Multilevel Design for Service Systems

Dissertation with the aim of achieving a doctoral degree
at the Faculty of Mathematics, Informatics, and Natural Sciences
Department of Informatics
University of Hamburg

submitted by

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June 2020

Hamburg

Day of disputation: 25.11.2020

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Zusammenfassung

Die digitale Transformation verändert Organisationen, die Arbeit, das Miteinander. Geschäftsmodelle werden durch digitale Dienstleistungen erweitert und erfordern ein Umdenken von Zusammenarbeit und Wertschöpfung. Gleichzeitig ermöglichen digitale Dienstleistungssysteme die Schaffung marktgerichteter Wertschöpfungsinnovationen, die durch (1) sozio-technische Informationssysteme eine Wertschöpfung zwischen verschiedenen Akteuren ermöglichen, (2) durch Offenheit und von der Mitwirkung der Akteure geprägt sind und (3) von den Werten, Normen und dem Verhalten der Akteure in dem Netzwerk beeinflusst werden.

Die einhergehende Dynamik von sozio-technischen Systemen und Dienstleistungssystemen setzt traditionelle und planorientierte Gestaltungsmethoden zunehmend unter Druck. Aktuelle Gestaltungsansätze adressieren die Dynamik durch iterative Vorgehensweisen, jedoch mit einem Fokus auf einzelne Dienstleistungen und die Gestaltung von interaktionsbezogenen Elementen zwischen einem Akteur und einem technischen System. Zudem ist wenig darüber bekannt, wie systematisch eine gemeinsame Wertschöpfung in Dienstleistungssystemen realisiert werden kann.

Es sind neue Ansätze notwendig, die den Blick von der Gestaltung technischer Systeme auf die Gestaltung des Umfelds und der Rahmenbedingungen von offenen Dienstleistungssystemen erweitern und anstelle eines planorientierten Vorgehens eine Entscheidungsunterstützung zu den verschiedenen Gestaltungselementen bereithalten. Dieses erfordert Forschungsaktivitäten für eine methodische Unterstützung und evidenz-basiertes Gestaltungswissen.

Das Ziel der Forschungsarbeit ist es, durch ein Action-Design-Research Forschungsvorgehen im realen Umfeld einer Organisation einen methodischen Beitrag für die Gestaltung von Dienstleistungssystemen sowie evidenzbasiertes Gestaltungswissen zu generieren. Crowdsourcing stellt durch den offenen Ansatz zur Mitwirkung einer Vielzahl von Akteuren einen vielsprechenden Ansatz dar, Dienstleistungssysteme umzusetzen. Über einen Zeitraum von drei Jahren werden deshalb Crowdsourcing-Mechanismen mithilfe einer IT-gestützten Plattform innerhalb einer Organisation gestaltet und pilotiert. Aus den Beobachtungen, Interviews und Nutzungsdaten der Plattform wurden in einem iterativen Prozess Erkenntnisse für die Gestaltung und Einführung von durch sozio-technische Artefakte gestützten Dienstleistungssystemen für eine gemeinsame Wertschöpfung gezogen.

Die Ergebnisse aus der Pilotierung wurden in fünf Publikationen veröffentlicht. Die zentralen Erkenntnisse werden in einem *Mehrebenen-Rahmenwerk zur Gestaltung von Dienstleistungssystemen*

zusammengefasst. Das Mehrebenen-Rahmenwerk unterstützt in der systematischen Analyse und Entscheidung im Gestaltungsprozess durch (1) eine Mehrebenen-Perspektive mit Makro-Meso-Mikro-Ebenen, die durch (2) zwei iterative, sich gegenseitig validierende Gestaltungszyklen miteinander verbunden sind. Diese Unterteilung legt eine Zuordnung von Gestaltungselementen fest und zeigt deren Zusammenhänge auf. Die Mehrebenen-Perspektive verbindet das übergeordnete Ziel der gemeinsamen Wertschöpfung in Dienstleistungssystemen durch die Verknüpfung des Wertversprechens auf der Makro-Ebene mit empirisch beobachtbarem Verhalten von Akteuren auf der Mikro-Ebene mithilfe von sozio-technischen Systemen auf der Meso-Ebene.

Konkret werden in dem Mehr-Ebenen-Rahmenwerk Gestaltungsaktivitäten, die unmittelbaren Einfluss auf das sozio-technische Artefakt und das Nutzungsverhalten der Akteure haben, in dem *Engagement Design* zusammengefasst. In diesem Gestaltungszyklus werden (1) die Gestaltungsoptionen, die die Interaktion zwischen einem Akteur und einem sozio-technischen Artefakt beeinflussen sowie (2) Interventionen in dem Umfeld der Akteure zur Unterstützung der Mitwirkung gebündelt. Beispielsweise hat eine leichte Bedienbarkeit eines technischen Artefakts einen Einfluss auf den Zugang für die Akteure und Gamification-Elemente können die Mitwirkung stimulieren. Jedoch weisen diese Gestaltungsoptionen unterschiedliche Effekte auf, die vom Umfeld des Akteurs abhängig sind. Beispielsweise ermöglicht die Option für anonyme Beiträge Mitarbeitern innerhalb einer Organisation, kritische und strategische Verbesserungsvorschläge auf einer Plattform vorzuschlagen und diese offen zu diskutieren. Darüber hinaus sind Interventionen notwendig, um bspw. durch Schulungen und Community-Management die Akteure und dessen Ressourcen zu mobilisieren und zu integrieren. Zusammenhänge zwischen den Gestaltungsoptionen und den Effekten auf das Verhalten der Akteure können mithilfe einer sozio-technischen Perspektive analysiert werden.

Die Ergebnisse aus der Pilotierung zeigen, dass diese beteiligungsbefördernden Maßnahmen nicht ausreichen, um eine kontinuierliche Mitwirkung der Akteure zu erzielen. Nutzerzentrierte Methoden unterstützen die Gestaltung von Benutzeroberflächen, berücksichtigen jedoch das Umfeld, die Rahmenbedingungen und die resultierende Wirkung auf die Akteure unzureichend. Das Umfeld wird u.a. durch Werte und Normen repräsentiert, manifestiert sich durch das Verhalten der Akteure und ist geprägt durch Regularien, Strukturen und Prozesse. Wenngleich Akteure motiviert zur Mitwirkung sind, können diese Rahmenbedingungen und das Wertversprechen des Dienstleistungssystems die Beteiligung einschränken. Am Beispiel des internen Crowdsourcings in der öffentlichen Verwaltung wird deutlich, dass die Vorgabe einer effizienten Ressourcennutzung als staatliche Institution, reprä-

sentiert durch die Zielvorgaben der Funktionsbereiche, dem offenen und experimentierfreudigen Vorgehen beim internen Crowdsourcing entgegensteht. Deshalb müssen das Umfeld und die Rahmenbedingungen, in dem sich die Akteure bewegen, einem aktiven Gestaltungsprozess unterzogen werden. Die Aktivitäten werden in dem *Institutional Design* Zyklus gebündelt und umfassen Gestaltungselemente rund um das Wertversprechen des Dienstleistungssystems, der Konfiguration von mitwirkenden Akteuren und Ressourcen sowie den Rahmenbedingungen.

Während das Rahmenwerk einen methodischen Beitrag zur systematischen Gestaltung von Dienstleistungssystemen leistet, werden basierend auf den Erkenntnissen aus der naturalistischen Evaluation *Gestaltungsprinzipien für internes Crowdsourcing* abgeleitet. Diese Prinzipien fassen Empfehlungen zur Wahl von Gestaltungsoptionen und den korrespondierenden Effekten auf die Mitarbeitenden und Strukturen in Organisationen zusammen und leisten einen Beitrag zur Erweiterung des evidenzbasierten Gestaltungswissens für internes Crowdsourcing.

Zusammengefasst unterstützen die Forschungsergebnisse die Forschung und Praxis in der systematischen Analyse, Entscheidung und Umsetzung von Gestaltungsoptionen in der Entwicklung von Dienstleistungssystemen. Durch die integrierte Sichtweise auf sozio-technische Artefakte und den Kontext der Akteure wird die Perspektive von technologisch fokussierten Entwicklungen um die Gestaltung von strukturgegebenen Rahmenbedingungen erweitert. Die Gestaltung von sozio-technischen Artefakten und der Rahmenbedingungen als nicht trennbare Einheit verändert die Wertschöpfung zwischen verschiedenen Akteuren, dessen Wirkung auf die Organisationen und Märkte weiter zu explorieren sind. Hierfür sind weiterführende Forschungsaktivitäten notwendig, die durch die Anwendung des Mehrebenen-Rahmenwerks in unterschiedlichen Kontexten das Wissen über das Zusammenwirken der Gestaltungszyklen erweitern.

Abstract

Problem Statement and Objective of Thesis

Digitalization has changed the perception of service innovation significantly, as services are increasingly technology-enabled, interconnected, co-created, and experience-focused (Barrett et al. 2015; Lusch and Nambisan 2015). Simultaneously, service systems have evolved as a concept of research in information systems (IS) research and broaden the perspective of technology-enabled innovations toward a network of interconnected services (Fielt et al. 2013; Rai and Sambamurthy 2006). Recent research emphasizes that service innovation evolves around loosely coupled service ecosystems that depend on the engagement of multiple actors. Technologies, institutions, and value co-creation connect these actors (Vargo and Lusch 2017), emphasizing the role of socio-technical artifacts (Böhmann et al. 2014). A growth in dynamisms and uncertainties accompanies these developments because of continuously evolving, learning, and open service systems (Böhmann et al. 2018; Frow et al. 2014).

Such a dynamic context challenges the assumptions of plan-driven service design approaches (Benkenstein et al. 2017; Ostrom et al. 2015; Payne et al. 2008). In the absence of environmental stability, these approaches are unlikely to succeed (Böhmann et al. 2014). Recent work emphasizes iterative methods for service design (e.g., Patrício et al. 2018b; Teixeira et al. 2016); however, a strong focus is placed on the user-centric design for actor engagement and engagement platforms. Nevertheless, these methods have not yet accounted for the contextual role of service systems with its environmental conditions and the institutions of service systems (Barrett et al. 2015; Koskela-Huotari et al. 2016; Koskela-Huotari et al. 2020; Vargo and Lusch 2016). Service systems engineering (SSE) calls for research to contribute to the methodological and evidence-based design knowledge in order to design digital opportunities for service systems systematically (Böhmann et al. 2014).

Given that service systems depend on the engagement of actors (Storbacka et al. 2016), internal crowdsourcing represents a promising mechanism for mobilizing and integrating actors for value co-creation. This mechanism emphasizes how multiple actors mobilize their resources, such as skills and knowledge, and integrates them into interactions using socio-technical artifacts (Zuchowski et al. 2016). Consequently, the overall aim of this research work is to improve understanding of the systematic design of service systems and to derive evidence-based design knowledge by applying internal crowdsourcing.

Research Design and Methodology

Rooted in cumulative research design, this thesis applies *action design research* (ADR) (Sein et al. 2011). Based on a piloting approach (Briggs et al. 2019; Schwabe and Krcmar 2000), several *build, intervene and evaluation* activities were carried out. In the first step, Semmann and Grotherr (2017) developed an IT-enabled engagement platform within a public organization. Engagement platforms are socio-technical artifacts that enable actors to exchange resources (Breidbach and Brodie 2017) collaboratively. Within this naturalistic environment, the developed IT-enabled engagement platform was open to all interested employees, where they could propose, discuss, and realize change initiatives for newly introduced software. The platform lays down the empirical baseline for subsequent research activities. Based on interviews, workshops, and engagement platform usage data, evaluation results were gathered. As part of the *reflection and learning* stage, these results were evaluated by applying the socio-technical perspective (Orlikowski and Iacono 2001). The insights gained from naturalistic evaluation led to socio-technical design principles for engagement (Grotherr et al. 2018a). Following the *formalization and learning* stage, Grotherr et al. (2019) further elaborated on the design knowledge obtained by comparing the results with those of a second design science research project that was conducted within another public organization. The social cognitive theory was applied to reflect on engaged and empowered employees, their motives, social norms, and cultural properties (Bandura 1989). These reflections subsequently led to design principles for internal crowdsourcing. Reflecting on the design process and the evaluation, Grotherr et al. (2018b) conceptualized a multi-level design framework for service systems that represents the core theoretical contribution of this thesis. This framework builds on microfoundations for macro-level phenomena. When applied to service systems, this approach seeks to bridge the macro-level value co-creation with empirically observable actor engagement at the micro level (Storbacka et al. 2016). The thesis leverages this theoretical foundation to propose a multilevel framework for service systems design, thereby contributing to the methodological knowledge base of service systems engineering. The generalizability of the framework was demonstrated by applying it within a smart community research project (Grotherr et al. 2020).

Results

This thesis comprises two main results: (1) A *multilevel design framework for service systems* and (2) *design principles* for internal crowdsourcing. The findings provide methodological support on *how* to design service systems and design decision support on *what* is required to operationalize value co-creation and to establish internal crowdsourcing in an actor's natural environment.

Drawing on microfoundations for value co-creation (Storbacka et al. 2016), Grotherr et al. (2018b) develop a *multilevel design framework* for the systematic design of service systems. The framework builds on (1) a multilevel perspective and (2) two iterative, validating design cycles. First, applying a *multilevel perspective* bridges the macro-level phenomena of value co-creation, engagement platforms as intermediaries for resource mobilization and integration on meso-level, and the micro-level observations of actor engagement. It enables scholars and practitioners to design service systems across these levels, as such a view of design elements and their interrelation help increase understanding of resource exchanges between actors and the relation to value co-creation. Second, the *two iterative, validating design cycles* propose an incremental approach. With small improvements during its design and usage, the service system continuously evolves. This approach is appropriate for interventions in an actor's environment because the effects of altering design decisions can be observed.

The two intertwined design cycles refer to different design activities. The *engagement design* focuses on the design of socio-technical artifacts, which effects can be observed by utilizing a piloting approach in actors' natural environments. However, transferring an artifact into an actor's environment requires designing prerequisites that shape an actor's willingness to engage. While highlighting the importance of institutions for service systems (Barrett et al. 2015; Koskela-Huotari et al. 2020), the framework points toward the need for the *institutional design*. This design cycle refers to the design of environmental conditions, configurations of actors and resources, and value propositions, summarized as the institutional set-up. Therefore, supporting structures such as processes and roles must be developed, required actors and resources mobilized and integrated, and guiding value propositions adapted. Both design cycles facilitate the reconfiguration of service systems and socio-technical artifacts to an actor's environment in order to enable actor engagement and facilitate value-in-context.

Beyond providing a framework for designing service systems, this thesis develops *design principles* that help researchers and practitioners to decide on design options for internal crowdsourcing (Grotherr et al. 2019). By evaluating the design made on engagement platforms situated in two public organizations, Grotherr et al. (2019) discuss the effects of design decisions at individual and organizational level and contribute to the call for evidence-based design knowledge (Böhmann et al. 2014; Nunamaker et al. 2015; Zuchowski et al. 2016). This thesis concludes that design should not only focus on the process of artifact design but should also consider the entire environment. These environmental conditions include the design of governance mechanisms, such as contracts, rules, incentive structures, and regulations, which direct toward the institutional design cycle of the multilevel framework.

The results of the cumulative research approach presented within this dissertation were continually published between 2017 and 2020 in five papers. The first paper, "*How to Empower Users for Co-Creation—Conceptualizing an Engagement Platform for Benefits Realization*," develops an IT-enabled engagement platform by building on internal crowdsourcing in order to stimulate actor engagement. This platform is developed and evaluated during several build, intervene, and evaluate cycles within a public organization (Semmann and Grotherr 2017).

The second paper, "*Engaging Users to Co-Create—Implications for Service Systems Design by Evaluating an Engagement Platform*," provides socio-technical design principles for engagement that are based on the naturalistic evaluation of the previously developed engagement platform with a socio-technical perspective (Grotherr et al. 2018a). The engagement platform and design principles reflect on the socio-technical design and adaptation for engaging employees in value co-creation.

The third paper, "*Using Microfoundations of Value Co-Creation to Guide Service Systems Design—A Multilevel Design Framework*," conceptualizes a multilevel design framework for service systems. This framework builds on a multilevel perspective and two intertwined design cycles, thereby contributing to the methodological knowledge base of service systems engineering, which enhances the theoretical relevance of this thesis (Grotherr et al. 2018b).

In the fourth paper, "*Multilevel Design for Smart Communities—The Case of Building a Local Online Neighborhood Social Community*," the multilevel design framework for service systems is applied to a design science research (DSR) project, which aims to build a smart community. The case demonstrates the application and its usefulness for capturing the micro-meso-macro-implications of smart community design (Grotherr et al. 2020).

The fifth paper, "*Waking Up a Sleeping Giant: Lessons from Two Extended Pilots to Transform Public Organizations by Internal Crowdsourcing*," elaborates on the design principles proposed in Grotherr et al. (2018a) by comparing them to a second design science research project situated within a public organization. By applying the social cognitive theory, this comparison leads to design principles that guide the design of internal crowdsourcing in public organizations (Grotherr et al. 2019).

Theoretical Contribution

This thesis contributes with (1) the multilevel design framework to the *methodological* knowledge base for service systems engineering (SSE) and with (2) the design principles to the evidence-based *design knowledge for internal crowdsourcing* mechanisms, building on the naturalistic intervention of the engagement platforms within public organizations.

Several service design methods focus on interactional and explorative design activities of one single service (e.g., Bullinger et al. 2003; Holmlid 2007). However, this perspective neglects the broader context of service systems, engaging actors, and institutions (Koskela-Huotari et al. 2020). Within an actor's context, changes at organizational and individual levels only occur when considering environmental conditions. The multilevel design framework with two intertwined design cycles goes beyond traditional service design approaches, which focus on the design of artifacts, toward the design of institutional set-up in order to enable actor engagement. The framework considers the design of the institutional set-up, comprising environmental conditions, institutions, configurations of actors and resources and value propositions (institutional design), and the design of socio-technical artifacts (engagement design) as inseparable design activities. Its multiple levels provide a more detailed specification of design activities and elements with an improved understanding of their interrelations. This research result contributes to the methodological knowledge base of *service systems engineering*.

Moreover, while research about internal crowdsourcing increases, little is known about the adaption of the concept within organizations and specific contexts (Pedersen et al. 2013; Zuchowski et al. 2016). This thesis addresses this research need by providing *design knowledge for internal crowdsourcing* and their corresponding effects on organizational structure and individual behavior (Grotherr et al. 2019). Design principles are derived in two design science research projects, which design and introduce internal crowdsourcing within public organizations. These principles foster the establishment of internal crowdsourcing within naturalistic environments by mobilizing and integrating the resources of employees into a collaborative process of exchange, thus unleashing the potential of empowered employees (Elmes et al. 2005). By doing so, the design knowledge of governance and supporting structures is elaborated upon, advancing the existing body of knowledge on internal crowdsourcing.

Practical Contribution

This thesis combines theoretical contributions with managerial relevance because the design and piloting were carried out in real-world environments. The intervention in organizations responds to the need for "the last research mile" in order to unleash the potential of developed artifacts in an actor's natural environment (Benoit et al. 2019; Nunamaker et al. 2015). In particular, this thesis provides two practical contributions. First, the multilevel framework for service systems provides *guidance for coordinating design activities* by identifying design elements. The framework helps allocate responsible roles from different design domains to find suitable configurations of socio-technical artifacts and environmental conditions, such as governance structures or processes. The intertwined design cycles highlight the need to align socio-technical artifact design and organizational design. Doing so enhances artifact's fit in the organizational context. Consequently, service innovation and transformation require the design of organizational set-up at strategic and operational levels. These activities range from shifting management practices, guiding values, experimental approaches, adaption performance-measurement systems, or cross-functional cooperation mechanisms (Grotherr et al. 2019).

Second, while digitization emphasizes technologies, the term digitalization has been coined to describe the complex socio-technical processes of adapting these technologies in broader individual, organizational, and societal contexts (Legner et al. 2017). Central drivers for digital transformation are new work processes and culture, rather than the implementation of technology only. This thesis provides evidence that the success of digitally-enabled initiatives depends on environmental conditions and employees' skills. It demonstrates how internal crowdsourcing facilitates *employee engagement and empowerment* and how a service system perspective captures the design of socio-technical artifacts and broader environmental conditions.

Outlook

The research results identify a set of research opportunities that relate to (1) extending the multilevel design framework by supporting processes or tools and (2) broadening the perspective of the design of service ecosystems through institutionalization.

First, the potential of the multilevel design framework to conduct an inquiry into an institutional set-up and its ability to guide service systems designers need further research activities. The synchronization of the two design cycles requires a more detailed description of duration, frequency, roles, and structured processes. In addition, best practices and tools must strengthen understanding of how the multilevel framework can be utilized in a broader context.

Second, due to technological advancements and a data-driven economy, new forms of value co-creation and emergence of learning services are facilitated (Böhmann et al. 2018). These developments exploit technological and architectural networks with rapidly emerging machine-to-machine interaction and lead to smart service systems, such as self-driving cars (Wünderlich et al. 2015). Nevertheless, embedding these service systems within a real-world environment necessitates regulations, governance structures, and processes for facilitating social responsibility for digital innovations. As service science recognizes the role of institutionalization in service ecosystems (Vargo et al. 2015), further research should be directed toward obtaining a more in-depth understanding of how these interconnected service systems bear the potential to shape markets and customer needs. Since engineering approaches and design knowledge help transform organizations, individuals, and service ecosystems, they consequently need further elaboration.

Keywords: Service Systems Engineering, Actor Engagement, Internal Crowdsourcing, Multilevel Design Framework, Design Principles, Action Design Research, Naturalistic Environment

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List of Abbreviations

ADR	Action Design Research
BIE	Build, Intervene and Evaluate
DP	Design Principle
DSR	Design Science Research
IS	Information Systems
RQ	Research Question
S-D logic	Service-Dominant Logic
SSE	Service Systems Engineering

1 Introduction

The following chapter outlines the motivation for conducting this research, stemming from the emergence of open, actor-centered, technology-enabled, and interconnected service systems. Building on the challenge to systematically design these service systems in dynamically changing environments, the research questions are also presented here. To address the need for methods for service systems and evidence-based design knowledge, this thesis further builds on interventions into the naturalistic environment of a public organization. Since service systems are predominantly dependent on actor engagement, internal crowdsourcing mechanisms are applied to mobilize and integrate actors and their resources with socio-technical artifacts. In addition, the outline of this cumulative thesis and the five publications included are highlighted.

1.1 Motivation

With the rise of new technologies and the digital transformation in organizations and society (Peters et al. 2016), new service innovations emerge (Barrett et al. 2015; Lusch and Nambisan 2015). Developments such as social platforms, artificial intelligence, and big data afford opportunities for new business models and value co-creation (Chandler and Lusch 2015; Legner et al. 2017). These collaborations lead to new forms of resource mobilization and integration and occur together with the emergence of open phenomena, engagement platforms, and learning service systems (Böhmann et al. 2014; Breidbach and Brodie 2017; Schlagwein et al. 2017).

Service systems evolved as a research concept in the information systems (IS) field, which aims to link knowledge from various domains in order to contribute to service science and information systems research (Benoit et al. 2017; Böhmann et al. 2014, 2018; Fielt et al. 2013; Rai and Sambamurthy 2006; Satzger et al. 2010). Current service innovations and service systems as socio-technical systems consist of a variety of actors and technological advancements (Böhmann et al. 2014). Openness, interconnection, and contextualization characterize these configurations situated in dynamic environments (Barrett et al. 2015; Chandler and Lusch 2015; Legner et al. 2017).

Consequently, service systems mirror this shift from single services toward a complex, interconnected system of loosely-coupled services, which either enter or leave technology-mediated service systems (Böhmann et al. 2018; Spohrer et al. 2007). In line with the ongoing service-driven shift (servitization) in many industries (Baines et al. 2017), domains such as health care, mobility, and other service ecosystems seek to design interconnected and open service systems. These domains take advantage of

digital technologies by efficiently reconfiguring actors and resources in order to meet customer needs and address changing market demands (Gallivan and Srite 2005; Janowski 2015; Ostrom et al. 2015).

1.2 Problem Statement

Due to digitalization, the connectivity of organizations and individuals is enhanced, and "today's service systems have been driven to an unprecedented level of scale, complexity and interdependence" (Maglio et al. 2010, p. 678). To explore how technologies enable service innovation and to exploit digitalization for value co-creation in such dynamic environments, researchers must still address a variety of research topics. These researches need to include: (1) approaches for operationalizing value co-creation, (2) methods that support the design of service systems, and (3) evidence-based design knowledge. Only a few methods exist that support the systematic design of service systems (Böhmann et al. 2014). Indicating the lack of methodological support, extant methods do not consider the broader context and openness of service systems (Patrício et al. 2018b). Such challenges are predominantly highlighted by Böhmann et al. (2014) and supported by a wide range of literature (Benkenstein et al. 2017; Böhmann et al. 2018; Ostrom et al. 2010, 2015; Patrício et al. 2018a).

(1) *Lack of operationalizing value co-creation*: Value co-creation is theoretically discussed in marketing, information systems, design, and other related disciplines (Maglio et al. 2009; Patrício et al. 2018b; Vargo and Lusch 2004, 2008). However, there is a lack of guidance on how to operationalize value co-creation (Böhmann et al. 2014; Ostrom et al. 2015; Pinho et al. 2014). Few studies address the need to provide structural support in order to make value co-creation tangible and designable (Payne et al. 2008). For instance, due to the contextual nature of value co-creation (Chandler and Vargo 2011), observing and measuring value is difficult (Pinho et al. 2014).

