innovation process. The role stated that at *Alpha* sustainability,

in terms of resource efficiency, is already part of the company's DNA and that they are working on achieving the same for circular economy principles. However, they perceive their B2B customers as conservative, driven by costs and efficiency, not by sustainability. One interviewee shared: "If I can argue [...] to save, for example, 50 percent [in costs] due to CO₂ reduction, I can convince people." (S). The B2B customer's lack of attention to sustainability is seen as the main barrier to realizing ecological and social value. Recognizing and addressing this barrier suggests that this role adopts the paradoxical frame. Moreover, the role perceived data and the information value it generates as an enabler for creating ecological value: "Receiving well-prepared data to decide what we are going to do with it [...] is highly relevant in huge processes like the circular economy." (S). This implies the adoption of the technological insight frame. The role further perceived product take-back as a form of risk management regarding resource security and tracking an opportunity to manage CO₂ emissions, which is an economic factor. However, none of the interviewees within this role explicitly focused on social value potential. Lastly, this role views the B2B customer as a partner to regain used materials, which indicates the adoption of the latitude for strategic change frame.

In contrast to *Alpha*, *Beta's* social value potential is essential for the company's strategy and position in the health and safety industry. The S role shared their *expectations* of an industry shift towards digitalization, servitization, and sustainability. This, together with the corporate *commitment* to sustainability, underlines the need to become an SSPSS provider. "If we are able [...] to analyze data to reduce accidents [...] and in the end, no one dies" (S) describes *Beta's* goal for creating social value for the end-user based on information value, for example, by tracking employees' positions in an emergency. Moreover, the role described that preventing accidents reduces costs. This suggests the adoption of the paradoxical frame. Future costs are why caring about the carbon footprint is perceived as risk management. B2B customers are already asking for emission information, which can be provided by tracking and creating supply chain transparency. Hence, the information value is an opportunity to leverage the social and ecological value potential, suggesting the adoption of the technological insight frame. The role shared that *Beta* had introduced a sustainable product years before, but due to the higher costs, there was no demand. This shared experience seems to have generated an understanding of the M role and the importance of the B2B customer value. Exploring future demands toward leveraging social and ecological value potential thus shows the use of the latitude for strategic change frame.

In addition to this organizational S role, our results indicate that some employees adopt discretionary behavior at *Alpha* and *Beta* to drive sustainability outside their role. This behavior is called *organizational citizenship behavior for the environment* (OCBE), which is defined as "individual and discretionary social behaviors that are not explicitly recognized by the formal reward system and that contribute to a more effective environmental management by organizations" (Boiral 2009, p.223), where prosocial describes the employee's voluntary behavior to create value for the organization, society, and the environment. Based on the taxonomy of green employee behaviors (Ones and Dilchert 2012), in our two cases, we identify the behavioral theme of "working sustainably" by creating sustainable products, services, and processes (Ones and Dilchert 2012). For example, the S role at *Alpha* shared with us: "Ideally, sustainability management makes it possible for people to transfer their private topics, where they are already intrinsically motivated, to the company. And if they are also product managers, that is the connection [to innovation]. We have one person in our company who is like that [...] he just pulled it off, took everyone with him, including his bosses. And the strategy of the division is not yet ready. But he's done it anyway. [...] I think we've been working for 20 years [...] on that ...]. 20 years of proposals, [...] workshops, pitches to the management, nothing ever happened. And he just did it." (S). Likewise, at *Beta*, the M role explained: "[I am the internal promoter of sustainability, because] I as a person have an affinity for sustainability. I already had photovoltaics on my roof when there was still no EEG. Yes, I am a wind miller. [...] I was a good fit from that point of view." (M). Interestingly, the S role at *Beta* described this individual from the M role as an internal driver for sustainability, pushing related B2B customer inquiries internally (S). Hence, in addition to the organizational sustainability role, individual employees can assume a citizenship role for sustainability. This shows that the value perception of the analyzed roles is influenced by both their functional role and individual subjective beliefs. Thus, in line with prior research (Paulsson et al. 2019) we call for academics to embrace *individual values* and explore the role of employees as change agents for SSPSS.