(2) *Lack of methodological support for designing service systems:* Despite the emergence of service science (Alter 2012; Lusch and Vargo 2011; Maglio et al. 2009), the knowledge about the systematic design of service systems is scarce (Böhmann et al. 2014). Only a few methods have been published, rooted in the field of service engineering (Alter 2008; Bullinger and Scheer 2006). However, these methods do not consider the complexity, openness, and contextual nature of digital-enabled service systems (Böhmann et al. 2014). Moreover, previous studies on service design focus on the design of value networks and service experiences such as interactional aspects between customers and touchpoints with service providers (Patrício et al. 2018a; Patrício et al. 2011). However, technological advancements, configurations of actors and resources, institutions, and the value-in-context

conceptualization are the leading drivers for service innovations. These characteristics have be captured by a broader design process (Edvardsson et al. 2018; Vargo et al. 2015). Consequently, new methods are needed to systematically design service systems (Böhmann et al. 2018). These methods must capture the design of socio-technical artifacts, the design of individual service encounters, as well as the broader context—with its institutions, configurations of actors and resources, and environmental conditions. The emerging service systems engineering discipline highlights these research needs and aims to systematize the design process using models and methods (Böhmann et al. 2014).

(3) *Lack of evidence-based design knowledge*: Finding the right configuration of actors and resources is vital for service systems (Maglio et al. 2009). Recently, the role of engagement platforms as socio-technical artifacts and intermediaries for value exchanges between actors is highlighted (Breidbach and Brodie 2017; Breidbach and Maglio 2016). Despite the relevance of understanding actors' interactions within their environment (Doherty and King 2005; Edvardsson and Tronvoll 2011; Goldkuhl 2013; Luna-Reyes et al. 2005), research on the way socio-technical artifacts, such as engagement platforms, shape actors' willingness to engage is scarce (Beirão et al. 2017; Böhmann et al. 2014). Research is needed to steer scholars and practitioners toward understanding the effects of design decisions and derive evidence-based design knowledge (Böhmann et al. 2014; Iivari 2015; Niederman and March 2012). Design knowledge has to capture the socio-technical artifacts and the natural environment within the design process in order to bridge rigor and relevance (Benoit et al. 2019; Nunamaker et al. 2015). These contributions have the potential to shape the understanding of the interconnections of actors and socio-technical artifacts, designing service innovation, and the influence of decision-making in the design process.

1.3 Research Goals and Research Questions

The evolving service science and service systems engineering disciplines address the proposed research needs (Barrett et al. 2015; Böhmann et al. 2014; Maglio and Breidbach 2014). Since service systems are understood as socio-technical systems for enabling value co-creation (Böhmann et al. 2014), the aim is to find effective configurations of actors and resources. The integrative perspective has the potential to shed light on the complex interrelation of technology-mediated service systems, which build on multiple actors and resource mobilization and integration. Consequently, this thesis aims to contribute to the methodological knowledge base for service systems engineering and evidence-based design knowledge. Accordingly, the overall aim of this research thesis is to:

Improve the systematic design of service systems and derive evidence-based design knowledge.

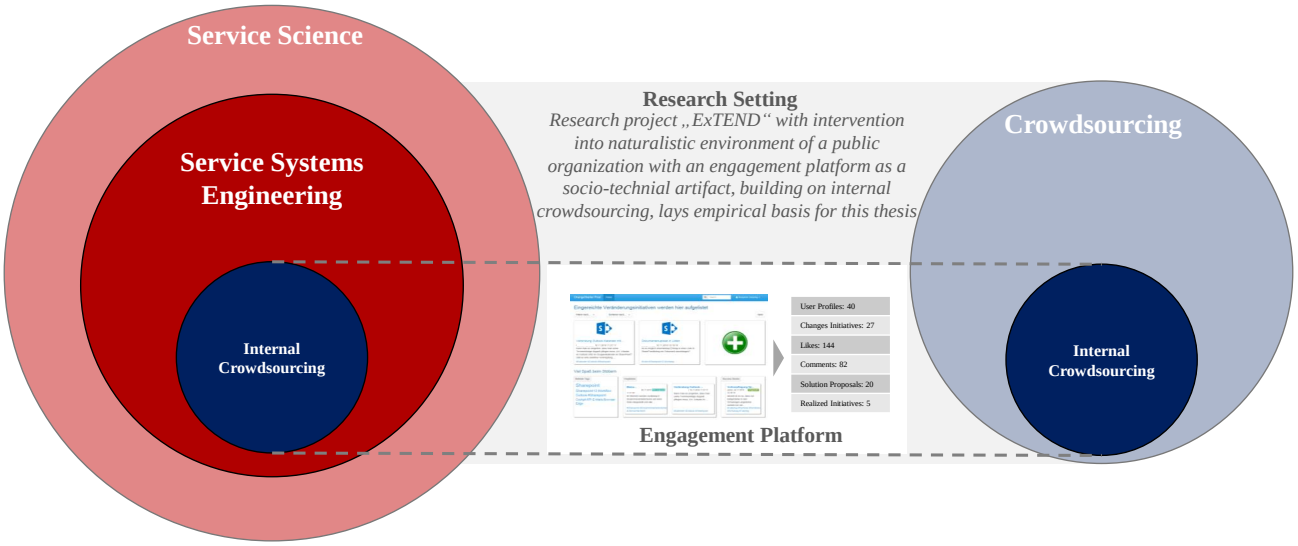

Figure 1. The Research Setting and the Related Research Areas of this Thesis.
Source: Own Representation.

To address the research goal, this thesis builds on *service science* and *crowdsourcing*. Both themes complement one another because service systems engineering depends on actor engagement (Böhmann et al. 2014; Storbacka et al. 2016), and crowdsourcing provides a mechanism for implementing the action-formation for actor engagement. These mechanisms emphasize how actors mobilize their resources, such as skills and knowledge, and integrate them into interactions using socio-technical artifacts (Zuchowski et al. 2016).

To derive evidence-based design knowledge, the action design research (ADR) approach has the potential—through continuous build, intervene, and evaluate (BIE) activities within a naturalistic environment—to understand design decisions and their corresponding effects on actor engagement. Hence, this thesis builds on the research setting of a three-year research project "*ExTEND—Engineering von Dienstleistungssystemen für nutzergenerierte Dienstleistungen*." The project was conducted in a naturalistic environment of a public organization. It implemented an engagement platform by applying internal crowdsourcing, which aims to engage employees to propose, discuss, and realize tool-specific improvements for newly introduced software (cf. Figure 1).

In sum, three research questions (RQ-X) are proposed, following a cumulative research approach and ADR methodology, as required by service science and design science (Böhmann et al. 2014; Gregor and Jones 2007; Iivari 2015; Patrício et al. 2018b). This thesis follows this need by including several directly and indirectly related publications, as described in Chapter 4. Each of the five publications included follows one research question and provides research results, which contribute to the body of knowledge on service systems and internal crowdsourcing (cf. Figure 2).

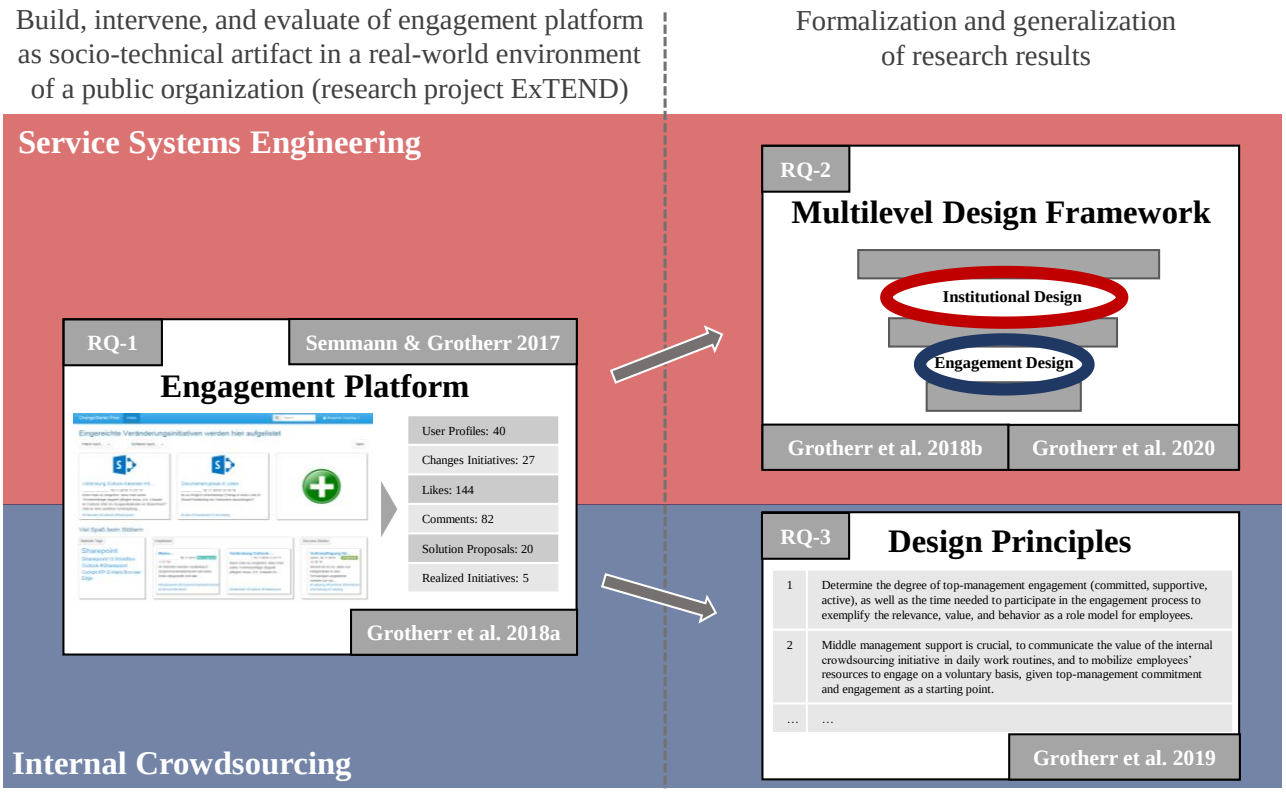

Figure 2. Overview of Intervention in a Real-World Environment and Generalization of Research Results.
Source: Own Representation.

Engagement platforms, as socio-technical artifacts, enable actors to exchange resources and bridge the gap between value co-creation and the empirical, observable actor engagement (Breidbach and Brodie 2017; Storbacka et al. 2016). In particular, the research question proposed in Semmann and Grotherr (2017)—"*How can a concept to empower users for co-creation of change initiatives be designed to enhance the possibilities to realize benefits?*"—focuses on the design and introduction of an engagement platform and corresponding design features within a public organization.

Based on the evaluation results, there is a need for *reflection and learning* in order to understand the environment and dynamics between actors and technology (Akhlaghpour et al. 2013; Goldkuhl and Perjons 2014; Matook and Brown 2016). The research question—"*How does an engagement platform be adapted based on users' engagement?*"—guides Grotherr et al. (2018a) to evaluate the previously developed engagement platform. By applying a socio-technical perspective (Orlikowski and Iacono 2001), this paper contributes with socio-technical design principles for engagement. The design of the engagement platform and the evaluation results address the following research question:

RQ-1: How can an engagement platform be designed and adapted as a socio-technical artifact for engaging employees for value co-creation?

As part of *formalization and learning*, service systems engineering strives to develop methods to address the proposed research needs (Böhmann et al. 2014). To generalize the design process of the build, intervene, and evaluate stages, Grotherr et al. (2018b) conceptualize a multilevel design framework for service systems. A multilevel perspective and two intertwined design cycles are applied by them, following the research question: "*How can microfoundations of value co-creation guide the service systems design?*". The goal of service systems design is the creation of value-adding service systems, which require socio-technical artifacts (engagement design) and the development of environmental conditions, configurations of actors and resources, institutions, and value propositions to be summarized in the institutional set-up (institutional design) (Grotherr et al. 2018b).

Grotherr et al. (2020) apply the multilevel design framework to the realm of smart communities to demonstrate transferability to other domains. This case derives design implications, guided by the research question: "*How can design activities be conducted systematically to build smart communities?*". The application aims to evaluate the range of design elements and activities coverage.

Altogether, the multilevel design framework as a methodological contribution to service systems engineering addresses the research question:

RQ-2: How can microfoundations of value co-creation guide service systems design?

Grotherr et al. (2019) further elaborate on the design principles previously proposed in Grotherr et al. (2018a), building on the realm of internal crowdsourcing. Two design science projects in two distinct public organizations are compared, both of which aim to engage and empower employees to collaboratively initiate and realize change initiatives for (a) software-specific (Semmann and Grotherr 2017) and (b) general strategic improvements (Wagenknecht et al. 2017a) (cf. Table 2, p. 11). Both projects piloted internal crowdsourcing over a certain period of time. The derived design principles for internal crowdsourcing summarize the evaluation results and corresponding effects on employees, organizational structure and culture. This publication is guided by the research question: "*What design propositions guide internal crowdsourcing with IT-enabled engagement platforms that aim for employee engagement and empowerment in public organizations?*". The knowledge obtained from these two pilots leads to design knowledge for internal crowdsourcing and addresses the following research question:

RQ-3: How to design internal crowdsourcing for employee engagement and empowerment?

1.4 Outline of the Thesis

The thesis comprises 13 chapters, which are shown in Table 1. By providing research motivation and research gaps, followed by research goals and questions, Chapter 1 introduces the present thesis. Chapter 2 describes the research design. First, research strategy and methods are described. Second, the application of the methods is explained. Subsequently, Chapter 3 provides the theoretical foundations on which this thesis builds on. Chapter 4 focuses on the publications included within this cumulative thesis, supplemented by all indirectly related publications of this research work. Chapter 5 comprises theoretical contributions, followed by Chapter 6, which summarizes the practical contributions of this thesis. Finally, Chapters 7 and 8 present the limitations of this research and the implications for future research. Chapters 9 to 13 outline the core publications that constitute this thesis.

Table 1. Thesis Outline.

Wrapper	**1. Introduction**	**2. Research Approach**	**3. Theoretical Foundations**	**4. Publications**
	5. Theoretical Contribution	**6. Practical Contribution**	**7. Limitations**	**8. Implications for Further Research**
	9. Paper 1	*Semmann, M., and Grotherr, C. 2017* **How to Empower Users for Co-Creation—Conceptualizing an Engagement Platform for Benefits Realization** 13th International Conference on Wirtschaftsinformatik, St. Gallen, Switzerland.		
Publications	10. Paper 2	*Grotherr, C., Semmann, M., and Böhmann, T. 2018* **Engaging Users to Co-Create—Implications for Service Systems Design by Evaluating an Engagement Platform** 51st Hawaii International Conference on System Sciences (HICSS), Waikoloa Village, Hawaii, USA.		
	11. Paper 3	*Grotherr, C., Semmann, M., and Böhmann, T. 2018* **Using Microfoundations of Value Co-Creation to Guide Service Systems Design—A Multilevel Design Framework** International Conference on Information Systems (ICIS), San Francisco, California, USA.		
	12. Paper 4	*Grotherr, C., Vogel, P., and Semmann, M. 2020* **Multilevel Design for Smart Communities—The Case of Building a Local Online Neighborhood Social Community** 53rd Hawaii International Conference on System Sciences (HICSS), Grand Wailea, Hawaii, USA.		
	13. Paper 5	*Grotherr, C., Wagenknecht, T., and Semmann, M. 2019* **Waking up a Sleeping Giant: Lessons from Two Extended Pilots to Transform Public Organizations by Internal Crowdsourcing** International Conference on Information Systems (ICIS), Munich, Germany.		

Source: Own Representation.

2 Research Approach

The following chapter describes the research strategy and methods of this thesis. To gain insights into evidence-based design knowledge and to contribute to the methodological knowledge base of service systems engineering, research in a naturalistic environment of a public organization is carried out, following the ADR approach. An engagement platform is developed and introduced in order to observe organizational and individual effects, leading to theoretical and practical contributions.

2.1 Research Strategy

2.1.1 Overall Research Strategy

In IS research, the paradigms of natural science and design science are predominant (Bichler et al. 2016). While natural science seeks to understand human behavior and action-taking (March and Smith 1995), design science aims at building novel artifacts to improve current practices and performances (Hevner et al. 2004; Simon 1996). This thesis is situated in the design science realm paradigm of IS research, as shown in Figure 3.

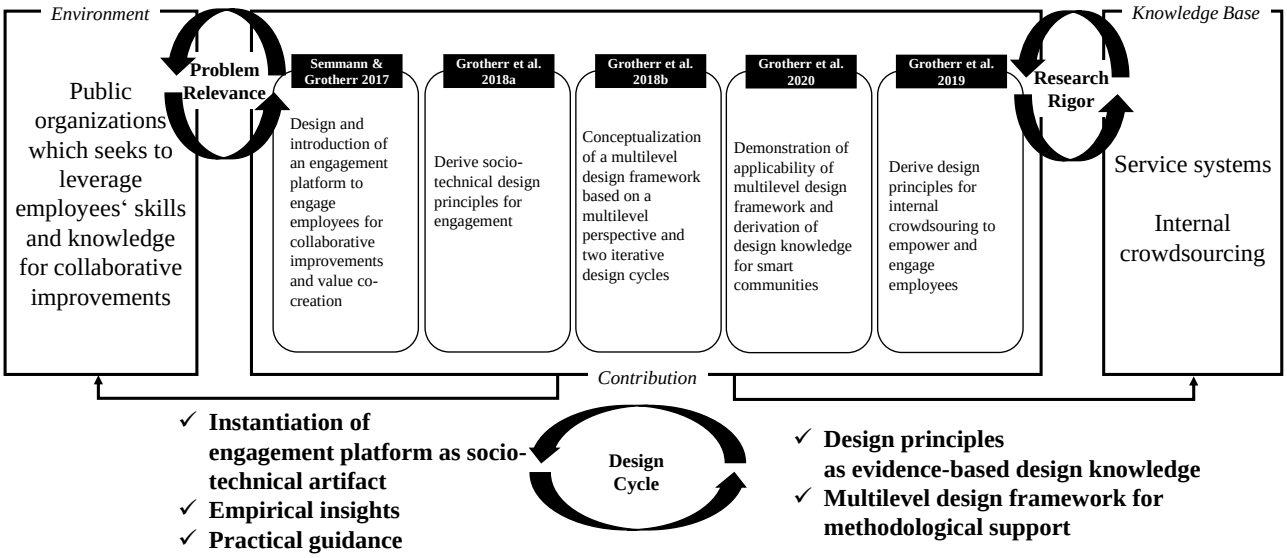

Figure 3. Rigor, Relevance, and Design Cycles within this Thesis.
Source: Adapted from Hevner (2007).

Guidelines provided by Hevner (2007) are adapted to ensure problem relevance and research rigor. First, the *Problem Relevance Cycle* reflects the intervention into the naturalistic environment of a public organization that seeks to leverage its employees' skills and knowledge for collaborative improvements. Second, the *Research Rigor Cycle* utilizes prior knowledge of service systems and internal crowdsourcing to solve the defined problem. Third, the *Design Cycle* combines the relevance and

rigor cycles, developing an engagement platform that enables employees to propose change initiatives, gain crowd-commitment, and realize change initiatives (cf. Figure 5, p. 12). In line with the call for more cumulative research (Niederman and March 2012), the research results are generalized within the publications included and contribute to the design and methodological knowledge base for service systems engineering and internal crowdsourcing (cf. Figure 2, p. 5).

2.1.2 Action Design Research

Action design research overview. Methods such as design science research (Peffers et al. 2007) and action research (Davison et al. 2004) create a balance between the interests of researchers and practitioners by applying scientific methods to relevant practical and theoretical research (Cole et al. 2005). ADR combines action research and design science by developing artifacts to solve specific problems in a real-world environment (Sein et al. 2011). Given the research goal to contribute to evidence-based design knowledge and the methodological knowledge base of service systems engineering, this thesis applies ADR methodology (Sein et al. 2011). The method provides a nominal sequence of four stages and seven guiding principles, which are interconnected and iteratively traversed. This method serves as a template for structuring this thesis (cf. Figure 4).

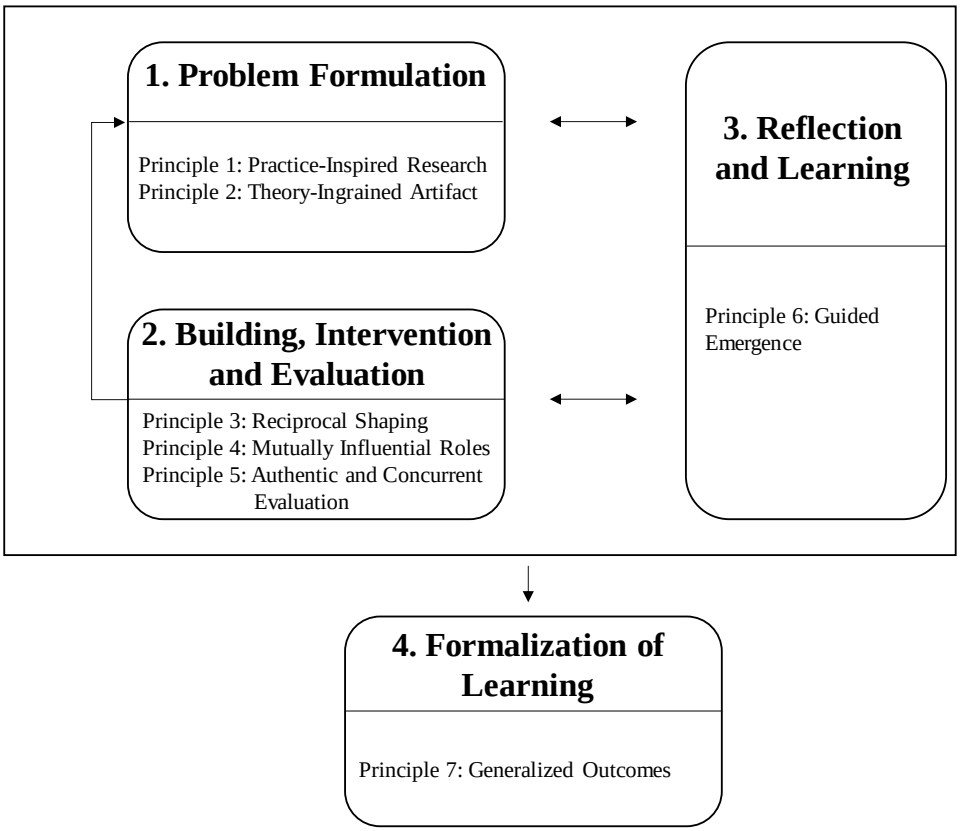

Figure 4. Action Design Research: Stages and Principles.
Source: Sein et al. (2011).

Problem formulation. Starting with the *problem formulation* stage, weak points and the reasons why this research is essential are identified (Sein et al. 2011). Within the thesis, the need to contribute to service systems engineering is highlighted (Böhmann et al. 2014). The issues identified relate to (1) a lack of how to operationalize value co-creation, (2) a lack of supporting methods for service systems engineering and (3) a lack of evidence-based design knowledge (cf. Section 1.1, p. 1).

Build, intervene and evaluate. Within the second stage, the aim is to *build*, *intervene*, and *evaluate* (BIE) artifacts. Artifacts can be constructs, models, methods, and instantiations (Hevner et al. 2004). These design and development activities require researchers to engage with the organizational context in order to adapt and evaluate an artifact's configuration (Sein et al. 2011). Such reciprocal shaping relates to the concept of "ensemble artifacts". That means "while the researcher may guide the initial design, the ensemble artifact emerges through the interaction between design and use. Consequently, the artifact must eventually reflect intended as well as unintended organizational consequences" (Sein et al. 2011, pp. 39-40). "Ensemble artifacts are dynamic and emerge from the contexts of both their initial design and continual redesign via organizational use" (ibid, p. 52). Accordingly, intervening in a naturalistic environment to gain more in-depth insights into the socio-technical nature of an artifact is required (Gregor et al. 2006; Markus 2004; Silva and Hirschheim 2007).

Within this thesis, subsequent build, intervene, and evaluate cycles are conducted to observe how the research results are adapted and reconfigured within naturalistic environments (cf. Table 2, p. 11). This thesis primarily builds on the research setting of the research project "*ExTEND—Engineering von Dienstleistungssystemen für nutzergenerierte Dienstleistungen*" (cf. Figure 1, p. 4). In November 2015, the project started to invite employees within a public organization to engage in improving the software in their work environments (Agarwal et al. 2019).

Table 2. Research Settings and Relation to Included Publications.

Research settings	*ExTEND Research Project:* Long-term piloting of engagement platform within the naturalistic environment of a public organization (cf. Figure 1, p. 4)	Comparative research project to derive design principles for internal crowdsourcing	Application of the multilevel design framework to smart community domain
Period	Own involvement (2015-2018)	2019	2019
Publications	Semmann and Grotherr (2017); Grotherr et al. (2018a); Grotherr et al. (2018b)		Grotherr et al. (2020)
	Grotherr et al. (2019)		
Characteristics of research settings	Public organization		Smart community
	Port agency	Employment agency	Online neighborhood community
Range of affected actors	1,800 employees	120 employees	6,000 inhabitants
	Multiple businesses, digital and IT units		Health authority, housing cooperatives, inhabitants
Vision	Fostering empowerment and engagement, switching culture from top-down to bottom-up		Engaging actors and resources in a local neighborhood community for improving well-being
Specific aim	Process and software improvements	Strategic improvements	
Applied mechanism	Internal crowdsourcing		Local (online) neighborhood social network
Socio-technical artifact	Engagement Platform		
	cf. Semmann and Grotherr (2017)	cf. Wagenknecht (2018)	cf. Vogel et al. (2019b)
Research approach	Design science research		
Data collection and analysis	Workshops, interviews, observation, usage data, qualitative content analysis		

Source: Own Representation.