Market (M) Role

Interviewees within this role are closely connected to B2B customers. Moreover, this role perceived the importance of the end-user value as greater than the previously described roles. They explained that the

B2B customer limits the realization of information value as well as ecological and social value due to a focus on economic value potential. This role employs a business case frame and, depending on the company, the business model boundaries or the latitude for strategic change frame.

At *Alpha*, sustainability is, so far, not integrated into the M roles' *identity*, as this role perceives sustainability as an add-on or quality feature. Therefore, the role considered social and ecological value important; however, they explained, "Our targets are mainly economic, not ecological." (M). Time, money, and quality are more important criteria, and the "driver for sustainability [...] is [only] the [B2B] customer who requires it." (M). This shows the adoption of the business case frame, as the role tries to align the values by focusing on economic value and eliminating tensions. Being a system-supplier, the role also expressed concerns regarding the circular economy: "Why should we take it back? Maybe someone else does it much better [...]. Then let him do it." (M). As discussed earlier, this shows uncertainty in strategically positioning *Alpha* in the context of SSPSS and, thus, in the organizational *identity*. Capacity building and education, therefore, could support the M role in reflecting sustainability issues and embracing sustainability in its identity. Regarding the smart component that creates information value, the role clarified that this is not suitable for all their products because, in some cases, being smart does not increase product functionality. However, the role also explained that the information value potential could lead to independence and convenience for end users in a digital learning context. At the same time, this creates fewer costs, time, and waste for the B2B customer. Individuals in this role also explain how user insights can improve product design and marketing activities. In summary, the M role at *Alpha* focuses on the B2B customer value combined with the economic value potential realized through the information value. Regarding the end-user, social, and ecological values, barriers toward their realization were perceived. In particular, convincing a B2B customer to appreciate the information value, the ecological and social value potential was mentioned. This suggests that this role employs the business model boundaries frame, which is limited by the strategic orientation of the company and customer demands, leading to a business case frame.

At *Beta*, this role shared the organizational *identity* of becoming an SSPSS solution provider and emphasized the company's sustainability achievements. This suggests that the organizational *commitment* and educational capacity building already support the identity transition from selling cost-efficient, high-quality products to offering SSPSS. The M role at *Beta* aims to leverage the social value potential for the end user, for example, through monitoring health. This constitutes B2B customer value as "in the end, there is a monetary component because we can reduce the loss of workdays [...] and of course [it will increase] employee satisfaction." (M). However, while end users might choose the safest product, the B2B customer is driven by costs: "At the bottom line, I have to clarify for my [B2B] customer that he will save money using this service. In the end, it is all about money." (M). Product consultancy and service can support choosing the right product and extending the use phase, thus saving material and reducing CO₂ emissions, ultimately reducing costs for the B2B customer. Hence, rigid customer requirements lead to adopting a business case frame. Regarding the smart component, this role explains that the information value potential depends on the type of product, as *Beta* also produces disposable products, and integrating sensors into these does not provide value. However, in other cases, identification and tracking can enable reuse options and provide the end user with individualized solutions. So far, the interest of B2B customers in returning products is low: "I almost can't get a few hundred kilos together, even though we sell thousands and thousands." (M). Nevertheless, *Beta* is trying to convince their B2B customers of product return, suggesting a latitude for strategic change frame. Thus, our findings indicate that the M role's identity is a key determinant in constructing SSPSS value propositions. Capacity building on sustainability and digital technologies can facilitate the alignment of this role's sensemaking with the organizational level.

Summary RQ2: Reflection and Discussion

Our findings show that the value proposition of SSPSS is multi-faceted. For this reason, it is useful to distinguish between B2B customer value, end-user value, information value, economic value, ecological value, and social value (Méndez-León et al. 2022; Schenkel et al. 2015; Schüritz and Satzger 2016). It is important to note that the interdependencies between values described in the following are driven by our case selection and thus might only apply to our two cases. We can summarize that the roles described the information value potential as the basis for economic, social, and ecological potential. Social and ecological value potential can only be leveraged if they create economic value. Moreover, the differentiation between B2B customer value and end-user value is helpful as they might be in opposition. While economic potential constitutes B2B customer value, social value potential is mainly an end-user value potential. However, the

realization of end-user value depends on the B2B customer. This lack of distinction reflects a shortcoming in the current literature on SSPSS. Thus, we call for future research to reflect this distinction creating a better understanding of the tensions between values.