Semmann and Grotherr (2017) built an engagement platform in the naturalistic environment of this public organization. The platform utilizes internal crowdsourcing in order to engage and empower employees to propose, comment, and implement change initiatives for improving newly introduced software (cf. Figure 5). By utilizing a piloting approach (Briggs et al. 2019; Schwabe and Krcmar 2000), the usage data and insights on design decisions are derived. By doing so, the social actions in the work context of engaging actors are gathered and analyzed from a socio-technical perspective (Goldkuhl 2013; Orlikowski and Iacono 2001).

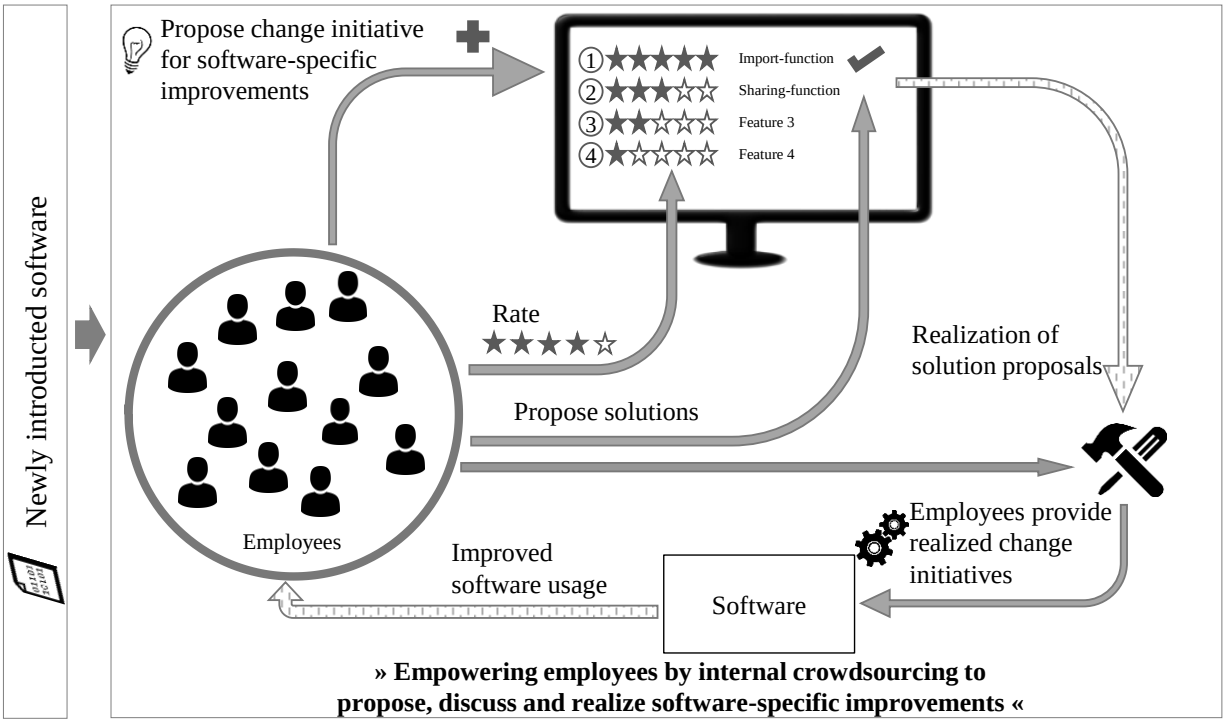

Figure 5. Operating Mechanism of the Engagement Platform proposed by Semmann and Grotherr (2017).
Source: Own Representation.

Reflection and learning and formalization of learning. The *reflection and learning* stage aims to compare the defined problem statement with evaluation results. Evaluation criteria can be defined "in terms of functionality, completeness, consistency, accuracy, performance, reliability, usability, fit with the organization, and other relevant quality attributes" (Hevner et al. 2004, p. 85). After conducting these iterations, the results are reflected and formalized to gain knowledge for a broader audience of scholars and practitioners (Sein et al. 2011). The *formalization of learning* stage reflects the learnings derived during the intervention and seeks to generalize outcomes for a class of problems and solutions (Eisenhardt and Graebner 2007; Sein et al. 2011). Possible results are design principles (Sein et al. 2011), which can be formulated according to Chandra et al. (2015). This abstraction of derived knowledge captures the insights gained during the intervention and provides general lessons, ensuring a contribution to the scholarly body of knowledge.

Within this thesis, the results of *reflection and learning* and *formalization and learning* stages are combined in Grotherr et al. (2018a, 2018b, 2019, 2020) publications because they are closely linked to one another and mutually expand (cf. Figure 2, p. 5).

Following the "Framework for Evaluation in Design Science Research" (Venable et al. 2016), Grotherr et al. (2018a) reveal insights gained during the evaluation of the engagement platform within the naturalistic environment. The aim is to analyze the requirements for stimulating the engagement

of actors in terms of the platform design, additional resources, and the set of supporting interventions. By applying the socio-technical perspective "ensemble view" (Orlikowski and Iacono 2001), socio-technical design principles for engagement and the design of engagement platforms as a conduit for employee-driven software change initiatives are derived.

Reflecting on the design process and the evaluation, this thesis generalizes design knowledge and conceptualizes a multilevel design framework, building on the microfoundations of value co-creation (Grotherr et al. 2018b). A multilevel perspective and two iterative, validating design cycles provide implications for service systems design, which extends the socio-technical artifact design (engagement design) toward a broader perspective of the institutional set-up design (institutional design). The insights gained in the ExTEND research settings provide evidence about the interrelation of engagement and institutional design as well as how service systems can be realized in organizations. Thus, the role of value-in-context as a perspective for understanding service systems transformation is highlighted (Grotherr et al. 2018b). The proposed multilevel framework contributes to the realm of service systems engineering, which "seeks to advance knowledge on models, methods, and artifacts that enable to support the engineering of service systems" (Böhmann et al. 2014, p. 76).

Grotherr et al. (2020) mirror the transferability of the multilevel design framework to other research domains. The paper demonstrates—within a smart community-building project that aims to build an engagement platform for increasing the social inclusion of the elderly population (Vogel et al. 2019b, 2020)—how the framework informs the design process. By conducting a case study (Yin 2017), the empirical observations at the micro level lead to design implications at the meso and macro levels.

Grotherr et al. (2019) advance design knowledge for internal crowdsourcing and highlight how this mechanism shapes public organizations by comparing the case of Semmann and Grotherr (2017) with a second design science research project (Wagenknecht et al. 2017c), which empower and engage employees to propose, discuss, and realize change initiatives. Both cases are carried out in public organizations over a certain period and utilize a piloting approach, which produces usage data obtained from the engagement platform as well as several interviews and workshops. Based on these findings, design principles are derived for designing and introducing internal crowdsourcing in naturalistic settings to leverage the potential of new working modes. The insights provided by both publications inform the process of transforming public organizations using internal crowdsourcing.

Consequently, this thesis contributes to the existing body of knowledge on service systems engineering and internal crowdsourcing, which is highlighted in Chapters 5 and 6.

2.2 Research Methods

2.2.1 Literature Review

This thesis includes literature reviews that shape each included publication. This activity outlines the evidence obtained during previous research and provides information about the relevance of the current research (problem formulation). Drawing on the existing body of knowledge ensures rigor of developed artifacts (Rowley and Slack 2004; vom Brocke et al. 2009; Webster and Watson 2002). Literature reviews were conducted through scientific outlets; for instance, the journals listed in the senior scholars' basket of the Association of Information Systems (Scholars 2019) and digital databases, as suggested by Knackstedt and Winkelmann (2006). In addition, a continuous literature review process was applied for the ongoing build, intervene, and evaluation cycles in order to incorporate new insights into the research process (Rowe 2014).

2.2.2 Data Collection: Piloting, Interviews, Think-Aloud, Observations

To explore and exploit value co-creation, service systems must be embedded in an environment (Böhmann et al. 2014). Emphasis is laid on the piloting approach during the build, intervene, and evaluate cycles, which aims to "develop and implement technological innovations in their natural organizational and social environment" (Schwabe and Krcmar 2000, p. 3). This approach is suitable for cumulative research to observe the artifact as an integral part of the organization (Briggs et al. 2019). To gain in-depth contextual knowledge during the piloting, several qualitative research approaches were applied (Boren and Ramey 2000; Hertzum and Holmegaard 2015). Workshops, thinking aloud, observations, and semi-structured interviews—lasting between 30 and 60 min—were performed for formative evaluation activities. Interviewees were chosen from strategic, tactical, and operational levels to derive design requirements for the engagement platform. The interviews followed Rubin and Rubin (2011) guidelines. Furthermore, multiple mock-ups and prototypes were used to explore the contextual circumstances and relevant experts within the studied organization. During the piloting, usage data were collected on the engagement platform (i.e. content, log files).

2.2.3 Data Analysis: Socio-Technical Perspective and Social Cognitive Theory

Collected data were transcribed and qualitatively analyzed (Schreier 2012). To understand the actors' willingness to engage in collaborative practices, their motives were analyzed (Van Doorn et al. 2010). Relational, informational, and temporal properties, along with value-in-use activities, define this behavioral view and can be analyzed by applying the *socio-technical perspective* (Orlikowski and Iacono 2001; Storbacka et al. 2016). Utilizing this perspective, the effects of the engagement platform

within the naturalistic environment can be analyzed. To understand the impact, Orlikowski and Iacono (2001) highlight five different views on artifacts: (1) nominal view, (2) computational view, (3) tool view, (4) proxy view, and (5) ensemble view. Notably, the "ensemble perspective" was used to link the design decisions made to the artifact designs and the observed effects within actors' environment.

To dig deeper into environmental factors influencing actor engagement, Grotherr et al. (2019) apply the *social cognitive theory* (Bandura 2001). This theory broadens the perspective of interactions between socio-technical artifacts, individuals, and cultural properties. Cultural properties reflect values and shared assumptions, social norms, and individual motivation to engage. In turn, engaged and empowered employees also change these cultural properties in the long term. Such changes refer to the concept of institutional work (Lawrence et al. 2013).

3 Theoretical Foundations

The theoretical foundations of this thesis are *service science* and *crowdsourcing* (cf. Figure 1, p. 4). In *service science*, Service-Dominant logic (Vargo and Lusch 2004), service systems (Maglio et al. 2009), service systems engineering (Böhmann et al. 2014), and actor engagement (Storbacka et al. 2016) are core concepts. Apart from the fact that service rooted in computer science is considered technically, such as web- or network-based services, this thesis applies an integrative perspective on services. Services are considered to be the process of exchanging competencies between humans, enabled by socio-technical artifacts (Akaka and Vargo 2014). This interaction between technology and individuals delivers benefits for both (Vargo et al. 2008). Consequently, service systems are understood as configurations of actors and resources connected by socio-technical artifacts (Böhmann et al. 2014). Recent research conceptualizes actor engagement as a microfoundation for bridging value co-creation with empirical, observable actor engagement (Storbacka et al. 2016). In particular, service systems depend on actor engagement, and their action-formation mechanism is represented by an actor's willingness to engage.

The second conceptual foundation applied within this thesis is *crowdsourcing* for implementing action-formation mechanisms for actor engagement. Internal crowdsourcing aims at leveraging the unused resources of actors for mutual value co-creation within organizations. This conceptualization emphasizes how multiple actors mobilize their resources, such as skills and knowledge, and integrate them into a collaboration process. The aim is to complete tasks such as decisions, designs, and ideations (Zuchowski et al. 2016). Information technologies, such as engagement platforms as socio-technical artifacts, support these exchanges (Breidbach and Brodie 2017; Breidbach and Maglio 2016).

3.1 Service Logic, Service Systems, and Service Systems Engineering

The service sector is one of the largest in the world and has the highest growth potential (Agency 2019). Over 74% of employees in Germany were employed in the service sector in 2018 (Statistisches Bundesamt 2019). Many heterogeneous services offer emerged, ranging from traditional services, such as the hospitality or health industry, through evolving service industries, such as insurance and finance, to technology-supported service systems, such as mobility. This *servitization* builds foundations for market opportunities in different industries (Baines et al. 2017; Barrett et al. 2015; Bundesministerium für Wirtschaft und Energie 2019; Kurtmollaiev et al. 2018; Lusch and Nambisan 2015; Smith et al. 2014). Driven by technological advancements, service has the advantage of transforming

business models (Chesbrough and Spohrer 2006), as examples of automotive, aerospace, or information technology highlight (Neely 2008). This transformation requires a shift from a product toward a service perspective, which implies having a customer-centric mindset (Brodie et al. 2011; Vargo and Lusch 2004, 2008). Therefore, collaboration and contextualization are central concepts, which emphasize engaging actors for value co-creation (Chandler and Vargo 2011).

Consequently, both service and the process of servitization have become drivers of growth and a strategic priority in economy and research (Chesbrough and Spohrer 2006; Grönroos 2012). With the shift from goods to intangible, heterogeneous, inseparable, and perishable service, research to understand services has been conducted for more than 30 years (Parasuraman et al. 1985). Accordingly, research on service has the potential to sustain economic growth and increase well-being. In this regard, *service science* is an evolving interdisciplinary research stream that builds on the knowledge and capabilities of marketing, computer science, psychology, and strategy fields (Maglio et al. 2015; Spohrer and Maglio 2010). Furthermore, IS research also mentions the importance of service science (Barrett et al. 2015; Böhmann et al. 2014; Fielt et al. 2013; Ostrom et al. 2015; Peters et al. 2016; Rai and Sambamurthy 2006). Service science integrates multiple domains, looking to focus on models, theories, and applications that drive service innovation and value co-creation (Ostrom et al. 2010). Key constructs include *Service-Dominant logic*, which contains as a theory a common terminology and perspective, and *service systems*, which model interacting entities, such as actors and resources, into a dynamic configuration (Spohrer and Kwan 2009; Vargo and Lusch 2004; Vargo et al. 2008).

With a shift from a good- to a *Service-Dominant logic* (S-D logic), Vargo and Lusch (2004) propose a paradigm shift from producing tangible goods toward intangible and heterogeneous information, knowledge, and relationships. This change is in line with shifting the focus from the product of exchange to the process of exchange (Vargo and Lusch 2004). Building on this shift, Vargo and Lusch (2004) define service as the "application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself" (p. 2). The paradigm shift is again refined by Vargo and Lusch (2008) later on, focusing on value creation as the result of value exchange by various cooperating actors. Value co-creation emphasizes integrating expertise, capabilities, and benefits into a purposeful interaction and communication between actors. S-D logic reflects this in five axioms: (1) Service is the fundamental basis of exchange; (2) Value is co-created by multiple actors, always including the beneficiary; (3) All social and economic actors are

resource integrators; (4) Value is always uniquely and phenomenologically determined by the beneficiary; and (5) Value co-creation is coordinated through actor-generated institutions and institutional arrangements (Vargo and Lusch 2015). These axioms are defined in more detail below:

(1) The first axiom indicates that the shift from good-logic, which focuses on the output of exchange, toward S-D logic as a processual conceptualization of resource exchanges, leads to actors engaging in exchange by applying their resources, such as knowledge, and receiving similar resources.

(2) The second axiom highlights the importance of the broad involvement of different actors. It implies broadening the perspective of firms' benefits toward the integration of firms, customers, and other actors (Vargo and Lusch 2011). They are all part of value creation together, intending to generate benefits for every actor (Vargo and Lusch 2004, 2008). This emphasizes the importance of value co-creation because value is generated simultaneously between these actors. As every actor is a beneficiary, "value is not completely individually, or even dyadically, created but, rather it is created through the integration of resources, provided by many sources, including a full range of market-facing, private and public actors" (Vargo and Lusch 2015, p. 9).

(3) The third axiom relates to resources, which need to be integrated by actors in order to receive desired benefits (Vargo and Lusch 2008). Operand and operant resources classify these resources. Operand resources need action to be taken for value creation. Operant resources, such as knowledge and skills, provide capabilities for acting upon other resources (Vargo and Lusch 2004).

(4) The fourth axiom defines value as subjective, shaped by the specific context of every actor, and idiosyncratic, experiential, and meaning-laden (Vargo and Lusch 2008). Each actor determines the perceived value in a specific context (Edvardsson et al. 2011). Consequently, social contexts and institutional arrangements shape value determination. This relational perspective relates to value-in-use and value-in-context (Edvardsson and Tronvoll 2011; Vargo and Lusch 2004).

(5) The fifth axiom builds on service ecosystems and institutions as sets of rules, norms, and beliefs, encapsulating fundamentals for guiding social actions. Institutional arrangement represents a social system within humans interact. The underlying cultural norms and cognitive models either enable or constrain value determination and co-creation (Vargo and Lusch 2016).

In general, value depends on the interaction between actors and access to resources, which provides a basis for mutual benefits (axiom 2). More specifically, *value-in-exchange* with a nominal measure, *value-in-use* as a measurement of real-improvements in an environment, and *value-in-context*, which

relates value to contextual factors (axiom 4), distinguish value (Vargo and Lusch 2008). This thesis builds on the notion of value-in-context because value determination strongly depends on individual and situational influences of a given context (Chandler and Vargo 2011). Value co-creation is, therefore, dependent on social and institutional factors (Edvardsson et al. 2011; Vargo and Lusch 2016). Actors utilize resources differently in various contexts, which they partially shape, but are also reciprocally shaped by the given context (Chandler and Vargo 2011).

S-D logic provides a foundation for understanding *service systems* as a basic unit of analysis (Alter 2012; Lusch and Vargo 2011; Maglio et al. 2009). Service systems are defined as "complex socio-technical systems that enable value co-creation" (Böhmann et al. 2014, p. 73), evolving to become a key concept in IS research that focuses on the dynamic configuration and interaction of actors and resources (Fielt et al. 2013). Within service systems, actors and resources are mobilized and integrated for a collaborative exchange of resources. Actors refer to humans and technology (Maglio et al. 2009; Storbacka et al. 2016). Resources comprise physical artifacts, technology, information, and other resources (Alter 2012; Spohrer et al. 2007). This classification follows a previous definition, which conceptualizes service systems as "a value-coproduction configuration of people, technology, other internal and external service systems, as well as shared information (such as language, processes, metrics, prices, policies, and laws)" (Spohrer et al. 2007, p. 72). Going beyond the focus of service systems being between individuals and organizations, *service ecosystems* consider a broader network of partners, suppliers, and other actors (Lusch et al. 2016). Building on Akaka and Vargo (2014) understanding of service ecosystems as "interaction within and among service systems" (p. 371) and Frow et al. (2014) definition of a service ecosystem as a "higher level system" (p. 332), this research builds on service systems that are nested and connected in service ecosystems.

Rooted in new service development (Edvardsson and Olsson 1996), *service design and engineering* reach out to human-centered design studies (Ostrom et al. 2015). However, design methods are proposed that are almost always limited to the design of one specific service in a sequence of activities (Alter 2008; Bullinger et al. 2003). This limitation is due to the origins of service engineering, which adopts knowledge from product engineering (Bullinger et al. 2003; Bullinger and Scheer 2006). Recent developments in research demonstrate the importance of broadening the perspective of dyadic customer and service provider interactions in services to that of interconnected value co-creation of multiple actors, described as configurations within service systems (Alter 2012; Maglio et al. 2009).

Service systems engineering (SSE) captures the limitation of the product-centered perspective of service design and engineering approaches (Böhmann et al. 2014; Ostrom et al. 2010). SSE aims to

develop novel approaches and models and to achieve evidence-based design knowledge (Böhmann et al. 2014). Future research must address the three pillars of service architectures, service systems interaction, and the engineering of resource mobilization (Böhmann et al. 2014). Stemming from manufacturing and software products, modular service architectures are applied to service systems in order to achieve the desired effect of reconfiguration and reuse (Böhmann 2004; Dörbecker and Böhmann 2015; Voss and Hsuan 2009). Service architectures orchestrate these services, which "transform the value proposition of a service system into a configuration of actors, resources, and activities of value co-creation" (Böhmann et al. 2014, p. 74). Service systems interaction is enabled by information systems, enhancing collaboration between actors and resources (Kieliszewski et al. 2012). Within these configurations, resources have to be mobilized and integrated into a contextual and collaborative interaction of exchange for mutual value co-creation (Edvardsson et al. 2011; Vargo and Lusch 2004).

Since value co-creation is a complex phenomenon, previous research build on multilevel conceptualizations to bridge the gap between value co-creation and its empirical observations. Contributions are made which explore the contexts of value co-creation (Chandler and Vargo 2011), the interconnections between service concepts and touch-points in service design (Patrício et al. 2011), and the types of outcomes of value co-creation (Beirão et al. 2017). Building on the microfoundational movement, which seeks to search "for potential micro explanations of heterogeneous macro outcomes, tending to focus on bottom-up influence, aggregation, and different forms of emergence" (Felin et al. 2015, p. 588), microfoundations have enabled theoretical advancements in multiple disciplines, such as strategic management, organizational theory, and information systems (Barney and Felin 2013; Davis and Marquis 2005; Felin and Foss 2005; Felin et al. 2015; Gavetti 2005; Lippman and Rumelt 2003). Following this movement, Storbacka et al. (2016) conceptualize *actor engagement* to explain value co-creation (cf. Figure 6). "Actor engagement is conceptualized as both the disposition to engage and the activity of engaging in an interactive process of resource integration within the institutional context provided by a service ecosystem" (Storbacka et al. 2016, p. 3008).

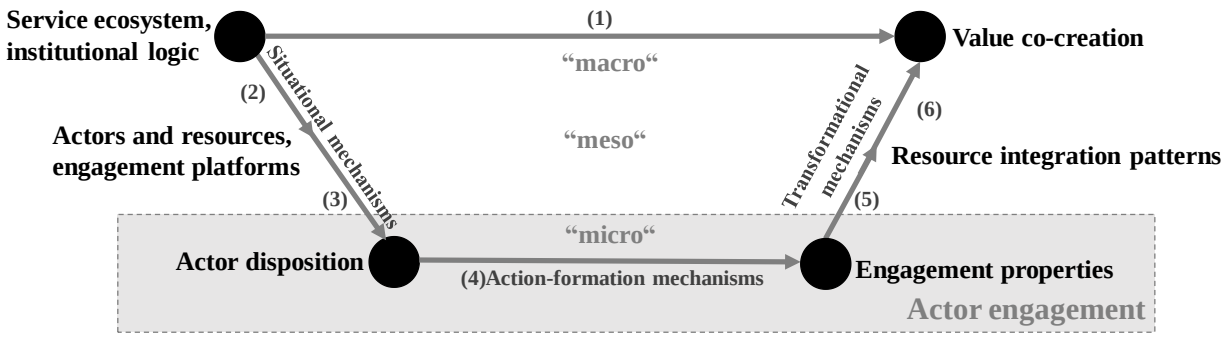

Figure 6. Actor Engagement explains Value Co-Creation.
Source: Based on Storbacka et al. (2016).

At the *macro level*, the service ecosystem encompasses the *institutional logic*. Institutional logic is defined as "the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality" (Thornton and Ocasio 1999, p. 804). Institutions can be (1) regulative, comprising laws and rules, (2) normative by understandings and means, and (3) cultural, defining shared beliefs and values (Scott 1995). These "rules of game" shape actors' dispositions and are reflected by "situational mechanisms" (Figure 6, [2] and [3]). Actor's disposition refers to the psychological state of an actor and influences the actor's intention to engage.

Mediated by engagement platforms at the *meso level*, technological advancements as socio-technical artifacts are used to mobilize and integrate actors and resources into a collaborative exchange (Breidbach and Brodie 2017; Breidbach and Maglio 2016), which is reflected by "action-formation mechanisms" (Figure 6, [4]). *Engagement platforms* are defined as "physical or virtual touchpoints designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value, between actors in a service system" (Breidbach et al. 2014, p. 596).

At the *micro level*, the results of actors' interactions are *engagement properties* (Hedström and Swedberg 1998), which are characterized by temporal, relational, and informational properties (Storbacka et al. 2016). The "transformational mechanisms" subsume the engagement properties and transition the results back to the macro level as value co-creation (Figure 6, [5] and [6]). *Resource integration patterns* encapsulate effective and reusable configurations of actors and resources (Peters 2016).

3.2 Crowdsourcing and Internal Crowdsourcing

Kickstarter, as a crowdfunding platform, has built 174,405 successfully funded projects totaling 4.5 billion dollars (kickstarter 2019). In 2007, Dell launched the platform IdeaStorm in order to obtain ideas for improvements, reaching 14,500 ideas, 730,000 votes, and 90,000 comments (Di Gangi et al. 2010). On the crowdtesting platform testbirds are 400,000 registered users with over 500 customers emerging for application testing (testbirds 2019). Looking at these examples, crowdsourcing is a promising phenomenon that enables organizations to leverages the skills and creativity of the public or a specific target group (Adamczyk et al. 2012). This enables new forms of value creation and leads to new types of work organizations (Hammon and Hippner 2012; Leimeister and Zogaj 2013).

The term *crowdsourcing* describes a combination of "crowd" and "outsourcing" and originates from Jeff Howe (Howe 2006). Zhao and Zhu (2014) highlight that crowdsourcing is considered to be a

paradigm, a process, or a platform. Accordingly, there are several definitions of crowdsourcing, which were consolidated by Estellés-Arolas and González-Ladrón-De-Guevara (2012):

> Crowdsourcing is a type of participative online activity in which an individual, an institution, a non-profit organization, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task. The undertaking of the task, variable complexity, and modularity, and in which the crowd should participate bringing their work, money, knowledge and/or experience, always entails mutual benefit. The user will receive the satisfaction of a given type of need, be it economic, social recognition, self-esteem, or the development of individual skills, while the crowdsourcer will obtain and utilize to their advantage that what the user has brought to the venture, whose form will depend on the type of activity undertaken (p. 197).

While target groups in external crowdsourcing are customers or other anonymous contributors, several organizations have evolved the process of adapting crowdsourcing to internal processes, such as ideation or decision-making, building on employees as a target group (Feldmann et al. 2013; Muller et al. 2013; Zuchowski et al. 2016). Zuchowski et al. (2016) define *internal crowdsourcing* as "an IT-enabled group activity based on an open call for participation in an enterprise" (p. 168). This mechanism has emerged as a flexible on-demand working model for mobilizing and integrating employees' resources, such as knowledge and skills (Boudreau and Lakhani 2013; Buettner 2015). Every employee of an organization is a crowdworker and can engage via internal, internet-based platforms (Leimeister et al. 2015). Motivated by these developments, this thesis focuses on internal crowdsourcing, which combines the two concepts of actor engagement and engagement platforms.

Internal crowdsourcing increases knowledge exchange within an organization by sharing ideas and information across hierarchical levels. This approach can overcome geographical locations and hierarchical structures, making hidden knowledge accessible (Villarroel and Reis 2010; Zhu et al. 2016). By integrating these actors, the internal crowd can address complex issues because employees have contextual knowledge of their operational business (Benbya and van Alstyne 2011). Employees empowered like this engage in a self-determined and autonomous manner in collaborative work practices and set a foundation for customer-centric and agile approaches.

However, few organizations recently apply internal crowdsourcing, which extends traditional work command-and-control models to open-call and task-solving approaches (Benbya and Leidner 2016; Feldmann et al. 2014; Semmann and Grotherr 2017; Vogel et al. 2019a; Zuchowski 2016). The use

of crowdsourcing in a company initially appears straightforward; however, its implementation brings significant challenges (Benbya and Leidner 2018; Dawson et al. 2016; Grotherr et al. 2019; Wagenknecht et al. 2017b, c). Additional challenges comprise, for example, the distribution of tasks and the cultural properties of organizations, affecting individual motivation to engage and, in turn, being affected by hierarchical structures. External crowdsourcing research does not address these issues (Majchrzak and Malhotra 2013). For instance, with respect to task allocation, external crowds autonomously choose tasks that entail a manageable effort, as the Amazon Mechanical Turk platform demonstrates (Fort et al. 2011; Peer et al. 2017). On external crowdsourcing platforms, simple and repetitive tasks are delegated and are often underpaid (Deng et al. 2016). In contrast, internal crowds are designed to solve complex challenges (Hetmank 2014; Zuchowski et al. 2016). As human resources on external crowdsourcing platforms are often a cost-effective factor for small, simple, and repetitive tasks, this type of task allocation is not appropriate within organizations. Furthermore, while external crowds comprise a large number of distributed actors (Estellés-Arolas and González-Ladrón-De-Guevara 2012; Hossain and Kauranen 2015), internal crowds are a closed community within the boundary of an organization (Zuchowski et al. 2016). Challenges arise due to day-to-day business, long-term relationships with contractual ties, and hierarchical structures (Hetmank 2014; Simula and Vuori 2012; Zhao and Zhu 2014). Thus, applying internal crowdsourcing hinges on a shift from a traditional plan and process-oriented modes of working toward a more democratic and dynamic collaboration between employees (Erickson et al. 2012). Accordingly, internal crowdsourcing encourages a shift from hierarchical to flat structures, facilitates social cooperation on a group level, and transform cultural properties over a long time period (Riemer et al. 2015; Zuchowski et al. 2016).

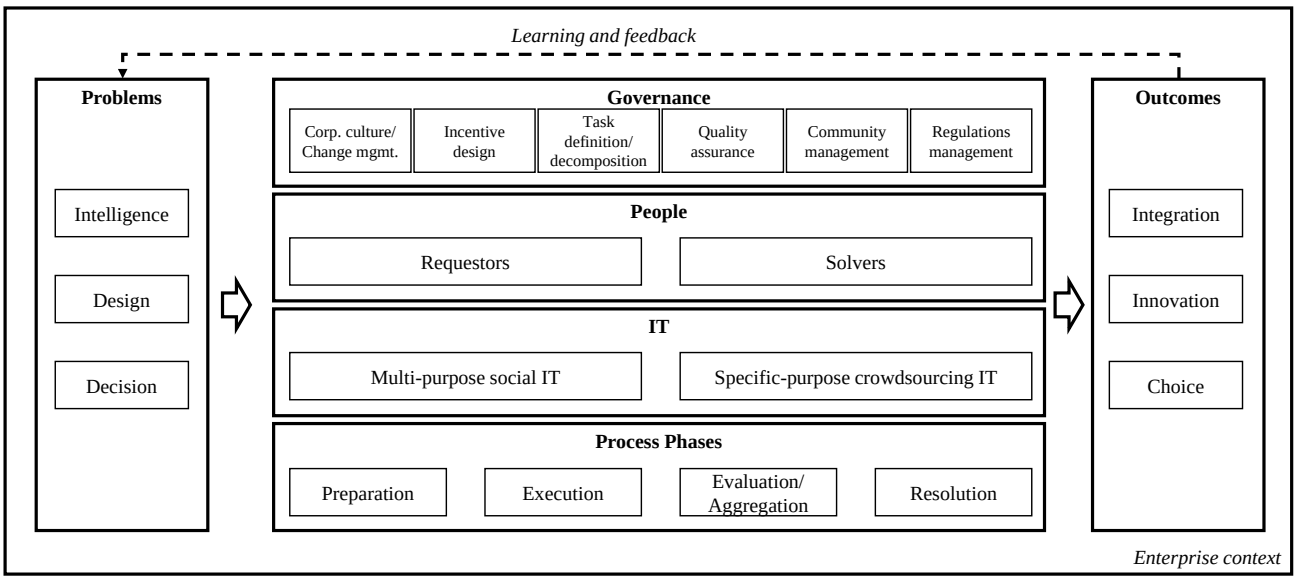

Figure 7. Conceptual Framework for Internal Crowdsourcing.
Source: Zuchowski et al. (2016).

To organize the components of internal crowdsourcing, Zuchowski et al. (2016) developed a framework with six components of internal crowdsourcing (cf. Figure 7). The *problem* type distinguishes crowdsourcing initiatives (Erickson et al. 2012). Zuchowski et al. (2016) categorize tasks into "intelligence" tasks in which actors provide ideas and solutions to problems, "design" tasks in which actors generate new content or innovations, and "decision" tasks in which actors provide opinions on products or services. After completion of the internal crowdsourcing process, *outcomes* are produced, which offer a solution to a problem or task. Zuchowski et al. (2016) also distinguish three different types of results: "integration," which combines information into new knowledge, "innovation," for the design of products and services, and "choice" as a result of the decision process.

The allocation of internal tasks is subject to various challenges in terms of *governance* (Pedersen et al. 2013; Zogaj et al. 2015). Flat hierarchies and flexible processes enable employees to develop ideas and collaborate across hierarchical and departmental levels, which require openness and transparency to be part of organizational culture (Majchrzak et al. 2009; Wagenknecht et al. 2017b). The design of incentives must consider the motives of the employees, which are classified into monetary (reward) and non-monetary (recognition) types (Li and Peters 2016; Vukovic and Bartolini 2010). The quality of the contributions is a central part when evaluating the final results in crowdsourcing (Vukovic and Bartolini 2010). Therefore, quality assurance must aggregate the results of individual subtasks and assess them against the initial objectives. Furthermore, it is recommended to introduce guiding mechanisms and roles—e.g., community guidelines and management—to effectively shape cooperation between actors (Grotherr et al. 2018a, 2019; Semmann and Grotherr 2017).

Crowdsourcing platforms, as *IT*-enabled intermediaries, realize the decentralized and time-independent collaboration of requestors and solvers (Zuchowski et al. 2016). The design of platforms shape an actor's willingness to engage (Grotherr et al. 2018a; Troll et al. 2016). Consequently, the design has to reflect cultural properties, such as the values and norms of organizations (Nevo and Wade 2010).

A crowdsourcing *process* guides the mobilization of actor's resources, such as knowledge and skills, and passes the preparation, execution, aggregation, and resolution stages (Zuchowski et al. 2016). Specific engagement platform design choices can support each stage, ranging from technical to social design features (Grotherr et al. 2018a; Semmann and Grotherr 2017).

4 Publications

4.1 Related publications

As service systems engineering and design science call for cumulative research (Böhmann et al. 2014; Iivari 2005), this research thesis responds through several publications. Twelve publications have been produced and published in conference proceedings and book chapters as part of this research. These publications were produced continuously throughout the research process to communicate the results. They either directly or indirectly relate to the topic of this thesis and are listed below.

Conference Proceedings

Grotherr, C., Semmann, M., & Böhmann, T. (2018).
Engaging Users to Co-Create—Implications for Service Systems Design by Evaluating an Engagement Platform.
51st Hawaii International Conference on System Sciences (HICSS), Waikoloa Village, Hawaii, USA.

Grotherr, C., Semmann, M., & Böhmann, T. (2018).
Using Microfoundations of Value Co-Creation to Guide Service Systems Design—A Multilevel Design Framework.
International Conference on Information Systems (ICIS), San Francisco, California, USA.

Grotherr, C., Wagenknecht, T., & Semmann, M. (2019).
Waking Up a Sleeping Giant: Lessons from Two Extended Pilots to Transform Public Organizations by Internal Crowdsourcing.
International Conference on Information Systems (ICIS), Munich, Germany.

Grotherr, C., Vogel, P., & Semmann, M. (2020).
Multilevel Design for Smart Communities—The Case of Building a Local Online Neighborhood Social Community.
53rd Hawaii International Conference on System Sciences (HICSS), Grand Wailea, Hawaii, USA.

Semmann, M., & Grotherr, C. (2017).
How to Empower Users for Co-Creation—Conceptualizing an Engagement Platform for Benefits Realization.
Wirtschaftsinformatik, St. Gallen, Switzerland.

Semmann, M., Grotherr, C., Vogel, P., Bittner, E., Biemann, C., & Böhmann, T. (2018).
Intelligent Collaboration of Humans and Language-Based Assistants (INSTANT).
International Conference on Information Systems (ICIS), San Francisco, USA.

Vogel. P., Grotherr, C., Kurtz, C., Böhmann, T. (2020).
Conceptualizing Design Parameters of Online Neighborhood Social Networks.
International Conference on Wirtschaftsinformatik (WI), Potsdam, Germany.

Vogel, P., Grotherr, C., Semmann, M. (2019).
Leveraging the Internal Crowd for Continuous Requirements Engineering: Lessons Learned from a Design Science Research Project.
European Conference on Information Systems (ECIS), Stockholm, Sweden.

Vogel, P., Grotherr, C., Böhmann, T. (2020).
Designing Tool Support for Crowd-Sourced Community Initiatives on Online Neighborhood Social Networks
European Conference on Information Systems (ECIS), Marrakesh, Morocco.

Vogel, P., Grotherr, C. (2020).
Collaborating with the Crowd for Software Requirements Engineering: A Literature Review
Americas Conference on Information Systems (AMCIS), Salt Lake City, USA.

Book Chapters

Agarwal, N., Bästlein, M., Böhmann, T., Ernst, S., Fritzsche, A., Grotherr, C., Hoffmann, H., Klemm, P., Leimeister, J. M., Li, M. M. (2019).
Nutzergenerierte Dienstleistungssysteme zur digitalen Transformation von Organisationen.
In V. Stich, D. Beverungen, G. Gudergan, & P. Jussen (Eds.), Digitale Dienstleistungsinnovationen.

Grotherr, C., Li, M. M., Schymanietz, M., Fritzsche, A., Semmann, M., Peters, C., Böhmann, T., Leimeister, J. M.. . . Möslein, K. M. (2020), (forthcoming).
Dimensionen der Digitalisierung—Wie Dienstleistungssysteme den Wandel treiben.
In Digitale Dienstleistungsinnovationen—Transformationspfade und betriebliche Anwendungen: Springer.

4.2 Included publications

To answer the research questions, this thesis includes five of the twelve articles listed above. The following subsection outlines the included publications. General details are provided, such as the author names, year, title of publication, outlet, and additional information, such as ranking (WKWI, VHB, CORE), track, and work share of the co-authors. To provide a brief overview of the thesis contribution, details about methodologies, aims, and contribution types are added.

This research builds upon the implementation of an engagement platform as a socio-technical artifact within a public organization by applying internal crowdsourcing (Semmann and Grotherr 2017) *(paper 1)*. Based on evaluating the engagement platform in the naturalistic environment through a socio-technical perspective, Grotherr et al. (2018a) derive design principles for engagement *(paper 2)*. These design principles are further elaborated by comparing them with a similar design science research project conducted in another public organization. By applying the social cognitive theory, Grotherr et

al. (2019) propose design principles that consider organizational culture, social control, and individual motivations for the empowerment of employees by internal crowdsourcing *(paper 5)*. To contribute to the methodological knowledge base of service systems engineering, Grotherr et al. (2018b) conceptualize a multilevel design framework for service systems *(paper 3)*. By applying the framework to a smart community building research project, transferability to other domains is demonstrated. This application leads to design implications for smart communities and facilitates the dialogue between the smart community and service science (Grotherr et al. 2020) *(paper 4)*.

Chapter 9:

Table 3. Summary of Appended Paper 1.

Citation	*Semmann, M., and Grotherr, C. 2017.* **How to Empower Users for Co-Creation—Conceptualizing an Engagement Platform for Benefits Realization.** Internationale Tagung Wirtschaftsinformatik (13), St. Gallen, Switzerland.
Ranking	WKWI: A VHB-JOURQUAL 3: C CORE Ranking: C
Type of paper	Completed research paper
Track	Dienstleistungssysteme und hybride Wertschöpfung
Aim	This paper aims to empower employees to propose, discuss, and realize software-specific improvements for newly introduced software. An engagement platform as a socio-technical artifact was designed and introduced within the naturalistic environment of a public organization.
Methodology	Design Science Research (DSR)
Contribution	The paper presents how an engagement platform can be designed and introduced within a naturalistic environment. It demonstrates the variety of design variables and the utilization of internal crowdsourcing as a mechanism to stimulate actor engagement. The paper builds the basis for further evaluation and reflection activities (see papers 2, 3, and 5).
Co-authors' contribution	Martin Semmann co-authored the paper. Martin Semmann developed the frame for proposing and realizing software-specific improvements by empowering employees as part of the DSR phase's "problem formulation" and "objective of the solution." He further assisted in developing and adjusting the design variables of the engagement platform.

Chapter 10:

Table 4. Summary of Appended Paper 2.

Citation	*Grotherr, C., Semmann, M., & Böhmann, T. (2018).* **Engaging Users to Co-Create—Implications for Service Systems Design by Evaluating an Engagement Platform.** 51st Hawaii International Conference on System Sciences (HICSS), Waikoloa Village, Hawaii, USA.
Ranking	WKWI: B VHB-JOURQUAL 3: C CORE Ranking: A
Type of paper	Completed research paper
Track	Digital Services and the Digitalization of Services
Aim	This paper aims to understand the impact of design decisions on actor engagement. To derive insights on the socio-technical effects of artifacts, the aim is to evaluate employees' behavior on the engagement platform proposed by Semmann and Grotherr (2017). By applying the Framework for Evaluation in Design Science Research (Venable et al. 2016) and the socio-technical "ensemble view" perspective (Orlikowski and Iacono 2001), the paper demonstrates the socio-technical integration of the artifact in the organizational environment of a public organization.
Methodology	DSR, Framework for Evaluation in Design Science Research, interviews, workshops, think-aloud
Contribution	The paper contributes to research on evidence-based design knowledge for engagement and the design of engagement platforms as socio-technical artifacts. By analyzing the evaluation results based on think-aloud, interviews, and usage data from the engagement platform, design principles are derived. This design knowledge contributes to the discussion of socio-technical artifacts and their effects on the naturalistic environment.
Co-authors' contribution	Martin Semmann and Tilo Böhmann co-authored the paper. Martin Semmann assisted in conducting the think-aloud and in developing the analysis perspective. Tilo Böhmann gave feedback for the discussion.

Chapter 11:

Table 5. Summary of Appended Paper 3.

Citation	*Grotherr, C., Semmann, M., & Böhmann, T. (2018).* **Using Microfoundations of Value Co-Creation to Guide Service Systems Design—A Multilevel Design Framework.** International Conference on Information Systems (ICIS), San Francisco, California, USA.[1]
Ranking	WKWI: A VHB-JOURQUAL 3: A CORE Ranking: A*
Type of paper	Completed research paper
Track	Service Science
Aim	This paper conceptualizes a multilevel design framework for service systems by applying (1) a multilevel perspective and (2) two intertwined design cycles. Based on the microfoundation movement, the aim is to operationalize value co-creation by providing an approach for analyzing the effects of design decisions on multiple levels and corresponding design elements. The framework further summarizes the empirical observations of the piloting of the engagement platform within the naturalistic environment of the public organization (cf. papers 1 and 2).
Methodology	Conceptual
Contribution	This paper contributes to the methodological knowledge base of service systems engineering. Its multilevel conceptualization bridges the gap between macro-level value co-creation and empirical, observable actor engagement at the micro level. The two intertwined design cycles—institutional design and engagement design—help to conduct design activities systematically and to understand the effects of socio-technical artifacts and the institutional set-up. Based on this conceptualization, this paper demonstrates applicability by analyzing the "ExTEND" research project and the instantiated engagement platform (cf. Figure 1, p. 4).
Co-authors' contribution	Martin Semmann and Tilo Böhmann co-author the paper. Tilo Böhmann contributed to the idea of the paper and gave feedback for the logical flow and presentation of the multilevel design framework. Martin Semmann provided feedback for the initial design of the paper.
[1] Best Paper Nominee	

Chapter 12:

Table 6. Summary of Appended Paper 4.

Citation	*Grotherr, C., Vogel, P., & Semmann, M. (2020).* **Multilevel Design for Smart Communities—The Case of Building a Local Online Neighborhood Social Community.** 53rd Hawaii International Conference on System Sciences, Grand Wailea, Maui, USA.[1]
Ranking	WKWI: B VHB-JOURQUAL 3: C CORE Ranking: A
Type of paper	Completed research paper
Track	Smart and Connected Cities and Communities
Aim	Smart cities, as service systems, aim at integrating various actors and resources with digital technologies in order to serve individual, organizational, and governmental interests within smart communities. This paper aims to demonstrate the applicability of the multilevel design framework proposed by Grotherr et al. (2018b) beyond the service science domain for the systematic design of smart communities.
Methodology	Case study
Contribution	The paper illustrates the application of the multilevel design framework to other domains and how it can be used to derive design implications for the smart community-building project. It combines the research of service science, represented by the service systems perspective and the multilevel design framework, with the smart city and community realm. Using the framework with the smart community-building project, design implications are derived, contributing to the smart community domain. Furthermore, the paper contributes to service systems engineering as it demonstrates the applicability of the multilevel design framework.
Co-authors' contribution	Pascal Vogel and Martin Semmann co-authored the article. Pascal Vogel provided the case data for the smart community-building project. Martin Semmann revised the introduction and conclusion.
[1] Best Paper Nominee	

Chapter 13:

Table 7. Summary of Appended Paper 5.

Citation	*Grotherr, C., Wagenknecht, T., & Semmann, M. (2019).* **Waking Up a Sleeping Giant: Lessons from Two Extended Pilots to Transform Public Organizations by Internal Crowdsourcing.** International Conference on Information Systems, Munich, Germany.
Ranking	WKWI: A VHB-JOURQUAL 3: A CORE Ranking: A*
Type of paper	Completed research paper
Track	Smart Cities and Digital Government
Aim	This paper aims to provide design principles that guide scholars and practitioners when designing and introducing internal crowdsourcing as a mechanism for employee engagement and empowerment. The derived design principles include characteristics of public organizations at individual, group, and organizational levels.
Methodology	DSR, piloting
Contribution	The paper contributes by providing design principles for designing internal crowdsourcing, mediated by engagement platforms, which facilitate employee empowerment and engagement within organizations. Furthermore, it highlights the utility of the social cognitive theory for understanding the effects of new modes of collaboration, design features of engagement platforms, and required environmental conditions on individuals, social groups, and cultural properties of organizations.
Co-authors' contribution	Thomas Wagenknecht and Martin Semmann co-authored the article. Thomas Wagenknecht contributed to the idea of the paper, provided in-depth access to the data from the second public organization DSR project, and helped to reflect on the results regarding the social cognitive theory. Martin Semmann added the foundations of social cognitive theory and provided feedback for the design principles.

5 Theoretical Contribution

5.1 Overall Theoretical Contribution

This chapter summarizes the overall research contribution. As this thesis integrates the research streams of service science and crowdsourcing (cf. Figure 1, p. 4), the following sections focus on distinct contributions to these areas.

Overall, this thesis makes two core contributions, which Figure 8 highlights. Based on the intervention in the naturalistic environment of organizations, the contributions of this thesis are (1) methodological improvement for service systems engineering with the multilevel design framework (cf. Figure 9, p. 35) and (2) design knowledge for internal crowdsourcing (cf. Table 8, p. 43).

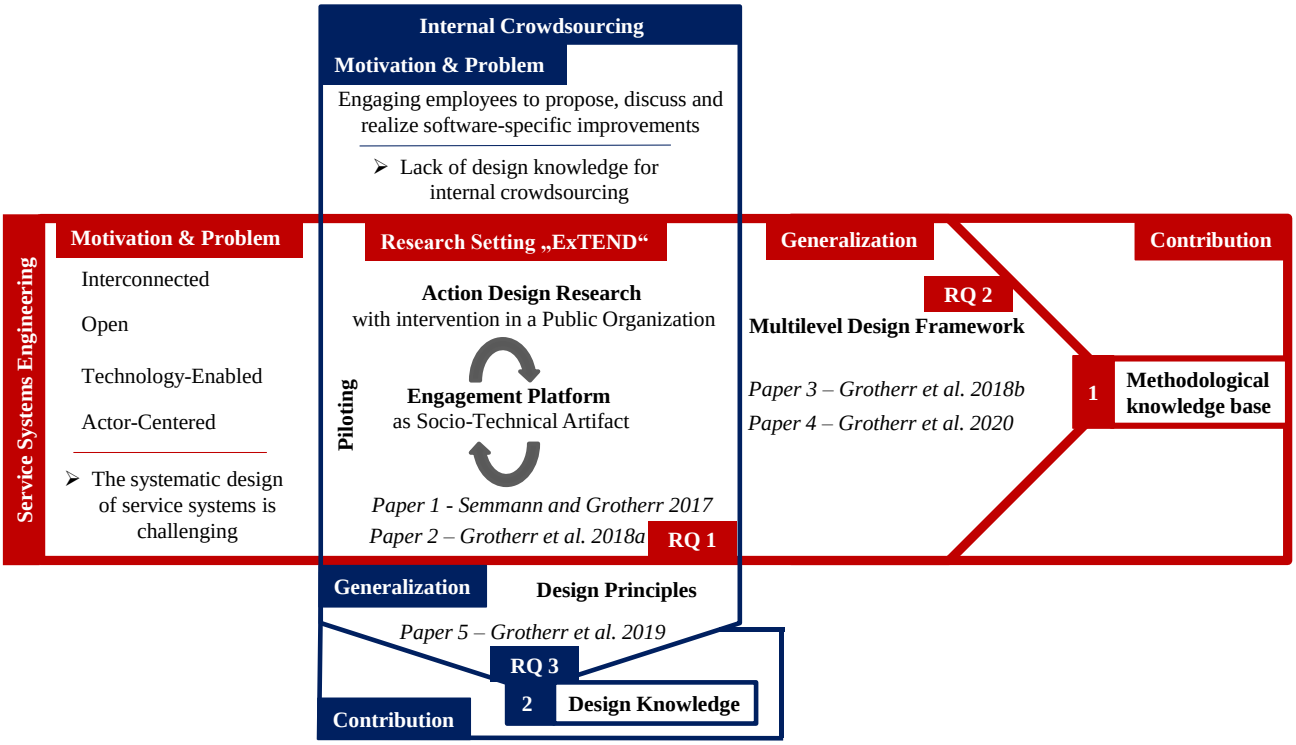

Figure 8. Overall Theoretical Contribution to Service Systems Engineering and Internal Crowdsourcing.
Source: Own Representation.

The *multilevel design framework* contributes to the *methodological knowledge base of service systems engineering.* This contribution is achieved (1) by providing two intertwined design cycles for designing socio-technical artifacts and environmental conditions at multiple levels systematically (Grotherr et al. 2018b) and (2) by demonstrating applicability to other domains through the smart community example (Grotherr et al. 2020).

First, the framework increases understanding of the service system design in terms of design elements and activities (Grotherr et al. 2018b). The elements are allocated to the macro and meso levels. The effects of the design can be observed as actor engagement at the micro level, which leads to refinements at the meso and macro levels. Two design cycles connect the design activities and elements: (1) *institutional design* and (2) *engagement design*. This distinction helps manage the complexity of service systems and the interdependencies of institutional set-up and socio-technical artifact design. Both design cycles require different design knowledge, ranging from the design of the socio-technical artifacts (engagement design) to the (re)design of configurations of actors and resources, value propositions, and environmental conditions (institutional design). This view comprises organizational, psychological, and technological aspects that enable resource mobilization and integration. Therefore, domain experts have to integrate their views and implications as part of the reflection phase that can imply a transition from the engagement design to the institutional design cycle.