Each value potential is constructed through sensemaking in business model innovation. We argue that value sensemaking occurs beyond the organizational level on a functional and individual level (Figure 3). Each level explores SSPSS value potentials based on sensemaking. Our analysis suggests that *cognitive frames* (Hahn et al. 2014; Penttilä et al. 2020) can explain differences in sensemaking, as different functional roles introduce their understanding into the innovation process. These diverging cognitive frames, especially regarding change, can hinder business model innovation (Egffjord and Sund 2020). *Beta* shows a shared meaning regarding the relevance of digital technologies, servitization, and sustainability based on a strong commitment, organizational identity, and expectations for the future. The roles also show a greater convergence of the frames applied. For example, the M role already recognizes value potentials beyond the economic dimension, and the S role also comprehends the importance of the cost perspective. In contrast, at *Alpha*, the S role tries to push sustainability against barriers within the organization, such as resistance by the M role and its limitation by the business model boundary frame. The cognitive frames applied are rather divergent, and a coherent meaning regarding digital technologies and sustainability is not yet prevalent. Creating awareness of these different perceptions to orchestrate these differences successfully could help overcome perceptual barriers. For example, understanding the M role’s needs when interacting with B2B customers, the S role could help to bring social and ecological value potentials in the context of economic value, thus addressing B2B customers’ needs. Moreover, our findings indicate that *individual sensemaking* based on subjective beliefs and values constitutes the third level of analysis. Regarding sustainability, individual sensemaking is particularly important as people have intrinsic motivation to shape their organization based on their identity, such as being a “wind miller”. To conclude, we argue that the sensemaking perspective provides useful guidance for understanding business model innovation of SSPSS, as the selection and evaluation of information results in action (Daft and Weick 1984; Weick 1995).

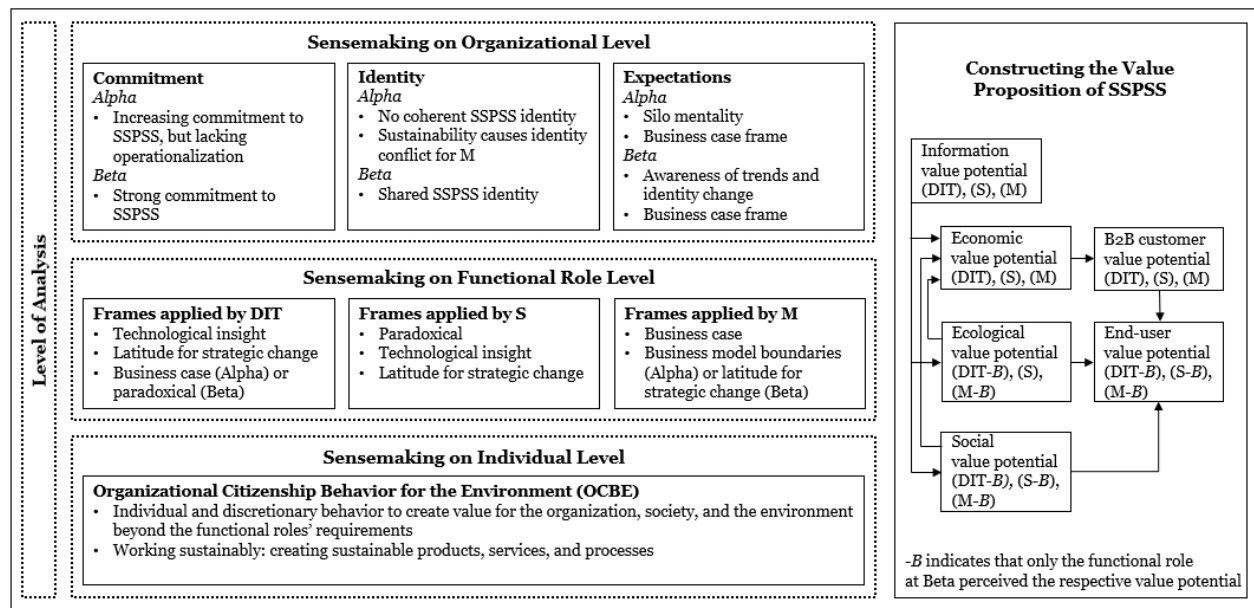


Figure 3. Making Sense of the SSPSS Value Proposition in the Two Cases

Conclusion

Bringing the learning from *Alpha* and *Beta* to the conceptual level, we conclude that the value proposition of SSPSS is multi-faceted and that values are subjective. Each facet is constructed through the interaction of organizational, functional roles’, and individual sensemaking. Thus, we conclude that sensemaking is a multi-level process in the innovation process of SSPSS. We answer RQ1 by highlighting that organizational differences in sensemaking regarding the SSPSS value proposition depend on differences in commitment,