Second, applications demonstrate the utility of the multilevel design. The framework is applied to (1) engage and empower employees to propose and realize software-specific improvements (Grotherr et al. 2018b) and (2) to build a smart community (Grotherr et al. 2020) (cf. Table 2, p. 11). The cases emphasize exploiting the full potential (1) of internal crowdsourcing as an instrument for switching top-down logic to bottom-up logic within organizations and (2) of neighborhood peer-support services and engagement platforms for building smart communities. During the reflection phase and in the micro level observations, design implications for the meso and macro level are derived to highlight the interdependence of institutional and engagement design.

Based on this argumentation, this thesis concludes that the multilevel design framework and the integration of institutional and socio-technical artifact design are inseparable design activities for service systems design. Broadening the perspective of design is one of the framework's strengths that differentiates this framework from previous service design approaches. In line with the value-in-context mindset, the framework emphasizes the shortcomings of designing a service system solely from a single-service perspective and the importance of engagement for supporting socio-technical design. The proposed intertwined and continuous design cycles, in contrast, focus on exploiting and scaling service systems in naturalistic environments. In other words, linking technology design with a focus on interactional aspects *and* organizational design with a focus on configurations of actors, resources, and supporting structures are crucial for value-adding service systems. This perspective extends the set of methods used for the design of service systems.

The research results further contribute to *design knowledge for internal crowdsourcing* and provide insights into how it shapes individuals, groups, and organizational culture. Based on the evaluation results of two longitudinal piloting approaches, Grotherr et al. (2019) draw on the social cognitive theory to derive implications for organizational, group, and individual effects of design decisions. The two studied DSR projects applied a piloting approach within naturalistic environments of two public organizations (Briggs et al. 2019; Schwabe and Krcmar 2000). The resulting two piloted engagement platforms aimed to empower and engage employees for (a) software-specific and (b) general strategic improvements (cf. Table 2, p. 11). The comparison leads to design principles that guide scholars and practitioners, enhancing design knowledge for internal crowdsourcing and the effects on employees and organizational structure. These insights aid understanding of what design activities are required to establish new modes of collaboration within an organization and address the need for empirical studies within specific contexts (Erickson et al. 2012; Pedersen et al. 2013; Zuchowski et al. 2016). In addition, the design knowledge derived during the intervention within the two organizations contributes to the call for evidence-based design knowledge (Böhmann et al. 2014; Iivari 2015; Niederman and March 2012). This knowledge represents the value-in-use and value-in-context conceptualizations (Chandler and Vargo 2011), responds to the "proof-of-use research to address complex issues of operational feasibility" (Nunamaker et al. 2015, p. 10), and bridges the rigor and relevance for scholars and practitioners (Benoit et al. 2019; Briggs et al. 2019).

5.2 Contributions to Service Systems Engineering

5.2.1 Multilevel Design Framework for Service Systems

To understand how "service systems enable value co-creation through a configuration of actors and resources" (Böhmann et al. 2014, p. 78), interdisciplinary efforts are required that integrate IS research, management disciplines and design (Lusch et al. 2016). This integration requires new methods, which combine organizational, human, and technological understanding for designing service systems (Patrício et al. 2018b). Previously, human-centered design methods, such as participatory design (Schuler and Namioka 1993) and interaction design (Holmlid 2007), highlighted the fundamental role of engaging actors in the design process. Accordingly, service design focuses on human experiences with interaction points. Emphasis has been given to how a service fits individual preferences and to designing effective interfaces that enhance user experiences (Sangiorgi 2009). Tools such as customer journeys (Lemon and Verhoef 2016), service experience blueprints (Patrício et al. 2011), design probes (Mattelmäki 2006), personas (Pruitt and Grudin 2003), or design games (Brandt

and Grunnet 2000) help increase understanding and communicate customer needs. These tools make user experience visible and enable the collaborative design of touchpoints with users as co-designers.

While service design considers human-centered and interactional aspects, the design of institutions is less acknowledged (Koskela-Huotari et al. 2020; Kurtmollaiev et al. 2018; Siltaloppi et al. 2016; Vargo et al. 2015). Few studies have explicitly deal with the transformative nature of service design within service systems such as organizations and social structures (Patrício et al. 2018b; Russell-Bennett et al. 2019). Even if iterative design approaches exist in service research (Yu and Sangiorgi 2018), they do not yet provide sufficient support for dealing with complexity because "service systems are dynamic and open, rather than simple and optimized" (Spohrer et al. 2007, p. 76). These studies focus on embedding the capabilities of new design practices, such as design thinking, thereby applying new modes of interaction, collaboration, and mindset (Junginger 2015).

To overcome this shortcoming, Grotherr et al. (2018b) conceptualize a multilevel design framework for service systems. This framework builds on (1) a *multilevel perspective* and (2) *two intertwined design cycles*. This conceptualization integrates the design of socio-technical artifacts (engagement design) with the design of environmental conditions of the institutional set-up, such as the configuration of actors, resources, and supporting structures (institutional design) (cf. Figure 9).

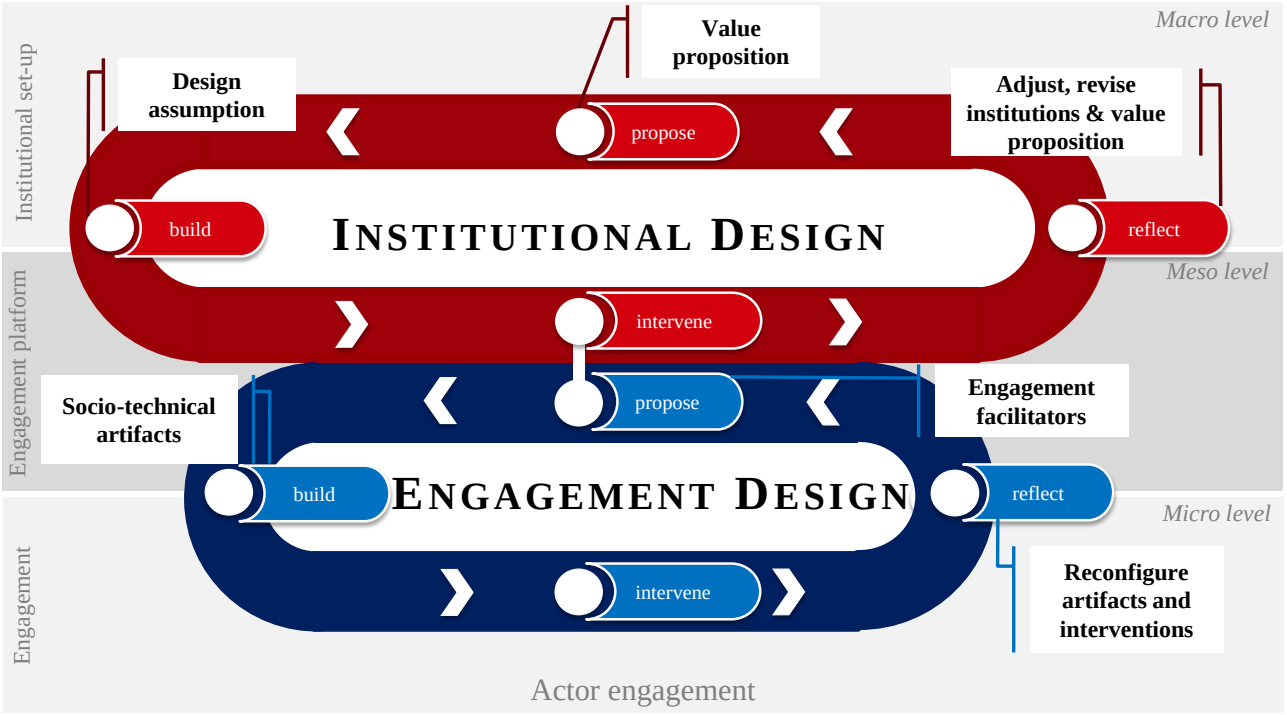

Figure 9. Multilevel Design Framework for Service Systems.
Source: Adapted from Grotherr et al. (2018b).

The *multilevel perspective*, represented by the micro-meso-macro level, systematically arranges design activities and elements. The two design cycles reflect the dynamics of service systems, which are related to designable elements at the macro and meso levels. In contrast to traditional service design and engineering methods, this framework extends the perspective of engagement-related design activities to institutional set-up design. This perspective broadens the socio-technical artifact design, as a major facilitator for many digital service innovations (Barrett et al. 2015; Breidbach and Maglio 2016; Patrício et al. 2018b), to the design of environmental conditions, which emphasizes a value-in-context perspective (Chandler and Vargo 2011; Edvardsson and Tronvoll 2011).

More specifically, the *institutional design cycle* summarizes the need to design the institutional set-up as a precondition for actor engagement. This cycle comprises configurations of actors and resources, value propositions, and structural design elements such as governance or regulations. Within an organizational setting, resource allocations, supporting infrastructures, and responsibilities reflect the environmental conditions. The design activities are in line with organizational changes, affecting business models, incentive structures, or governance (Kurtmollaiev et al. 2018). The *engagement design cycle* aims at designing socio-technical artifacts, such as engagement platforms and supporting interventions, in order to mobilize and integrate actors and resources for interaction.

Both design cycles are *intertwined design cycles*. As the publications Grotherr et al. (2018a, b, 2019, 2020) and Semmann and Grotherr (2017) demonstrate, there is a considerable risk of misaligning the institutional set-up because the design of a socio-technical artifact might not fit into the environmental conditions. To align both design spheres, the multilevel framework comprises intertwined design cycles of engagement and institutional elements. Consequently, lessons within the engagement design can lead to design implications within the institutional design. Improvements within the engagement design can be straightforward, such as technical design features that enhance the usability of platforms and reduce engagement barriers. In contrast, modifications within the institutional design can lead to substantial changes at an organizational level. For instance, engaging and empowering employees to propose and realize change initiatives requires a technical integrated engagement platform or decisions on the visibility of engagement (engagement design), as well as incentive structures and interfaces to adjacent service systems for mobilizing and integrating actors (institutional design) (Grotherr et al. 2018a, b).

5.2.2 Contextualization of Service System Design in Naturalistic Environments

The multilevel design framework builds on core assumptions, such as value-in-context, openness, and institutions, as well as on the role of piloting in naturalistic environments and engagement platforms.

These core assumptions lay the foundation for service systems design activities of the multilevel design framework and are described in detail in the following subsections.

Value-in-context and institutions as drivers for service innovation. Several methods for service engineering have been proposed in recent years (Bullinger and Scheer 2006). Many of these approaches aim at developing new artifacts to solve novel problems. However, this perspective does not explicitly deal with the refinements of existing artifacts (Beverungen et al. 2018). Therefore, this thesis argues for taking a *value-in-context* perspective that considers environmental conditions and artifacts (Edvardsson et al. 2011). Focusing on the value-in-context perspective facilitates the ownership of value co-creation because actors better relate to the value propositions that are associated with their environment. In other words, bringing a managerial perspective to service systems design means changing the greenfield approach to considerations of real-world environments as brownfields. This shift provides a valuable perspective for understanding how social interactions shape the practices and perceptions of value co-creation (Chandler and Vargo 2011; Edvardsson et al. 2011). Based on a social and cultural network, the cultural properties and situational aspects shape actors' willingness to engage and, in turn, also shape value co-creation. This includes the actors' past, present, and future disposition to engage (Storbacka et al. 2016). Therefore, service systems design must consider the experiences of actors in order to encapsulate actors' dispositions and to anticipate interaction and engagement properties in advance. Consequently, the multilevel framework draws attention to the context and environment that frames actor engagement.

Service science captures these changes by adopting an *institutional theory* perspective (Lawrence and Suddaby 2006; Lawrence et al. 2009). Institutional logic and institutional work highlight the role of a social structure (Baker et al. 2019). Beliefs, shared assumptions, and rules that determine an actor's behavior refer to institutional logic. Within interconnected service systems, ranging from families and organizations to large value networks of service ecosystems (Spohrer et al. 2012), resources belong to different service systems. These distributions imply different access rights and resource conflicts that service systems design has to address (Grotherr et al. 2018b). Accordingly, the design process must consider the boundaries of these resources. In other words, value propositions and institutional logic either facilitate or hinder actor engagement, as actors engage voluntarily (Li et al. 2018). Broadening the perspective of design to encompass environmental conditions is in line with the economic exchange perspective given by Maglio et al. (2009): "In this context, economic exchange depends on voluntary, reciprocal value creation between service systems (each system must willingly interact and both systems must be improved)" (p. 403). In the case of engagement barriers, actors are not willing

or able to contribute to value co-creation (Li et al. 2018). As the example of the public organizations in Grotherr et al. (2019) demonstrates, hierarchical structures and silo mentality hinder actors from exchanging information. This perspective is based on general public organizations' interests to perform efficiently and in structured processes (Holgersson et al. 2015). Actors' are not able to engage when there is a lack of required resources, such as knowledge, or when the institutional set-up does not allow for collaboration across service systems (Grotherr et al. 2018b). In the case of public organizations, challenges arise due to conflicts with daily business, which is in contrast with the voluntary engagement of employees (Grotherr et al. 2019). Interaction points with adjacent service systems have to be defined in order to integrate service systems into an actor's environment and to build synergies and incentives for engagement (Grotherr et al. 2018a, b).

Consequently, engagement platforms as socio-technical artifacts cannot be viewed isolated from the environment (Grotherr et al. 2018a, b). These inseparable design activities highlight the transformative character of service systems design (Anderson et al. 2013; Ostrom et al. 2015; Patrício et al. 2018b). Several engagement-stimulating initiatives exist, such as community management or the communication mechanism, that have to be applied (Grotherr et al. 2018a). Nevertheless, environmental conditions captured by the institutional set-up must be developed to increase and sustain resource integration in service systems (Grotherr et al. 2018a, b).

Openness and dynamics of service systems, value propositions, and institutions. Service systems are dynamic systems that continuously evolve through reconfigurations. However, creating and establishing service innovations brings up a causality dilemma. Service innovations aim at creating value but often require disruption of prevailing service systems (Siltaloppi et al. 2016). Actors within service systems decide, based on value proposition and institutional logic, either to engage or to leave the service system (Li et al. 2018). Consequently, service innovations have to meet needs, values, practices, and prevailing structures but also disrupt them at the same time (Edvardsson and Tronvoll 2013; Koskela-Huotari et al. 2016). This loop of breaking, making, and maintaining institutions is referred to *institutionalization* and *institutional work* (Lawrence et al. 2013; Vargo et al. 2015).

The dynamic and iterative process of exchange between various engaging actors implies a shift in institutions, which enables new service innovations (Vargo et al. 2015). The cases of Grotherr et al. (2020) and Semmann and Grotherr (2017) highlight how these institutions and value propositions of service systems slowly move toward a convergent set of values and practices. Grotherr et al. (2020) examine the stepwise shaping of institutions with the use of engagement platforms within a smart community. The presented case, as part of a broader healthcare service ecosystem, aims at creating

an online neighborhood community that shares common interests via activities on an online engagement platform (Grotherr et al. 2020). The case attempts to solve a major societal challenge of an aging population, accompanied by social exclusion (Plouffe and Kalache 2010). This development requires the mobilization and integration of diverse actors, ranging from individuals to organizations and institutional actors such as churches or government agencies (Frow et al. 2016). The engagement of diverse actors leads to multiple competing and conflicting values, which the design process must address. In comparison, the case presented by Semmann and Grotherr (2017) aims to engage and empower employees to propose, discuss, and realize the change initiatives for newly introduced software. Employee empowerment implies a shift from the top-down to the bottom-up approach in decision-making and getting-things-done. Therefore, the definition of a guiding value proposition is the first activity of a service systems design process. Building on issues of current service system practices and outcomes, an initial hypothesis of a value proposition is proposed, which leads to design assumptions on valuable configurations of actors and resources (Grotherr et al. 2018b). However, during the design over months and years, the initially defined value proposition and design assumptions are continuously refined because new insights from the intervention, evaluation, and reflection activities enhance the initial problem understanding, requiring actors, resources, and supporting institutional set-up. This case is representative: Starting with the assumption of "user-generated service for software improvement," the value proposition was extended and opened to a hybrid mode of interaction between the voluntary engagement of end-users and the targeted participation of the IT-department (Grotherr et al. 2018b).

The multilevel design framework reflects these observations by introducing iterative, validating design cycles. Emphasis is given to the evolving character of open and dynamic service systems by continuous design cycles, which are not static but represent an ongoing process of reconfiguration of the institutional set-up, value propositions, and actor and resource configurations.

Role of piloting for engaging in natural environments. To find and adjust the configurations of actors and resources that create value-in-context, engagement into an actor's environment is essential and requires explorative approaches (Böhmann et al. 2014; Lusch et al. 2008; Maglio and Spohrer 2008). Various approaches reflect the need for iterative and validating design activities in research and practice, such as design science and entrepreneurial approaches (Peffers et al. 2007; Ries 2011). Approaches such as piloting are useful for digging deep into an actor's natural environment to explore the effects of newly developed artifacts (Briggs et al. 2019; Schwabe and Krcmar 2000). Continuous

intervening and piloting in real-world environments allow researchers to understand the current service system configuration and to reflect on design decisions. This intervention facilitates the derivation of evidence-based design knowledge and bridges the gap between IS research and practice (Benoit et al. 2019; Briggs et al. 2019; Nunamaker et al. 2015). The multilevel design framework emphasizes these approaches within interventions in each design cycle to reflect observed effects in an actor's natural environment in design decisions.

Role of the engagement platform and the socio-technical perspective. To reflect design assumptions made up-front and to link value co-creation with observable actor engagement, engagement platforms can be applied (Breidbach and Brodie 2017). By doing so, engagement barriers are observed. These obstacles may emerge due to social or technical problems (Grotherr et al. 2018a; Silver and Markus 2013). While technical problems relate to the performance or usability aspects of artifacts, social problems arise from uncertainties of a user or a lack of appreciation of the value proposition of the introduced artifact. Consequently, designing engagement platforms requires consideration of both social and technical aspects, which is already mirrored in the IS field (Akhlaghpour et al. 2013; Goldkuhl and Perjons 2014; Matook and Brown 2016; Orlikowski and Iacono 2001). Accordingly, the concept of socio-technical artifacts strongly relates to technology-enabled value co-creation in service science (Breidbach and Maglio 2015; Breidbach and Maglio 2016) and socio-technical artifacts must be analyzed and designed within their environments and during their use (Goldkuhl 2013; Simon 1996).

To conclude on the design decisions of the engagement platform within the social environment of engaging actors, Grotherr et al. (2018a) and Grotherr et al. (2018b) derive design knowledge that serves to guide scholars and practitioners when designing configurations of actors, resources and engagement platforms. Therefore, the engagement platform is evaluated through the case of software-specific improvements (cf. Figure 2, p. 5), highlighting an actor's behavior from a socio-technical perspective in connection to the social and technical design features of the platform developed by Semmann and Grotherr (2017). For instance, as a consequence of prevailing social norms influenced by cultural properties (Deshpande and Webster 1989; Leidner and Kayworth 2006), the visibility of activities on engagement platforms shapes an actor's disposition to engage (Grotherr et al. 2018a; Grotherr et al. 2019). While intrinsic factors, such as recognition of meaningful contributions, might motivate some actors, others are uncertain when, for example, they publish critical organizational issues. Thus, transparency of engagement has to be balanced in order to incentivize actors on the one hand, and to reduce entry barriers for engagement, on the other hand (Grotherr et al. 2018a).

5.3 Contribution to Internal Crowdsourcing

5.3.1 Linking Service Science and Crowdsourcing

Service science and the study of S-D logic (Vargo and Lusch 2004, 2008, 2016), service systems (Maglio et al. 2009; Vargo et al. 2008) and *crowdsourcing* (Howe 2006, 2008)—specifically internal crowdsourcing (Zuchowski et al. 2016)—emerged separated in the domains of marketing, IS, and management. However, both disciplines seek to engage multiple actors in an interactive process of co-creation. Each actor mobilizes and integrates resources for mutual value creation. With the conceptualization of actor engagement as a microfoundation for value co-creation (Storbacka et al. 2016), in particular, crowdsourcing mechanisms implement engagement supporting approaches and artifacts for service systems.

Consequently, crowdsourcing catalyzes collective intelligence, leverage actors' resources, and integrates them into service systems. Borrowing internal crowdsourcing has the potential for accomplishing evidence-based design knowledge and operationalization of value co-creation in organizations. In turn, reflecting on the notion of value co-creation and institutions, service science informs the realm of crowdsourcing. Consequently, this thesis blends both research streams and improves the understanding of the systematic design of service systems and engagement platforms, which depends on the engagement of multiple actors (cf. Figure 1, p. 4).

5.3.2 Design Knowledge for Internal Crowdsourcing

Recent approaches from open service innovation literature involve customers outside an organization in the development of service innovations (Chesbrough 2011). With the emergence of social media, crowdsourcing evolved rapidly into a popular mechanism promising cost-effective access to scalable information and expertise from a mass of online users (Vukovic and Bartolini 2010). However, crowdsourcing has distinguishing properties regarding the use of technology (in comparison to the wisdom of a crowd), a large undefined crowd (in comparison to outsourcing), and an unspecific task definition (in comparison to open innovation, open-source) (Hetmank 2014).

Within organizational boundaries, tapping into the skill, capabilities, and knowledge of employees remains an approach for resource mobilization and integration that needs further exploration in order to exploit the potential for service innovation (Barrett et al. 2015). To date, several initiatives involve employees. They are involved in suggestion boards or enterprise 2.0 solutions, which comprises, for

instance, wikis (McAfee 2009). However, these tools involve employees as passive information providers and idea generators. They do not engage them as active contributors in value co-creation activities, such as decision-making or implementing proposed ideas (Zuchowski et al. 2016).

In more recent initiatives, employees are increasingly engaged in implementation activities that are summarized as internal crowdsourcing (Zuchowski et al. 2016). Reasons for implementing internal crowdsourcing can be twofold. First, it enables employees to propose and implement ideas that can improve the overall performance of affected objects. Second, involving employees in decision-making can be seen as a democratic approach in an organization (Schneider et al. 2012). It gives voice to employees by asking them to engage in debates actively and share their perception, indicating that every employee matters and is part of the value co-creation. The aim is to move away from formal, hierarchical structures toward informal working practices and new groups of interests.

Recent research on internal crowdsourcing provides insights into the current state and research opportunities (Zuchowski et al. 2016). Nevertheless, despite a few applications (Benbya and Leidner 2016; Zuchowski 2016), the adaption of the concept within organizations and specific contexts is scarce (Zuchowski et al. 2016). There is limited knowledge on how organizations can leverage the innovation potential of employees for contributing to value co-creation through the use of technology (Benbya and Leidner 2018; Breidbach and Maglio 2016; Knop et al. 2017). Most crowdsourcing literature deals with the innovation domain and focuses on ideas and design contests and "research informing such design decisions will be useful" (Zuchowski et al. 2016, p. 179).

Introducing internal crowdsourcing is accompanied by changes at both management and employee levels. Employees are encouraged to voluntarily adopt new working practices to increase shared beliefs and feedback processes, which lead to changes in communication (Erickson et al. 2012). This new form of work requires new forms of leadership that would allow experimentation and learning culture (learn-to-fail). Hence, legitimizing and proactive behaviors for developing novel solutions is crucial (Baer and Frese 2003; Benbya and Leidner 2016). In contrast, crowdsourcing embodies values, such as openness or transparency, that might confront organizational structures such as hierarchy, formal roles, or bureaucratic control (Erickson 2012). Challenges include loss of management control, acceptance of new working practices, and difficulties in integrating crowdsourcing into existing organizational processes (Erickson et al. 2012). Little is known about how organizations react to internal crowdsourcing and how employees behave on engagement platforms (Benbya and Leidner 2018;

Wagenknecht et al. 2017b). Research is needed that goes beyond the design and prototyping of engagement platforms to actual usage and use scenarios in the natural environments of individuals and how they reshape cultural properties (Markus 2004; Nunamaker et al. 2015).

To contribute to the internal crowdsourcing research field, Grotherr et al. (2019) address the issues associated with the design and introduction of internal crowdsourcing that is meant to empower employees for co-creation. This mechanism is introduced within two long-term design science projects in the naturalistic environments of two distinct public organizations (cf. Table 2, p. 11). The engagement platforms proposed by Semmann and Grotherr (2017) and Wagenknecht et al. (2017c) broaden the perception of employees from passive idea generators to actively engaged participants who provide feedback or realize change initiatives. A holistic perspective was applied that considers not only technical use but development, migration, and deployment of the artifact (Nunamaker et al. 2009; Silver and Markus 2013). The boundaries between the artifact and its environment are closely intertwined so that it is no longer possible to determine the boundaries. For this reason, the concept of an IT artifact is often substituted by a socio-technical artifact (Goldkuhl 2013; Orlikowski and Iacono 2001). To dig deeper into the relationship between cultural properties, social control, and individual motivation, as well as into the use of socio-technical artifacts and environmental conditions, Grotherr et al. (2019) introduce social cognitive theory (Bandura 1989) to capture observed human behavior on the two studied engagement platforms. The results are translated into design principles (DP) with the aim of empowering employees, as depicted and highlighted in Table 8.

Table 8. Design Principles for Internal Crowdsourcing in Public Organizations.

1	Determine the degree of top-management engagement (committed, supportive, active), as well as the time needed to participate in the engagement process to exemplify the relevance, value, and behavior as a role model for employees.
2	Middle management support is crucial, to communicate the value of the internal crowdsourcing initiative in daily work routines, and to mobilize employees' resources to engage on a voluntary basis, given top-management commitment and engagement as a starting point.
3	The platform must be designed to be lightweight, and integrated into the employees' work context, to reduce social and technical entry barriers, such as access, adoption of a new platform, and modes of collaboration.
4	Setting up realistic expectations and defining simple tasks for an internal crowdsourcing platform is crucial, to avoid overwhelming employees and the organization with novel, explorative approaches, given the limitation that resources are scarce in public organizations.
5	Building heterogenic crowds by defining and maintaining adjacent business units and functions lead to visibility of the overall project, facilitates company-wide acceptance, and leads to action, demonstrates the relevance and value of the platform, and reduces resistance in relation to new ways of working.

6 & 7	Providing real names on the platform increases group dynamics based on employee recognition, and the possibility of exploring other peers, assuming that in public organizations, employees behave professionally. Enabling anonymous employee contributions is valuable regarding sensitive and organizational critical subjects, to reduce uncertainties and entry barriers in front of superiors and other employees.
8	Providing initial content that employees use as a point of reference, to provide contextualized examples for using the platform, thus reducing uncertainties and entry barriers.

Source: Grotherr et al. (2019).

Organizations have to ensure that crowdsourcing tasks are completed, which require suitable governance structures (Pedersen et al. 2013). Crowdsourcing governance determines the rules, incentives, and guidelines that shape an actor's disposition to engage, guaranteeing that the defined value proposition of the platform will be fulfilled (Zuchowski et al. 2016). Consequently, it is useful to distinguish between recognition (visible outline of contribution—e.g., number of publications and hits), reputation (value-added commentary about the contribution that community members recognize), and rewards (outcome of recognition and reputation) (Haythornthwaite 2009). Reputation can be gained by offering real employee names and is therefore a critical motivational factor, especially within an internal crowd (cf. Table 8, DP 6 & 7).

However, the growing autonomy of employees also risks overwhelming them. There is a need for steering the workload of employees and counteracting accordingly (Cross and Gray 2013) (cf. Table 8, DP 3 & 4). However, the question of personal data protection arises because the collection of data can also be misused as an employee's assessment criterion. Nevertheless, trade-offs must be made to balance the developments made for increased autonomy and, possibly, for increased workload in order to present supporting rather than controlling functions. Consequently, the truth lies somewhere in-between the top-down and bottom-up approaches (cf. Table 8, DP 1 & 2). While top-down commitment and vision communication may be critical for effective change management (Hendry 1999), too much control would decrease the empowerment of employees and, as a result, lead to dissatisfaction. The evaluation results highlight the crucial role of middle management because they are differentiators at the front lines and are responsible for creating the mindset of change on every employment level. The variety of design principles illustrates the connection between individual perception, required engagement and institutional design, as well as the interaction between the levels presented in the multilevel design framework (Grotherr et al. 2018b).

6 Practical Contribution

Besides the theoretical contributions to the domains of service science and crowdsourcing, this thesis provides practical contributions (cf. Figure 10). In general, due to the naturalistic intervention, practical relevance is ensured. Furthermore, the design knowledge obtained for internal crowdsourcing and the multilevel design framework supports practitioners in selecting and understanding design options and their effects.

6.1 Overall Practical Contribution

Empirical intervention in natural environments ensures practical relevance. In general, the results of this thesis are relevant for practice because research is conducted in natural environments and in close cooperation with public organizations. The continuous redesign of the research results within a public organization, reflected by the piloting approach, bridges the gap between IS research and practice (Benoit et al. 2019; Nunamaker et al. 2015). Since the knowledge on how to operationalize value co-creation is scarce for practitioners (Lambert and Enz 2012), insights gained during the application of the developed engagement platform are linked to theoretical foundations. The findings are grounded on the usage data collected from the engagement platforms and on qualitative feedback collected through think-aloud (Grotherr et al. 2019, 2020; Semmann and Grotherr 2017). This baseline enforces research results that fit naturalistic environments. By incorporating a socio-technical perspective and the social cognitive theory, the embedded character of artifacts, value-in-context, and human behavior are captured and considered when depicting the design principles.

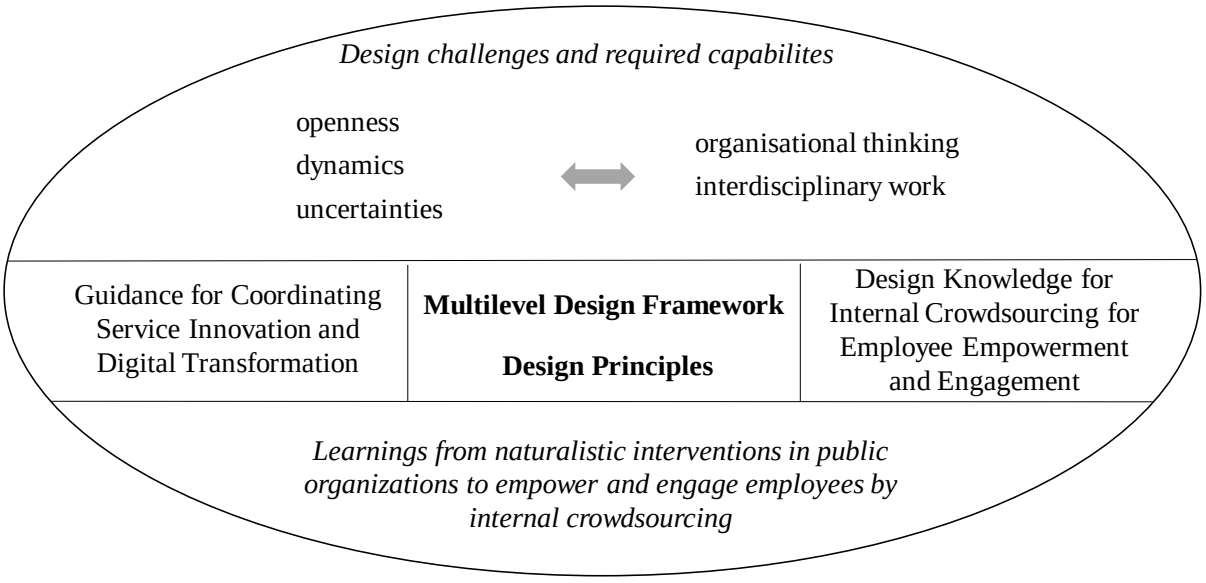

Figure 10. Practical Contributions of this Thesis.
Source: Own Representation.

Digitalization drives servitization and service systems enable digital transformation. Digitalization and servitization accompany each other. One the one hand, the digital transformation of organizations, humans, and technology enables new service innovations and impacts business models (Barrett et al. 2015; Legner et al. 2017). On the other hand, a service systems perspective helps to improve the transformation process for businesses toward a customer and service orientation. This perspective facilitates understanding of the manufacturer toward a service and usage-oriented characteristics, which is conceptualized as value-in-use (Vargo and Lusch 2004). In this context, service systems transformation is associated with organizational changes. With technological advancements, such service systems are smart, autonomous, and data-driven (Larson 2016; Maglio 2017). These developments increasingly drive new and unintended reconfigurations of actors and resources and, by integrating machines as actors, the human roles in service systems change. Questions arise regarding control mechanisms, decision rights, transparency of autonomous systems, and augmenting human intelligence by applying artificial intelligence (Semmann et al. 2018). The effects are not yet predictable today; however, a systematic approach, as provided by the multilevel design framework, lays the foundation for tackling these issues in a comprehensible fashion and requires further interdisciplinary research.

Methodological support for structuring the design process. The *multilevel design framework* provides practitioners with methodological support to understand, decide, coordinate, and communicate design activities and their effects. The descriptions of the activities, elements, and their anticipated effects guide practitioners and the design process, facilitating organizational thinking (cf. Figure 10). Practitioners can analyze the interdependence of individual engagement and the environmental conditions, such as the process structure and governance mechanism of an organization. This distinction helps extract inhibitors for leveraging unused resources such as employees' skills. With this knowledge, they can develop roadmaps for changing organizational structure in the long term and socio-technical artifacts in the middle term, as well as provide engagement to stimulate interventions, such as training or community-management in the short term. Due to the validation cycles, practitioners can evaluate the effects of the design decisions and reflect them within institutional or engagement design. Additionally, the design of socio-technical artifacts may comprise usability aspects to stimulate engagement—for example, by applying gamification elements. However, monetary awards may also have to be considered by financial and legal experts within an organizational setting. With the multilevel perspective, these different domain experts can all be integrated and used to communicate the required design activities in order to leverage the potentials of digital service systems.

Decision support for designing internal crowdsourcing. The proposed *design principles* for internal crowdsourcing support practitioners in decision-making. Based on the naturalistic intervention within a public organization, insights are derived to design engagement platforms to stimulate engagement (Grotherr et al. 2018a; Semmann and Grotherr 2017). The studied case aims to empower and engage employees to propose, discuss, and realize software-specific improvements. These insights help to understand and design the social and technical design features of artifacts and supporting interventions. Moreover, Grotherr et al. (2019) provide design knowledge that reflects how to design and introduce internal crowdsourcing within organizations. This design knowledge is derived and reflected regarding organizational culture and its guiding social norms of employees. This knowledge helps practitioners establish new modes of collaboration between employees.

Empowering and engaging employees through internal crowdsourcing. Due to the digital transformation and the emergence of new working modes (Ashford et al. 2007), empowering and engaging employees for value co-creation has gained attention in research and practice (Albrecht et al. 2018; Bock 2015; Corporate Leadership Council 2004; Trends 2017). Research calls for an in-depth exploration of how employees respond to these new modes and how organizational barriers can be overcome (Lenka et al. 2018). Studies indicate a positive impact of engaged employees on organizational performance (Attridge 2009; Coppin 2017). Based on the quote, "Knowledge is the only good that increases when you share it" (Marie von Ebner-Eschenbach, 1830–1916), knowledge is only valuable when it is used. However, while employees are often seen as passive idea generators that use suggestion boards, new developments focus on a newly defined and active role of employees (Larivière et al. 2017). Engaging employees in actively contributing to the development and realization of change initiatives bridges the gap between the envisioned future mode of business operation and the employees' motivation. Internal crowdsourcing demonstrates how to operationalize this gap. The design principles proposed by Grotherr et al. (2019) guide practitioners in the design and arrangement of configurations of employees, management, technology, and governance structures.

6.2 Guidance for Coordinating Digital Transformation

Servitization takes place in various domains, leading to a rethinking of operations and business strategies (Smith et al. 2014). Several manufacturing firms have started to expand their product-centric portfolio to include a strategy of service offerings (Cusumano et al. 2015). With the rise of digital transformation, changes in technology, organizations, and society have emerged and have to be tackled when designing service innovations (Majchrzak et al. 2016; Matt et al. 2015; Peters et al. 2016; Vargo et al. 2015). Developments such as artificial intelligence or platformization have a substantial

impact on the service environment, raising opportunities but also challenges for organizations. This rise of service thinking and digital transformation follows a shift in perspectives of and approaches to design business, offerings, and insights gained into customer behavior (Böhmann et al. 2018). Accordingly, service organizations are subject to continuous change to react to market dynamics.

However, organizations struggle to implement the shift from product- to service-oriented business models, as a transformation of the operational, tactical, and strategic elements has to be undertaken (Baines et al. 2017; Eloranta and Turunen 2016). These changes are disruptive for organizations and require long-term efforts, sense-and-response capabilities, and entrepreneurial approaches (Jayachandran et al. 2004; Sarasvathy 2008). As done in previous research (Lyons and Tracy 2013), this thesis applied a service systems perspective to describe organizations, actors, resources, and interaction practices. In particular, the proposed multilevel framework helps practitioners structure this design and transformation process at different levels. The design elements, activities, and their interdependencies can be allocated to either organizational or technological elements. This clarification helps to identify domain experts, to synchronize design implications, and to guide the overall process.

Due to environmental uncertainties, a service systems designer often starts with incomplete information on service systems, institutional set-up, and actors. This information is gathered and refined through a continuous process of design and validation activities. The multilevel framework helps to increase the completeness of this process, as several service systems issues are related to engagement design and institutional design. Consequently, this interdependence helps practitioners understand the service system and explore effective designs gradually. The design iteration further allows for an initial design of a service system and for continual improvement within further iterations.

Moreover, the need for interdisciplinary research work for service systems design and for complementing digital technologies with configurations of environmental conditions is evident in this thesis. As service science influences and is influenced by marketing, IS research, strategy, and other related disciplines (Ostrom et al. 2010; Ostrom et al. 2015; Peters et al. 2016), this theoretical foundation represents a variety of perspectives for designing the digital transformation. The design entails not only the technology design of artifacts but also the design of organizational strategy, management, and practices. Despite the focus on designing socio-technical artifacts, ethical questions arise—ranging from big data analytics to privacy design in service ecosystems—which the design process must capture. At the macro level, strategic implications provide directions and regulations for the development of environmental conditions. At the meso level, socio-technical artifacts design affects an individual's willingness to engage. At the micro level, engagement of individuals, such as employees or

customers, can be observed. With this multilevel perspective, different design scenarios can be simulated. Design decisions are reflected following the phases and corresponding design elements. For instance, if motivational barriers are identified for engaging actors, then engagement-stimulating mechanisms such as gamification or improved usability stimulate the engagement of actors, which is referred to as engagement design. On the other hand, incentives such as monetary awards can be established to motivate actors to engage. This incentive can be implemented within the institutional design. However, reflecting on actors' disposition to engage, these design decisions can be reflected in advance to assess their anticipated effects. Such simulation helps to select highly promising design alternatives based on the anticipated effort, benefits, and risks.

The design of environmental conditions and the engagement of different actors require capabilities for managing complexity and evaluating impact. Success is limited in proportion to the capabilities of a designer to adapt the interdisciplinary design and validate practices. These activities require shared practices, models, and mindsets, as well as language and training. These capabilities are referred to T-shaped professionals with cross-disciplinary knowledge and a good background in service innovations (Spohrer and Kwan 2009). The multilevel framework provides a tool for understanding and for engaging various actors. This perspective encourages researchers and practitioners to integrate cross-functional teams in order to collaborate and design. The synchronization of engagement design and institutional design assists in identifying experts from different domains and contributes to understandings of interdependencies. These experts have different views about the design, ranging from technical and organizational to user perspectives. Connecting and synchronizing design cycles improve the information flow and communication between different experts in adjacent domains. Such cooperation enables designers to assign required design activities and to clarify responsibilities.

6.3 Empowered and Engaged Employees for Value Co-Creation

From a practical perspective, this thesis sheds light on the concept of "new work" by proposing internal crowdsourcing as a promising approach for the empowerment and engagement of employees and for overcoming organizational barriers (Ashford et al. 2007). Consequently, individual behavior and interactions within an organization affect its organizational culture and transformation, which refers to institutional work coming from organizational studies (Lawrence et al. 2013).

Driven by the emergence of new technologies, transformation takes place within organizations and reshapes the nature of work and leadership (Larivière et al. 2017; Williams and Schubert 2018). In organizations characterized by hierarchies and fixed structures, employees follow clear positions, divisions, and boundaries. In such an environment, the daily networking experiences of employees on

social platforms are mostly ignored. However, the changes in the market toward a service economy require a rethinking, where the silos mentality is displaced, and knowledge transfer promoted.

For transformation toward autonomy and self-organization, new values of openness and agility must be implemented. Zooming in, this implies new modes of working, which are reflected by the concept of employee empowerment. Employee empowerment is a crucial attribute for fostering exploration and exploitation of new service innovations (Clutterbuck and Kernaghan 1994; Deng et al. 2016; Giesbrecht et al. 2017; Maruping and Magni 2012). Employee empowerment is defined as an "increase in worker power (through, for example, increased formal authority or greater access to more useful information) that enables workers (and, collectively, the organization) to achieve institutional objectives with greater efficiency and effectiveness" (Elmes et al. 2005, p. 5). In particular, empowerment comprises a relational construct that increases the authority of lower-level units and a motivational construct that increases the motivation of employees by autonomy (Conger and Kanungo 1988).

Previous research focuses on analyzing this behavioral perspective (Seibert et al. 2004; Spreitzer 1995) but does not explain how this state can be reached and how this progress can be supported (Welbourne and Schramm 2017). Specifically, only few attention has been paid to IT empowerment (Elie-dit-cosaque et al. 2006; Junglas et al. 2014; Maruping and Magni 2012; Semmann and Böhmann 2015). Studies highlight that, by the end of 2017, 54% of IT problems were expected to be solved by employees themselves (Matchett 2015). This indicates that digital natives tend to work independently, using IT self-service tools, or searching through different channels for solutions, such as Google or StackOverflow (Zaza and Junglas 2016). However, most enterprise IS are customized to an organization. Thus, employees must find suitable solutions within the existing organizational context. Against the background in which more employees are choosing their tools for their daily routines (Harris et al. 2012), there is a rising need to explore the role of IT empowerment (Junglas et al. 2014).

Semmann and Grotherr (2017) and Vogel et al. (2019a) reflect on the role of employee empowerment by internal crowdsourcing for proposing and realizing software improvements and continuous requirements engineering. This type of democracy fosters competitiveness of organizations because decisions are based on employees' contextual knowledge, which leads to organizational thinking and innovation capabilities. The results of the evaluation of the two internal crowdsourcing projects demonstrate the interconnection between designing environmental conditions, such as structures and governance, and socio-technical artifacts, such as engagement platforms (Grotherr et al. 2018a).

7 Limitations

Based on the research approach choices, this thesis has certain limitations that are subject to the publications and addressed in this chapter.

Evaluation of research results by external users. Contextualization is necessary for value co-creation, and design principles must consider the environmental conditions to achieve the highest possible applicability. On the one hand, this value-in-context perspective requires interventions in actors' natural environments to rearrange the configurations of actors and resources and to observe the effects. On the other hand, this intervention leads to subjective biases. As Spohrer et al. (2007) stated, "service systems are complex adaptive systems made up of people, and people are complex and adaptive themselves" (p. 76), meaning that individual perception of value differs. Perceived usefulness depends on situational factors, which change due to environmental dynamics.

However, the abstraction of context is necessary to ensure the transferability and generalizability of results, which is central for design science (Gregor 2006; Peffers et al. 2007; Sein et al. 2011). In terms of the multilevel design framework, this thesis demonstrates—within the Grotherr et al. (2020) publication—the transferability through the application of the proposed framework in the smart community domain. However, shortcomings can be found in the missing applications of the multilevel framework by external experts. For further evaluation, independent users should examine the application of the framework and validate the proposed design knowledge for internal crowdsourcing.

Close engagement and cooperation with public organizations. Due to the proximity of the public organization to the design and introduction of the engagement platform (cf. Table 2, p. 11), a reciprocal subjective influence—both on the researcher and through the engagement in the naturalistic environment—cannot be excluded. The research outcome depends on the quality of the input. The explanatory power of the results is to some degree limited to the data collected within the organization. The validity of the results relies on the selection of the interviewed experts (Mayring 2010). Even though an effort was made to include a broad range of experts from all hierarchical levels and backgrounds, the number of respondents depended on availability and access to the organization, which was primarily supported by top management commitment and was beyond the influence of the researcher. Nevertheless, due to the application of the multilevel design framework to the case of building a smart community, usefulness was demonstrated, which highlights the interdependence of socio-technical artifact design and institutional set-up design within service systems.

8 Implications for Further Research

Based on the limitations, this research contains implications for future research activities. These implications seek to advance the multilevel design framework using supporting tools and processes. This offers a potential discourse for extending design knowledge for service systems (cf. Figure 11).

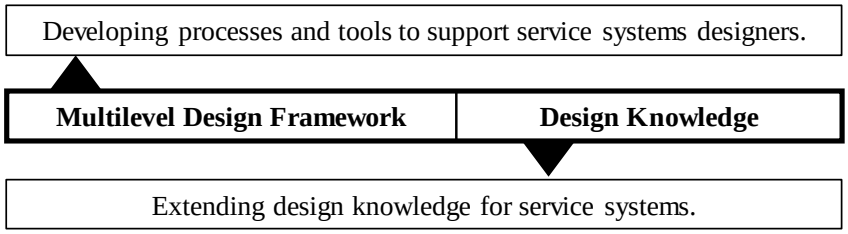

Figure 11. Overview Implications for Further Research.
Source: Own Representation.

8.1 Service Science and Service Systems Engineering

Expanding knowledge on the synchronization of design cycles. This thesis presents a multilevel framework to advance the study of service systems engineering. The emphasis on the role of the context and institutions requires the appropriate design of supporting structures, which refers to the institutional set-up. With institutional and engagement design, service systems designers can apply a more systematic approach in order to understand the design of service systems and the way to facilitate value co-creation between actors. Future research activities should deepen the interdependence of the two design cycles by applying the framework to other service systems and enriching the details of duration, cadence, required roles, challenges, and practices to support the design process.

Proof of utility required of individual designers. Following the argumentation in the limitations section of this thesis (cf. Chapter 7), the benefits of open issues with applying this framework for service systems designers must be assessed by scholars and practitioners. In future research, external experts should empirically examine the usefulness of the framework within an organizational setting. Such evaluation allows the transferability and usefulness of the framework to be demonstrated.

Guidelines, processes, and tools are required to support designers and organizations. While Grotherr et al. (2020) demonstrate the applicability of the multilevel design framework to other domains, a structured process that guides the stepwise application of the framework is missing. To date, there is no tool support, such as canvas or obeya rooms, which improve communication between involved actors in the design process. For this reason, tools should support the collaboration within an interdisciplinary service systems engineering team and the integration of various actors and resources for analyzing and designing service systems.

Extending design knowledge for resource integration patterns. Configurations of actors and resources have to be transferred into resource integration patterns (Storbacka et al. 2016). These activities are part of the institutional design, which exploits the value co-creation of engaging actors (Grotherr et al. 2018b). Further research should be undertaken to identify and assess resource integration patterns that take different design scenarios and effectiveness assessments into consideration.

Advancing knowledge on the institutionalization process. Despite the relevance of institutionalization for service innovation (Baker et al. 2019; Koskela-Huotari et al. 2016; Kurtmollaiev et al. 2018; Pop et al. 2018; Siltaloppi et al. 2016; Vargo and Lusch 2016; Vargo et al. 2015), research has not yet received sufficient interventions (Koskela-Huotari et al. 2020). Technological advancements, such as artificial intelligence, virtual reality, and machine-to-machine interactions, will have a substantial impact on service innovations (Demirkan et al. 2015; Maglio and Lim 2016; Peters et al. 2016). While technology is increasingly influencing service innovations, it is critical to consider the impact of these innovations on various social dimensions. This perspective is in line with Grotherr et al. (2020), who envisions building smart communities for social well-being in metropolitan regions. The guiding value proposition goes beyond individual interests to a collective co-creation for social well-being through engaging multiple actors via an engagement platform (Vogel et al. 2020; Vogel et al. 2019b).

Going forward it is expected that service research will focus on the transformative character of norms and practices, including, for example, privacy issues and the development of new working models (Anderson and Ostrom 2015; Kurtmollaiev et al. 2018; Patrício et al. 2018b, 2019). In this context, hybrid forms, such as human-robotic interactions, are promising areas of further research (Semmann et al. 2018) but require consideration of social and individual components, such as emotions and job routine changes. However, there is a lack of details concerning socio-technical and institutional changes (Koskela-Huotari et al. 2020), which can be captured by technological, human-centered, and structural design elements. There is a need to advance the knowledge on how institutions contribute to the emergence of service ecosystems, how they shape interactions within these systems, and vice-versa, and how socio-technical artifacts and institutional set-up shape institutions.

Focus on innovations in service ecosystems for shaping markets. Despite the relevance of technological developments, such as artificial intelligence, this thesis addresses the importance of designing service ecosystems as key enabler for future service innovations. The developments of open phenomena and platforms are in line with service ecosystems, which are defined as "relatively self-contained self-adjusting systems of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (Vargo and Lusch 2016, p. 11). Moreover, there

is a growing interest in leveraging innovation beyond economic and monetary values of business models to encourage institutionalization in service ecosystems (Baker et al. 2019; De Leoz and Petter 2018; Patrício et al. 2019). This research area is particularly important to study as it combines technological innovation with a transformative perspective on organizations and society for market-shaping (Fehrer et al. 2018b; Nenonen et al. 2019).

However, few studies have dealt with the changing perspective—from designing individual customer journeys and business models toward the design of markets in service ecosystems (Anderson et al. 2013; Fehrer et al. 2018a; Nenonen et al. 2019). The notion of disrupting markets characterizes this innovation process (Baker et al. 2019; Kindström et al. 2018). For building sustainable service ecosystems and markets, a collaboration process between service science, organizational studies, and sociology are becoming more important. Engaging multiple actors for value co-creation and designing the institutional set-up for adapting technologies are sources for service ecosystem innovations. These innovations have the potential to shape markets but need further undertakings. Little is known about how organizations can apply cross-functional and interdisciplinary collaborations by integrating competencies from the spheres of technology, law, strategy, and other related business units.

8.2 Employee Empowerment and Engagement by Internal Crowdsourcing

Grotherr et al. (2019) highlight the benefits of internal crowdsourcing for leveraging employees' unused resources. By doing so, institutional work takes place, which needs further elaboration on intended and unintended consequences for organizations. Further research is needed to extend the mechanisms required to establish internal crowdsourcing. Knowledge is required about design options, their effects, and necessary prerequisites—for example, mechanisms such as governance, distribution of tasks, and incentives (Semmann and Grotherr 2017; Zuchowski et al. 2016). In addition, it is essential for these mechanisms to intervene in natural environments to move out of the laboratory and scale the research up to real-world environments. In this context, one major challenge is to maintain the employees' motivation to engage (Bretschneider et al. 2016; Leimeister et al. 2009). It is necessary to create a critical mass so that crowdsourcing systems do not need to be maintained through cost-intensive and time-consuming interventions. These undertakings broaden the perspective of the design of engagement-stimulating mechanisms, such as gamification elements, toward an organizational design. Research should seek to find the processes, responsibilities, and approaches needed for integrating new modes of collaboration into daily work routines. It is not only important to address the issue of how both modes of working can co-exist but also the issue of how the transition to the new mode of working can successfully be achieved and how the improvements can be measured.