identity, and expectations. We answer RQ2 by concluding that different actors with different functional roles (DIT, S, M) differ in their sensemaking of SSPSS value potentials based on the respective cognitive frames tied to their role and subjective beliefs and values. To create a shared meaning of SSPSS value potentials, managers need to understand the degree of alignment between the different levels of analysis. Awareness of the different cognitive frames adopted and iterating commitment, identity, and expectations based on the desired pathway can create a shared understanding based on adaptive sensemaking. This can help to derive actions based on a realistic perception of the environment to manage the transition toward an SSPSS provider. Employees as change agents for sustainability can support this transition. In this context, the discussion on discretionary employee behavior is interesting as it raises the question of whether a strong organizational commitment to sustainability could translate into employees that self-select into the company based on an intrinsic sustainability motivation. Thus, the alignment of the individual and organizational levels could lead to the commitment becoming a self-fulfilling prophecy (Weick 2010).

Naturally, our study also comes with limitations. The differences we observed between *Alpha* and *Beta* in their sensemaking could be influenced by the size of the companies and their product portfolios. *Alpha* is bigger than *Beta* and has a more diverse product range, which complicates sharing information and suitability of a corporate vision for all departments. Future research could build on our findings and compare them with cases of other organizations from different economic sectors to increase the existing knowledge base. Another limitation regarding the literature on the value potentials of SSPSS is that we did not analyze the backgrounds or roles and thus the cognitive frames of the academics we cited. Just as practitioners, they could also be influenced by their own identity and expectations. To understand the literature-practice gap, further research could analyze and compare the different cognitive frames academics in the field apply. Lastly, we did not consider a hierarchy perspective when analyzing the three roles. However, management plays a crucial role when creating value proposition synergies for different stakeholders (Tantalo and Priem 2016), engaging in the construction of meaning through sense-giving activities (Maitlis and Sonenshein 2010; Weick 1995). Thus, reflecting on whether meaning is shared between different hierarchy levels (van Bracht 2019) offers opportunities for future research.

Beyond these opportunities, we identified additional avenues for future research. As discussed earlier, understanding OCBE and the role of employees and their subjective beliefs (Dangelico 2015; Paulsson et al. 2019) in the transition toward becoming an SSPSS provider offers an interesting opportunity for future research. Moreover, our findings revealed that the ecological value of emission savings was perceived as a crucial business factor across roles. However, prior research on information systems and the UN Sustainable Development Goals revealed a lack of research on climate change (Schoormann et al. 2021). Hence, scrutinizing the relationship between SSPSS and climate change is a highly relevant research opportunity. Moreover, different roles do not seem to have a mutual understanding of the “smartness” and “sustainability” of value propositions. For this reason, we support the call for research on understanding individual differences that drive actors toward or away from technology (Ostrom et al. 2021). Naturally, this also applies to sustainability. Moreover, there is great uncertainty about translating the value potentials related to the sustainable and smart components of PSS into economic value or eliciting customers’ willingness to pay. Our findings suggest that, to some extent, organizations fail to recognize value due to their internal sensemaking. For example, if the M role understands how sustainability values can be translated into an economic value attractive to the B2B customer, the ecological value could be realized. However, this requires that organizations engage in adaptive sensemaking through dialogue and knowledge transfer. While this study provides a starting point for understanding the construction of the SSPSS value proposition, shaped by organizational commitment, identity, and expectations, and the cognitive frames applied by different functional roles, sensemaking theory offers further research avenues (Maitlis and Sonenshein 2010): First, academics could analyze how to orchestrate the different functional roles to better implement SSPSS in practice based on adaptive sensemaking. Second, researchers could explore the influence of emotions and embodiment on decisions in the innovation process. Third, understanding innovation as a retrospective process in which individuals act and then make sense of their actions could lead to an interesting perspective on iterative innovation processes.

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