9 How to Empower Users for Co-Creation – Conceptualizing an Engagement Platform for Benefits Realization

Semmann, M., and Grotherr, C. 2017. “How to Empower Users for Co- Creation - Conceptualizing an Engagement Platform for Benefits Realization”, Internationale Tagung Wirtschaftsinformatik (13), St. Gallen, Switzerland

Abstract

Organizations invest huge portions of their budget in IT with the goal to realize benefits as improving work practice and establishing new processes. To achieve this goal, users are engaged throughout projects by various methods and approaches. Nevertheless, after the completion of a project, users lack power and opportunities to further realize benefits and thus assuring the overall success of a project. To close this gap, we present the concept of an engagement platform that empowers users collectively to induce change initiatives that enhances the realization of benefits in the post-project phase. By doing so, benefits management practices undergo a paradigm shift from recent top-down management towards bottom-up realization of benefits. This change in perspective also incorporates a service systems perspective as it focusses on the dynamic configuration of actors and resources to enable value creation in a complex context.

Keywords

Service System Engineering, Software Introduction, Technochange, User-Generated Services, Benefits Management

9.1 Introduction

Organizations invest huge portions of their budget in IT with the goal to realize benefits as improving work practice and establishing new processes (OECD 2015; WITSA 2010). To achieve these objectives, IT investments must be well embedded in the organizational context resulting in complex project constellations. Additionally, anticipated benefits of the software can only be created in distinct contexts by various users utilizing the software. Thus, projects contribute to a service system, as a sociotechnical artifact in a distinct organizational environment is instantiated (Böhmann et al. 2014). Following, benefits realization is done by using this sociotechnical artifact in a specific context while integrating various resources and actors (Böhmann et al. 2014). Engaging users is therefore state of practice during projects by various methods and approaches (Conforto et al. 2016; He and King 2008). This engagement is done by selecting some users with a top-down approach within the project. This top-down approach is advantageous to get projects approved and delivered. Whereas a much broader or even general participation is complex, expensive and hard to keep target-oriented during a project. Especially, considering major changes in software as introductions of new software or significant upgrades only representing users can be engaged efficiently throughout the project. Thus, most users cannot actively participate in the adaptation of software and organizational changes. Even more due to the context of use that is defined by the actors involved and the organizational boundaries this limited engagement leads to limited ability to realize benefits entirely. This limitation even increases after the completion of a project, users lack opportunities and power to further realize benefits and thus assuring the overall success of a project (Semmann and Böhmann 2015). Recent literature reviews on benefits management from a project perspective (Braun et al. 2009; Hesselmann and Kunal 2014) show that, in post-project phase, there is no established method or concept to support emerging benefits as well as intended but unrealized benefits which is also reflected in a qualitative study (Semmann and Böhmann 2015). This lack of engaging users is also mirrored as a third of installed software in organizations is estimated to be not used at all (1e Limited 2015).

By utilizing a service systems perspective with the users as facilitators of value in context, a bottom-up approach seems more beneficial to enhance capturing of benefits to overcome these limitations in the post-project phase. Especially, regarding varying time lags and emergent benefits that have not been anticipated (Brynjolfsson and Hitt 1998; Marchand et al. 2000; Markus 2004; Orlikowski 1996). Based on this perspective, a shift towards a bottom-up approach for enforcing co-creation within the community of users to further realize benefits and thus improving the solution and its value delivered

collectively (Lusch et al. 2007; Ng and Smith 2012). A promising approach to instantiate such a bottom-up engagement platform is internal crowdsourcing as it aims for collaborative value facilitation within an organization by potentially engaging all users (Zuchowski et al., 2016). This active engagement also copes with the need for organizational change that complements new or changed IT to realize benefits (Brynjolfsson and Hitt 1998). This is also recognized in literature on IT-enabled transformation that emphasizes that capturing benefits is a critical post-project activity (Markus 2004). Following this argumentation, the paper answers the following research question: *How can a concept to empower users for co-creation of change initiatives be designed to enhance the possibilities to realize benefits?*

We do so by presenting the concept of an engagement platform that empowers users to collaboratively induce change initiatives that enhances the realization of benefits in the post-project phase. The resulting platform seeks to catalyze the potential of value co-creation as it decidedly addresses the context of users' engagement with the delivered software during the introduction. To enable value creation between actors of the service system, users should be empowered to implement change initiatives and thus, foster timely realization of benefits. This novel approach exceeds common crowd initiatives established for example within innovation management as change initiatives are not only identified and ranked, but explicitly realized within a specific organizational context.

Thus, benefits management practices undergo a paradigm shift from recent top-down management towards bottom-up realization of benefits. This shift has the potential to increase the ability to change organizations and their work practice drastically (Kumar et al. 2016).

As service research (Böhmann et al. 2014) as well as design research (Iivari 2015; Niederman and March 2012) calls for evidence-based cumulative research, we propose the concept to an engagement platform as the result of the design phase of our design science project. The remainder of the paper is therefore structured as follows: the second section builds up a foundation of the research by defining and summarizing related research. In the third chapter, we describe the methodology used to develop the engagement platform. All components of the concept are derived and comprehensively described in chapter four. The paper closes with a conclusion and outlines future research.

9.2 Conceptual Foundations

9.2.1 Service Systems Engineering

Service systems describe a configuration of actors and resources and their interaction (Alter, 2012) in order to enable co-creation of value by sharing resources among actors (Maglio et al., 2009). This is in line with the definition given by Böhmann et al. who conceptualize a service system as "complex socio-technical systems that enable value co-creation" (Böhmann et al., 2014). Research has recognized the emergent importance of service systems and the need for establishing further research within this field such as service science (Maglio and Spohrer, 2008, Alter, 2012). This research is supposed to address the interaction between actor's regarding human agents with knowledge and skills as well as resources as technology, information, physical artifacts which interact in co-creation (Alter, 2012). Service systems engineering elaborates therefore on the importance of systematic design and development of such service systems and calls for research on evidence-based design knowledge (Böhmann et al., 2014). Service systems research consequently applies the principles of service-dominant logic which constitutes value creation through collaboration and contextualization (Vargo and Lusch, 2004). Accordingly, contextualization emphasizes that producer and consumer create value collaboratively by configuring actors and resources specifically in a context (Edvardsson et al., 2011, Vargo et al., 2008). Hence, service systems enable value co-creation through configuration of actors and resources guided by its value proposition (Vargo and Lusch, 2004). Understanding service systems as configuration of actors and resources with the aim of searching for principles and approaches that can help to improve value co-creation (Vargo and Akaka, 2012) we focus on the integration of these resources in order to foster the end-user co-creation of value within software implementation projects to realize benefits jointly.

9.2.2 Internal Crowdsourcing

Crowdsourcing is an IT-enabled phenomenon which is based on social IT like wikis, blogs or social networks (Zuchowski et al., 2016). Crowdsourcing can be defined as using information technology to connect various potential user groups to accomplished tasks by voluntary crowd workers often motivated by mutual benefits (Estellés-Arolas and González-Ladrón-De-Guevara, 2012). One main characteristic of crowdsourcing is the location of the crowd, which can be distinguished between external (e.g. communities of interest, customers) and internal (employees). External crowdsourcing has been applied in different industrial contexts as exemplified by the cases of LEGO (Schlagwein and Bjørn-Andersen, 2014) and SAP (Leimeister et al., 2009). Yet, little is known about building and

engaging a crowd within organizations (Zuchowski et al., 2016). As shown by Zuchowski et al. (2016), internal crowdsourcing has characteristics which distinguish it from external crowdsourcing. For example, the crowd is comprised of employees and is thus long-term oriented rather than independent ad-hoc and short-term-oriented external crowds (Zuchowski et al., 2016). An extensive literature review stated conflicting definitions and conceptualizations of internal crowdsourcing in literature (Zuchowski et al., 2016). The authors define internal crowdsourcing as "an (a) IT-enabled (b) group activity based on an (c) open call for participation (d) in an enterprise" (Zuchowski et al., 2016). This definition is in line with an engagement platform from a service systems perspective and therefore bears the potential to support benefits realization. Another characteristic is the need for organizational culture management skills, because the approach requires an open organization where employees can collaborate and debate with each other without having cultural boundaries (Benbya and Van Alstyne, 2010). A characteristic of external crowdsourced solutions, on the other hand, is that the design has the potential to reveal 'outside the box' information, while an internal crowd may also be suitable to solve contextualized, enterprise-centered problems (Schlagwein and Bjørn-Andersen, 2014). In addition to location, the task is an important factor for distinguishing crowdsourcing approaches (Erickson, 2012). Crowds can be engaged to gain access to a diverse knowledge base as tasks vary between low levels of complexity, as considered in research on microtasking or microworking (Brabham, 2013), to tasks with increasing complexity such as ranking, sharing knowledge, ideation to design and development of new solutions. While tasks with low complexity can be crowdsourced externally to increase productivity by reducing time and costs, knowledge-intensive tasks with a high complexity will often preferably be allocated to internal crowds as only an internal crowd is fully aware of a given context.

9.3 Research Design

The research project follows a design-oriented research strategy (Hevner et al., 2004) and is conducted by utilizing the Design Science Research Methodology (Peffers et al., 2006) to systematically and iteratively design, develop as well as demonstrate and evaluate a sociotechnical artifact in a suitable context.

Therefore, the first phase Problem Identification and Motivation aims for defining the research problem and adjusting the target of the solution. This deep understanding of the problem space defines the vision of the to be designed artifact. This research project follows the problem-centered initiation as the practical relevance is shown in the introductory section as well in following chapter. Although a

lack of benefits realization targeted by software implementation projects is identified current research does not address this issue. This research therefore aims at developing a concept to empower users for co-creation of improvements to enhance benefits realization after software introductions.

In the following phase Objectives of a to be designed solution are derived grounded on a previous study on post-project management in large organizations and research on service systems. The next phase Design and Development utilizes these results as the foundation of the implementation. As scholars call for cumulative research in service research (Böhmann et al., 2014) as well as design research (Niederman and March, 2012, Iivari, 2015) we propose a concept as a result of the design and development phase as focus of this research. Nevertheless, as design, development, and demonstration are highly iterative phases, we include insights of the demonstration of early mock-ups and a first prototype that build the foundation of a future evaluation. This evaluation is planned to be guided by the Framework for Evaluation in Design Science (FEDS) (Venable et al., 2016). Therefore, in the planned Evaluation phase the artifact is applied in the context of a Microsoft SharePoint introduction within the case organization. Thus, a suitable context to validate its applicability and utility by solving real problems is given (Peffers et al., 2006). The results gathered throughout this evaluation likely lead to further improvements on the initial concept.

9.4 Designing Benefit Realization Supporting Components

In the following section the course of the design science research project is described that leads to the design of the benefit-supporting components. The focus hereby lies on the conceptualization in the design and development phase. Accordingly, the first two phases are only shortly described as this project seeks for a cumulative communication of the results as called for by researchers (Böhmann et al., 2014, Niederman and March, 2012, Iivari, 2015).

9.4.1 Problem Identification and Motivation

Service systems have evolved into key concepts for research in information systems (Alter, 2012, Fielt et al., 2013). Many industries such as IT manufacturing and healthcare seek to design effective technology enabled service systems that efficiently allow the configuration of the service system to meet individual needs and to create value in each context (Böhmann et al., 2014, Ostrom et al., 2015). As various studies show, a major problem of software introductions is that the resulting solutions is insufficiently used in organizations and thus, value is not created (Ward et al., 2007, 1e Limited, 2015, Semmann and Böhmann, 2015, Marchand et al., 2000). This lack of use varies from denial of use at

all, users establishing workarounds to using a software but not efficiently or even effectively (Roder et al., 2016, Zainuddin and Staples, 2016, 1e Limited, 2015).

Despite this general problem description, this project is done in close cooperation with a client organization. The research takes place in a public law institution with 1.800 FTE. During an initiating workshop, the described problem was mirrored in this organization. Thus, a software introduction project was identified that fit to the described problem and has the potential to implement the to be designed concept of an engagement platform. Consequentially, the artifact aims at realizing benefits targeted by the project with a concept to empower users to co-create value within an engagement platform that integrates operant and operand resources within this service system. This is done by identifying possible improvements, discussing these, and applying the improvements collectively to realize benefits.

9.4.2 Objective of the Solution

With the overall problem definition as foundation for this design science research project, objectives of a solution must be identified. To do so, two approaches were taken. On the one hand, a preliminary qualitative study in twelve large organizations was conducted that evaluated the state of benefits management after a projects result is delivered (Semmann and Böhmann, 2015). The study reveals shortcomings of current practice that lead to implications for the design of the to be designed artifact (O1-4). On the other hand, literature on service systems engineering gives directions on the integration of resources and how actors can co-create value. Based on this research stream, a novel approach is taken that focusses on user-integration to co-create not only ideas for improving a software but also implementing the proposals by applying deep contextual understanding of engaging users (O5,6). The resulting objectives and their related sources are subsumed in Table 1.

Table 1. Objective of the proposed Solution

No.	Objective	Source
O1	Enforce continuity of benefits management that outlasts projects	(Semmann and Böhmann 2015)
O2	Accompany transition and early usage phases with an ongoing action-oriented approach instead of only a retrospective one	(Semmann and Böhmann 2015)
O3	Identify emergent benefits after the transition is completed and regular work practice is achieved	(Majchrzak et al. 2016; Semmann and Böhmann 2015)
O4	Establish ways to deal timely with improvements	(Patora-Wysocka 2016; Semmann and Böhmann 2015)

O5	Mobilize resources to enable user-driven change	(Böhmann et al. 2014a; Lusch et al. 2016; Peters et al. 2014; Storbacka et al. 2016; Vargo and Lusch 2016)
O6	Establish a platform that allows actors to engage	(Breidbach et al. 2014; Storbacka et al. 2016)

The first objective considers the dynamic during projects and afterwards that ownership of benefits is changing dynamically (O1). Therefore, an engagement platform should ensure that change proposals are consistently related to the initiator or a governing actor to be able to take on actions that support progressing with the change. Thus, distinct actors are aware of the benefits related with the change and can monitor its realization. Additionally, they have the ability to communicate the usefulness. Secondly, practical insights show that current benefits management practice is mainly retrospective in the post-project phase. Therefore, a solution needs an action-oriented approach (O2) to enable actors to improve the deployed software according to the specific needs to ensure the realization of value in context. Hence, it is not sufficient to solely collect change requests to propose follow-up projects. As users establish work routines with the introduced software (Bapuji et al., 2012), a solution should support users by identifying further unintended benefits (O3). By doing so, users can be more engaged by improving the software and contextualize it based on their specific needs. Analogously, by establishing approaches to timely implement and thus improve the introduced software (O4) users' engagement is likely to increase and as a result benefits realization increases as well. As a major challenge in service systems engineering is the mobilization and integration of resources, a solution should incorporate approaches to do so (O5). Following Breidbach et al. (2016), the solution should have touch points that provide structural support for actors to realize the exchange and the integration of resources (Breidbach et al., 2014). Finally, a solution to enable users to improve introduced software needs to be designed as an engagement platform (O6) (Breidbach et al., 2014, Storbacka et al., 2016). Consequently, the solution should facilitate exchange between users.

9.4.3 Design and Development

To address these objectives and as the third activity of the design science research process a concept is developed with the overall aim to enable end users to contribute to adaption and customization of an introduced software. Hence, the concepts integrate mechanisms to engage all users of a software recently introduced to exchange and integrate resources to improve the software. By striving for this goal a fundamental change takes place as an internal crowd is empowered to change software utilizing a bottom-up approach. This approach leads to empowered users that can propose, interact on, and realize changes to a software. In this context, opportunities are supported, which help to mobilize and

access previously untapped resources of users leading to a contextualized adaptation of the software and thus bearing the potential to improve benefits realization (Breidbach and Maglio, 2015). Doing so facilitates and empowers users to build and strengthen capabilities for implementing change initiatives using dynamic resource integration as an internal crowd. This concept shifts benefits realization from strictly formalized processes towards support in collecting experience and perception of users directly affected using the new software.

As this research takes a problem-centered approach, the design is mainly driven by the aforementioned practical and theoretical insights. Due to the strong commitment of the client organization, each iteration that lead to this concept was demonstrated and refined with practitioners. Nevertheless, the concept represents an abstraction and therefore, can comprehensively be adapted to other contexts as well.

Following the objectives, the concept for empowering users to co-create change initiatives and to enhance benefits realization in software introductions consists of three core components. A user joins the engagement platform and follows the concept in a sequence by proposing a change initiative (C1). The second component (C2) aims for gaining crowd-commitment as supporting factor for realizing the change initiative and embody validation by the internal crowd if the change initiative is worthwhile realizing. Last, the third component (C3) supports users to realize change initiatives that are accepted by the crowd and deemed beneficial. However, the concept has an iterative character which allows re-entry in earlier components based on insights gained during the initial change initiative. Possible insights can be further change initiatives, spare change initiatives or insights which impacts the proposed change initiative.

Every component subsumes several functions that aim to transform an expected input into desired output. Subsequently, we describe the three core components of the concept in detail. We thereby focus on functions, their interfaces, cross-sectional dependencies, and design variables that need to be considered for instantiations of the concept in various service systems.

Proposing a Change Initiative (C1)

The aim of this component is to provide an engagement platform for users that enables them to collect ideas for change initiatives (Table 2). These initiatives are only emergent during the use of the introduced software in specific contexts. If for example, a process lacks accuracy during its runtime users can report immediately and contribute a change initiative for the redesign of this process. To propose

a change initiative, users specify the change initiative (C1F1). This is done by describing the idea or issue (C1F2) and the related software as well as suggestions how a resolution could be realized on the engagement platform. To join the platform users should first create a user profile with information about skills and to further relate to matching change initiatives (C1F3). By using the platform, the profile will be extended with tags of interest for initiatives a user engaged with and thus represents a user's context holistically. Another mode to join the platform is to anonymously participate on the platform. This design decision must take into the effects of anonymity in communities' consideration as well as relatability of individual opinions. Table 2 subsumes the functions and highlights design decisions made in the organizational context of the project.

Table 2. Overview Component C1: Proposing Change Initiative

Objective	O1, O2, O3
Input	idea statement, improvement proposal, solution design
Functions	*Design Variables*
(C1F1) initialize change initiative	**idea, solution, problem**
(C1F2) describe change initiative	free text, **defined template**
(C1F3) create user profile	anonymous, **single-sign-on**, new profile
Output	well formulated change initiative

The overall aim of this module is to gain crowd-commitment for a proposed change initiative. Thus, users are supposed to engage to co-create suggestions and possible solution designs. Accordingly, one purpose of this component is to build communities of interests. To participate in such a community modes of crowdsourcing can be distinguished in general between the modes 'wisdom of the crowd' and 'marketplace/contest' (Vukovic and Bartolini, 2010). With the aim of improving usage of software and with the boundary condition of limited members in the user base it is not suitable to compete against each other. Moreover, the overall aim is to work collaboratively on a solution to an identified problem. This is in line with the guiding definition of internal crowdsourcing which declare an 'open call for participation' (Zuchowski et al., 2016). Therefore, the concept should provide opportunities to discover change initiatives (C2F1). This can be instantiated using search and filter functions for new and relevant change initiatives. A more proactive and dynamic way to discover change initiatives is by demonstrating success stories related to user profiles by recommender engines.

Providing feedback for change initiative, developing suggestions and solutions (C2F2, C2F3) as well as rating change initiatives (C2F4) requires engagement between actors (C2F5). To prioritize change initiatives rating mechanisms can be implemented inspired by funding, voting and rating mechanisms. Based on the feedback and a prioritization change initiatives are selected which have particularly high

and relevant benefits for software usage. To address a broad range of users, groups of interests and departments these functions must be provided across the organization to give all users the opportunity to participate as well as to involve users (C2F6). Therefore, communication such as blogs or forums are needed. Additionally, opportunities to address single users explicitly with sharing functions or with tagging systems that may suggest potential experts are needed to support communicating change initiatives and to engage users. A web-based information system which provides users a communication infrastructure is needed to allow them to share change initiatives, feedback, design discussions and helping to build solver groups. The participation of users will be strengthened in this way and they can contribute their expertise to provide improvements for a wider range of users. Gaining crowd-commitment does not only aim for gathering feedback for a change initiative but moreover to build a realization team to solve the issue and implement the developed solution design (C2F7). In this regard a user volunteers as a solver and thus teams up with the requestor and other committed users. This (virtual) formation can be supported for example by expertise matching tag systems as well as direct addressing potential solvers.

Table 3. Overview Component C2: Gaining Crowd-Commitment

Objective	O2, O4, O5, O6
Input	change initiative
Functions	*Design Variables*
(C2F1) discovering change initiative	**search function**, **success stories**, recommendations, **filter function**
(C2F2) feedback change initiative	**blog**, forum, instant messaging
(C2F3) develop suggestions and solutions	**free text**, mock-ups
(C2F4) rate change initiative	funding, rating, **voting**
(C2F5) communicating change initiative	**passive**, **active**
(C2F6) involve users, experts	**tagging**, mail, newsletter
(C2F7) building solver-team	**self-organized**, direct communication
(C2F8) govern crowd	**self-regulating**, passive controlling, community-manager
(C2F9) monitoring status change initiative	promote, remove, **provide status**
Output	(virtual) team formation, refined and validated solution design

Further mechanisms should be considered that adopt functions of managing the crowd. For example, in the case of inadequate comments guidance how to govern the crowd are required (C2F8). This might imply the need for community management as well as reporting mechanism. Additionally, by monitoring the status of a change initiative and information about recent activities, community management can actively promote or remove outdated change initiatives (C2F9). The hurdle lies in the

activation of users to engage on the platform, discovering change initiatives and to participate with feedback, rating as well as solving change initiatives. Guided by the demand to design an "engagement platform to incentivize certain actors to contribute their resources and enable service-for-service exchange" (Storbacka et al., 2016), corresponding motivation, activation and incentive mechanism for users have to be established. Therefore, motivation and incentives can be distinguished between the source of incentive (intrinsic, extrinsic) and the object (monetary, non-monetary) (Przygodda, 2005) and should be embedded in the instantiation of the concept (Cuel et al., 2011). However, the willingness and openness to participate on the engagement platform may be restricted by social influences. By designing communication, coordination, motivation and incentive guidelines the boundaries of individual decision making within an organization and closed communities should be considered. Actors act within a structure restricted by social rules and collective meanings, which are part of the organizational culture (Lusch and Nambisan, 2015). This is mirrored as well in the overview given in Table 3 including the design decisions in the case organization.

Realizing Change (C3)

As the overall aim of the concept is to realize change initiatives. As organizational context also embodies limited time for additional activities and lack of access permissions, change initiatives will be implemented jointly by the crowd and transferred to regular operation (C3F1). By providing dedicated time for users or adding additional resources users are empowered to realize benefits for themselves and for other users (C3F2). It is also possible that projects arise, which are equipped additionally with budgets and possibly additional resources and handed over to general project management. Other ways to support realization of change initiatives are crowd mechanism (C3F3) such as task management (Dwarakanath et al., 2015). Building tasks to split workload and provide the possibility for lightweight participation in the realization process. Further dividing realization projects into small tasks supports automated testing and automatic integration (Dwarakanath et al., 2015). After users have realized a change initiative, the solution should be tested and evaluated regarding defined acceptance criteria (C3F4). This also depends on the context and thus needs to be defined during instantiation of the engagement platform. After realizing and deploying change initiatives engaged users are informed and rewarded as defined during instantiation of the engagement platform (C3F5).

Table 4. Overview Component C3: Realizing Change

Objective	O2, O4, O5	
Input	solution design	
Functions		*Design Variables*

(C3F1) realizing change initiative	
(C3F2) enable realization	**attracting experts/consultants/IT**, providing dedicated time
(C3F3) building, assigning tasks	**self-regulated**, supported by tools, only if no additional tools are needed
(C3F4) testing and evaluating change initiative	how (**not mandatory**, acceptance criteria), who (IT department, **user**)
(C3F5) reward participants	monetary, **non-monetary**
Output	realized, deployed change initiative, realized benefits

9.4.4 Demonstration of a Preliminary Instantiation

The conceptual results of each design and development cycle were already initiated as prototypes and demonstrated within the case company. Starting with a reduced prototype the demonstration of the components and their functionality was initially conducted with a low-fidelity prototype (mock-ups). By extending the concept incrementally based on the preliminary results of the demonstration, the overall concept was instantiated as a responsive web application based on open source frameworks as shown in Figure 1.

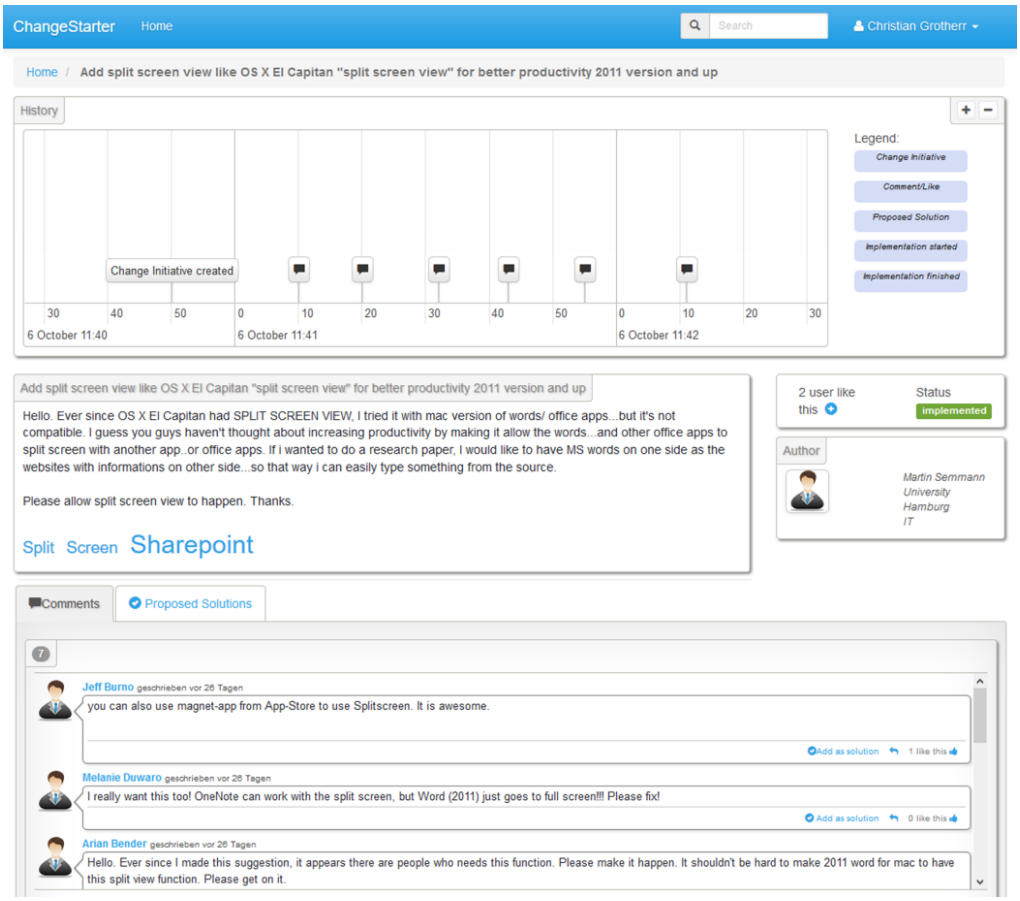

Figure 1. Instantiated User Engagement Platform supporting Benefits Realization

In sum, five workshops were conducted lasting two hours each including highly relevant stakeholders such as the CIO, head of IT operations, senior managers, representatives of the workers' council, and privacy commissioner to gain strong commitment of management as well as workforce.

Within the demonstration phase, feedback was gathered regarding the set of design variables and their manifestation to meet the requirements of the organization like the condition of voluntary and autonomous participation on the engagement platform. The results are highlighted in Table 2 to 4. Additionally, further extensions and improvements of features were discussed. For example, features were added to support discovering change initiatives (C2F1) like search functions and success stories. Despite this, every workshop helped streamlining the overall usability by simplifying the user interface to decrease adaption barriers.

9.4.5 Evaluation

As the first completed demonstration of the concept and its instantiation was successful, an extensive evaluation is currently planned. This evaluation is will be operationalized at the case organization and is open to all employees. Based on the gained commitment of relevant stakeholders during demonstration phase, we can deploy the prototype within the systems of the client and ensure deliberately low participation. Moreover, the evaluation does not have a dedicated timeframe and thus the internal crowd of the organization can evolve over time. The goal is to include 100 FTEs during the first phase of the evaluation. To achieve this goal, a set of potentially interested users is identified that could act as promotors for the concept within the organization. These users also serve as pre-tester to populate the platform with initial initiatives.

By evaluating the artifact within the organization, feedback is gathered applying qualitative methods such as interviews or thinking aloud to get insights on user's perception (Boren and Ramey, 2000, Myers, 2013) as well as gathering usage data. Accordingly, we do not only focus on the technical evaluation but also seek to gain insights on the social consequences of the artifact. Thus, the evaluation will contribute to the ongoing debate on socio-technical artifacts (Silver and Markus, 2013, Goldkuhl, 2013). The experiences and results of the evaluation are directly incorporated into further development and refinement of the concept.

9.4.6 Conclusion

Striving for a rise of benefits realization after a software introduction is formally closed, we presented a novel concept of an engagement platform. This concept utilizes a service systems perspective to

empower users by a bottom-up approach to propose, engage and discuss and finally implement changes for this software and work routines. By doing so, the entirety of users can improve sociotechnical interaction to enhance the creation of value in context. Consequently, users are empowered to realize benefits that could not sufficiently be addressed during the software introduction project but even more, can deal with emergent benefits collectively. As the design of the concept integrates practice-oriented as well as theoretical insights within a case organization to instantiate the concept, in depth knowledge on the integration of resources in a complex service system as well as engagement strategies can be gained. Thus, this research is a core foundation towards an evaluation that is evidence-based and bears the potential to further improve design knowledge on actor-centered service systems engineering. Additionally, the proposed concept relates to current research on benefits management that seeks to understand how benefits realization can be fostered on actor level.

As a next step, the concept will be evaluated in practice within the introduction of Microsoft SharePoint. Moreover, it is planned to apply the concept to other contexts to assess and further enhance the transferability. Especially, regarding the design variables we seek to identify beneficial combinations to strengthen the engagement of users and thus contribute to the still emerging research on actor engagement in service systems.

9.4.7 Acknowledgement

This research was partly sponsored by the German Federal Ministry for Education and Research in the project ExTEND under the reference 01FJ15125. Further information can be found under: http://www.projekt-extend.de/. Additionally, we thank Philipp Streicher for his efforts to prototypically implement the platform.

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10 Engaging Users to Co-Create – Implications for Service Systems Design by Evaluating an Engagement Platform

Grotherr, C., Semmann, M., and Böhmann, T. 2018. "Engaging Users to Co-Create – Implications for Service Systems Design by Evaluating an Engagement Platform", 51st Hawaii International Conference on System Sciences (HICSS), Waikoloa Village, Hawaii, USA.

Abstract

Far-reaching digitalization affords significantly more opportunities for engaging actors and mobilizing resources in service systems. By leveraging these capabilities, digitally enabled service systems can facilitate user-generated services. Traditional service engineering approaches provide for such service systems. This paper presents and discusses the evaluation of a field-based design science research project for designing an engagement platform that facilitates the co-creation of user-generated services. This study reports contributions to the design knowledge of such an engagement platform and their consequences for engagement activities. Based on the evaluation, we propose design propositions for such an engagement platform from a sociotechnical perspective.

Keywords

Actor Engagement, Co-Creation, Engagement Platform, Service System, Service Systems Engineering

10.1 Introduction

Service research and practice evolved within the last decade and had reached new levels of complexity. One shift that leads to this evolution was the transition from engineering of single services towards complex service systems [41]. Within those systems, the need to mobilize and integrate operand as well as operant resources is crucial. However, to mobilize and integrate these resources is still unknown or solely subject to high-level description. Even more, design knowledge regarding service systems still is scarce.

Design research acknowledges that engineering of systems requires consideration of social aspects as well as technical aspects. Despite this, approaches for such sociotechnical systems are not widely understood and applied [5]. As already mentioned by Orlikowski and Iacono [31] since 2001, information systems (IS) research analyzes IT artifacts from different perspectives. Accordingly, there is a need to analyze the sociotechnical environment [15] and IS researchers have called for more research on the dynamic between people and technology [1, 15, 28, 31]. This observation does relate strongly to service research, as this research area builds heavily on actors and their relation as well as technology [42]. This is especially mirrored in the discourse on service logic and service dominant logic [12, 23, 44], as well as technology-enabled value co-creation from a sociotechnical standpoint [9, 10].

Accordingly, through the growing interconnection of information technologies in every market, business- and individual area there is a need to analyze IT artifacts to understand reasons for success and failure of such development projects as well as their impact on the sociotechnical environment. Consequently, research that contributes to the systematic design and development of service systems leads to evidence-based design knowledge that contributes to service research as well as sociotechnical design research [6, 31].

A major challenge in service systems engineering is thus the formation of engagement platforms that link abstract value creation to engagement of actors that ultimately leads to realized value [42]. Since actors have to engage with each other on such a platform to co-create value as part of the resource mobilization, the success depends on the degree of engagement. However, individual actor engagement varies and depending on the motives for engagement, a focus on an individual level has to be taken [42]. These engagement properties are influenced by the design of the platform and are observable activities [42].

Following this service systems engineering perspective, this study reveals insights gained during the evaluation of a contextualized engagement platform within a naturalistic evaluation. The aim of this research is to derive design propositions for the design of successful user engagement platforms. Applying a sociotechnical perspective, functional and social design features and their relating effects on the intention of actors to perform value creation are analyzed. The aim is to understand the design of the engagement platform and its impact on the engagement activities as well as the organizational and individual issues surrounding its use. This leads to the following research question: *How does an engagement platform be adapted based on users' engagement?*

To address this research question, the aim of this research is to deepen the understanding of how sociotechnical artifacts influence user engagement. For this reason, a user engagement platform is observed and analyzed from a sociotechnical perspective. This engagement platform enables users to provide user-generated services as users suggest, rate, discuss, and jointly implement change initiatives, thereby contributing to a successful software introduction [37]. Accordingly, the technical and social design features of the platform are evaluated regarding their impact on the willingness of actors to engage on the platform. By doing so, insights will be gained regarding understanding the desired and undesired consequences of the choice of design variables. Based on these results, implications for the design of service systems will be derived for (a) resource mobilization and (b) possible service interaction points. The insights gained during the demonstration and evaluation of the user engagement platform provide evidence-based knowledge of the nature of sociotechnical systems and reveal several further research opportunities in the field of service systems. By doing so, this research contributes to the emerging field of service systems engineering with evidence-based design knowledge [6].

The remainder of this paper is structured as follows: the second section provides theoretical foundations and related research. The third chapter describes the research design. Subsequently, in the fourth section, we present insights on the benefits of the engagement platform, and the choice of design variables gained during the evaluation. Based on these results, the impact on user behavior and side effects are highlighted in the following and lead to design propositions for the design of value-adding service systems. The paper closes with a conclusion and future research opportunities.

10.2 Theoretical Foundations

10.2.1 Service Systems

Service engineering often considers services in isolation, but complex services comprise a combination of different services, so called service systems [41]. “Service systems are complex sociotechnical systems that enable value co-creation” [6] and are defined “as a value co-production configuration of people, technology, other internal and external service systems, and shared information (such as language, processes, metrics, prices, policies, and laws)“ [41]. In particular, a service system can represent in its smallest unit a dyadic relationship between a customer and the provider [20] but can also encompass complex service networks [11].

The service-for-service exchange perspective is a critical theoretical foundation for the development of service science and the study of service systems [25]. Thereby, value is created through contextualization and re-configuration of service systems [6]. Service science research revisits the importance in engagement of service systems as an integrated view [3, 12]. The development of evidence-based knowledge supporting the systematic development and piloting of service systems is one of the central research areas of service systems engineering [6]. Regarding the design of the elements of service systems, research and practice are faced with a lack of design knowledge, a growing complexity, and novel risks. Designing a service system entails the challenge of finding the right configurations of both IT and non-IT resources (actors) to create value in a context [6, 24, 25]. A central component to mobilize and integrate resources are engagement platforms which are defined as “physical or virtual touch points designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value, between actors in a service system” [8]. However, the engagement of actors depends on the motives to engage [43]. This behavioral view is defined through engagement properties. These relate to relational, informational and temporal properties as well to co-production and value-in-use activities [42]. Relational properties determine the social and institutional roles and position of an actor. Informational properties comprise the information basis for engagement which can be influenced by various actors. Temporal properties relate to the duration, regularity, and frequency of engagement and have implications for the design of channels.

This research contributes by deriving insights from a contextualized user engagement platform. Our aim is to ascertain how the institutional context and the design of the engagement platform influences engagement properties and engagement practices.

10.2.2 Sociotechnical Artifacts

Through the ongoing dissemination and interlocking of information technology within business and life information systems research highlights the importance of so-called IT artifacts [31]. An IT artifact can be defined as "...a distinctive element of our field, binding together multiple heterogenous elements of hardware, software, humans and institutions." [31]. This implies that artifacts always interact with their inner and outer environments and confirms that no clear boundaries can be drawn [39]. Thus, IT artifacts comprise not only technical but also, through the design for interactions with different actors, social aspects [17]. Combining these two properties, IT artifacts can be defined as sociotechnical constructs which perceive and interact with outside influences and include technical and social design features [2, 35, 38]. Thus, designing and analyzing such sociotechnical artifact implies two levels: (1) technical handling of the interface provided by the IT artifact as a foundation for (2) the social interaction and communication influenced by "[…] norms and linguistic elements […]" [14]. Hence, users are not able to conduct purely technical or social actions and therefore can't be analyzed separately [14, 40]. Artifacts are always engineered with the aim to interact with their embedded environment by providing functional properties to support the realization of defined goals [39]. For that reason, the analysis and assessment of an artifacts impact can only be performed within its inner and outer environment and during its use [14, 39]. To understand the IT artifact and the potential impact on its environment Orlikowski and Iacono [31] highlight five different views on IT artifacts: (1) nominal view, (2) computational view, (3) tool view, (4) proxy view and (5) ensemble view. Using these perspectives, the user engagement platform proposed in Semmann and Grotherr [37] was analyzed with a sociotechnical perspective to gain insight into how the technical and social design features of the engagement platform influence user behaviors and the engagement process.

10.3 Research Design

10.3.1 Overall Research Design

In this paper, we draw insights gained during the demonstration and evaluation phase of an ongoing research project following the design science research methodology (DSRM). Therefore, as described in the following section, an engagement platform was conceptualized in the case of a public organization. The aim of these previous research activities was to develop a prototype of the engagement platform which is deployed within a public organization with 1800 employees. Due to the ongoing and continuous integration with the case company, we conducted a formative evaluation in the demonstration phase and a summative evaluation. We choose a naturalistic evaluation to analyze the impact

of the engagement platform within the organizational and social environment. Embedding an engagement platform in a specific context provides the opportunity to understand the organizational and individual issues surrounding its use. The evaluation of the sociological impact is carried out according to the Framework for Evaluation in Design Science Research (FEDS) [45]. The DSR evaluation strategy of human risk & effectiveness was applied and leads to several evaluation cycles. Hence, the engagement platform was first evaluated in the demonstration phase with a close set of voluntary users. By conducting the formative evaluation, data is gathered to identify strengths and weaknesses of the engagement platform and to define improvements. After that, a rollout was conducted for a wider group of users within the organization to use the platform in daily work routines. This summative evaluation aims in understanding how the engagement platform is used within the naturalistic setting as a sociotechnical artifact and what implications can be derived to improve its use.

10.3.2 Previous Design Results

The introduction of new software within a company often leads to less than satisfying results and goals of the management team are regularly not achieved. This is particularly the case if the introduction leads to changes in users' daily work routines – projects which are called technochange projects [27]. Often, users only discover the full and sometimes unexpected potential of the software while they are already using it [7, 19]. This value is frequently realized after introducing the software [27, 30] when the project team is already working on new projects, and no resources are available to develop emerging requirements.

To counteract this phenomenon, untapped employee resources within an enterprise should be used, following the sharing economy paradigm [37]. The fundamental assumption is that employees or users of a software have free resources which they can use to improve their work environment. Furthermore, knowledge is spread throughout the entire company and can be used to improve software by adapting it to the needs of the users. Hence, users should be enabled to suggest, discuss, evaluate and realize so-called 'change initiatives' [37]. By doing so, users act as an internal crowd that is capable of coordinating and managing itself [47]. They are empowered to make decisions on their own, without the need for approval processes. Concepts like internal crowdsourcing [22, 47], benefits management [36] and the development of service systems [4, 44] are transferred into the context of software introductions.

The user engagement platform is developed as a platform which combines the concepts mentioned above [37]. This platform enables the realization of user-driven, internal change initiatives and should

be used within a company to improve software introductions. Therefore, mechanisms are provided for rapid and constructive feedback during the software introduction phase and thus directly contribute to agile and iterative improvements.

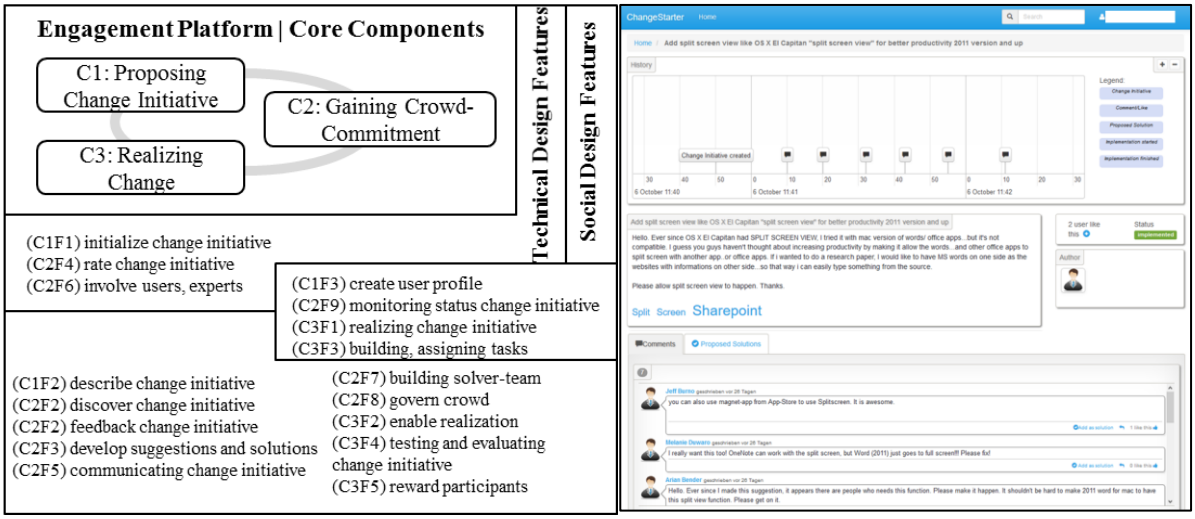

Figure 1. Core components, functions, and prototype of engagement platform (adapted from [37])

10.3.3 Data Collection and Analysis

During the evaluation activities, we collected data of (1) the software (logfiles, frontend, traffic) and user data through (2) thinking aloud and (3) observation. Through these sets of software data, conclusions can be drawn on activities on the platform. The analysis of the frontend especially allows for the interpretation of the content provided. To collect user data, we used thinking aloud as a method for "evaluations that are typically conducted at an early stage in the design process, where the results of the evaluation can be used to improve the system" [29]. In sum, 33 thinking aloud tests were conducted over a period of three months and with a duration of 30-45 minutes. Potential users were selected representing all hierarchical levels as well as business departments. During the thinking aloud tests, tasks were given to the users to become familiar with the engagement platform. To support users during this exploration, we decided to use the moderated thinking aloud [18]. Also, we observed the user during the execution of the provided tasks. Subsequently, a short interview was conducted to address aspects of the thinking aloud test and to get feedback from the user.

The engagement platform is placed within a dynamic and naturalistic environment, in which actors engage continuously through the proposed platform. By doing so, the boundaries between the engagement platform and its surrounding environment play a key role and become impossible to define and

distinguish clearly. Taking the perspective of the engagement platform as part of a work context, the interaction with its features do have implications on social actions [14, 31]. To gain a deep understanding of the impact of the design of the engagement platform and its influence on engagement properties it is necessary to replace the perspective of the engagement platform as a mere IT artifact with that of a sociotechnical artifact [14, 31].

To adapt the sociotechnical perspective, the design variables are classified as a preparatory step between social and technical design features as shown in Figure 1. This is necessary since the components described in Semmann and Grotherr [37] refer to the tool view representing a developer position. To analyze the impact of design variables and features of the engagement platform on the work environment and engagement properties we take a deep focus on the 'ensemble view' [31]. More precisely, we choose the subview 'embedded system' to analyze users' behavior which focuses on better understanding of how technology is used in a particular way embedded in a complex and dynamic social context [31]. Through this assignment, impacts can be determined by actors and the environment. The data gathered during the evaluation is mapped to this analysis framework and the results are presented in the following sections.

10.4 Evaluation Results

The evaluation is naturalistic in a real-world organization and aiming for voluntarily and ongoing participation of users on the engagement platform. Consequently, the first goal is to acquire users to join the engagement platform. Therefore, we invited users to participate in moderated thinking aloud tests. Doing so ensured a structured opening of the platform for all users and additionally ensured the first population of change initiatives as well as communication between the users. Thus, 40 user profiles were created for the invited users to perform the thinking aloud tests on the platform. At the end, we conducted 33 thinking aloud tests. The results are described in the following section.

As shown in Table 1, 27 ideas to improve the software were proposed on the platform within the component C1, thus confirming the assumption that users have ideas which leads to change initiatives. Relating to the change initiatives, users were aware of tagging their proposals and thereby contributed to enhancing the accessibility of the platform.

Table 1. User data gathered on the engagement platform

40	User profiles	C1
27	Change initiatives	C1
53	Tags	C1/C2
144 (34)	Likes (community management)	C2
82 (19)	Comments (community management)	C2
20	Solution proposals	C2 / C3
5	Realized change initiatives	C3

Its users perceive the engagement platform as a central communication medium which enables collaborative value creation. For example, a user recognizes the presence of "many helpful and technically experienced colleagues" on the platform. Almost all users used the comment and like mechanisms to express their opinions and to help other users with the same problem. Solely two users did not participate by commenting on proposals. Each user liked at least one initiative. Thus, interaction does take place on the platform and helps to provide valuable information of software use. This is fostered even more through the broad use of tags as organization-specific taxonomies within the naming scheme of the organization. Thus, access to information is easy, expert knowledge is made accessible to the entire organization, increasing the creation of synergies across business units. For example, some participants found a change initiative which was solved some days before or they were able to help in finding a suitable solution (C2F1). Accordingly, the collaboration and value co-creation of the users leads to first realized change initiatives (C3). However, depending on the change initiatives the scope of the solution varies. It can be classified into two types of user-driven change initiatives: (1) behavior change initiatives and (2) technical change initiatives. Ten users proposed ideas for changes to the software (C1) but did not recognize that the solution already exists. In this case, other users are able to explain how to use the software providing short how-tos and guidelines that complement behavioral change. From an IT departments perspective, these types of ideas indicate shortcomings of software training and thus indicate levers for improvement of these training services. In this case, there is no technical adaptation needed, but benefits can be realized through changing operational practices of the user. Further benefits from an IT departments perspective can arise from the provision of technical change initiatives. The IT department can be disburdened since a mature change initiative already contains detailed solution proposals developed by users collectively and thus

can be implemented more quickly (C3). Especially, as the head of IT operations states, “solutions based on open source projects help us to ensure timely implementation without the need for finding internal partners that could fund the initiative.”. Lastly, change initiatives that neither match the current portfolio of projects nor have high priority are integrated into the overall backlog. These change initiatives can be realized if relating projects occur or by members of the IT department alongside their daily routines.

10.5 Discussion

10.5.1 Design propositions for facilitating engagement

Based on the prior development of the platform that was done strictly by involving the organization [37], the engagement platform is evaluated within the organization and open to all interested employees. The results reflect insights of three months naturalistic evaluation. Given this setting, the usage within the first weeks was scarce, as few users applied the platform in their work routine. Accordingly, first change initiatives were contributed and comments were made on the platform as shown in Table 1.

Hence, various challenges and engagement barriers occur that influence the engagement properties of individual actors and therefore engagement activities. These barriers include all obstacles that arise when the platform is used or prepared for engagement but is prevented or interrupted from being used for social or technical problems. Social problems encompass e. g. uncertainty or lack of appreciation of the underlying value of the platform. Further, on actor’s behavior, not only positive types of interaction occur during the engagement process. For example, one change initiative was proposed on the platform to criticize previous events and completed projects. Technical problems, for example, can be related to the performance of the platform, usability aspects, or downtimes related to regular server maintenance. Hence, a disturbed or disabled communication flow has a negative impact on the sociotechnical communication of the actors and their embedded environment. These challenges limit the engagement of users and outline barriers for successful resource mobilization.

To draw conclusions on the design variables for the engagement platform as a sociotechnical artifact, user behavior is analyzed. Based on the analysis of the engagement properties, design propositions for the user engagement platforms and service systems are gained, supporting the engagement process and resource mobilization. By doing so, we enhance knowledge for contextualization and re-configuration of service components and resources as supposed by Böhmann, et al. [6]. Also, through the

design and evaluation of the user engagement platform, evidence-based knowledge for systematically designing and developing service systems is derived. By doing so, this research contributes to the lack of design knowledge for service systems [6].

Visibility of engagement activities as a resource mobilization mechanism through individual actors' recognition

The visibility of actors' engagement and their perception by other actors are crucial aspects when designing mechanisms for a user engagement platform. Visibility affects various engagement properties. First, informational properties are affected by users acting in their name and not anonymous. Thus, users are able to influence each other and are incentivized to mobilize their resources such as time and knowledge. Analogously, the power of actors based on their internal network or role can be leveraged as a relational property. Last, temporal properties are affected as visibility fosters continuous engagement of actors, as they are perceived as responsible for actions taken within the platform.

Through the evaluation activities, a contribution to the discussion of the *visibility of engagement activities* (anonymity of the engagement activities compared to providing transparency (C1F3)) and the perception of actors' activities by other actors can be made. Due to the type of engagement visibility on the platform, the effect on the engagement results in changes, creating different types of engagement or even values. There is evidence that suggests a positive relation between the visibility of engagement activities and the perception of other actors. Certain users seek to support other actors in solving a problem or realizing change initiatives (C2/C3) by sharing their knowledge and investing parts of their limited time budget. Through the variety of engagement activities, 82 comments are proposed on the platform. This leads to nearly every change initiative containing one solution proposal. By doing so, users try to represent themselves and their expertise within the company through the engagement platform. This result indicates a strong direction in defining recognition as a non-monetary motivational incentive (C3F5) that results in user enthusiasm and hence enables user engagement, ultimately leading to co-creation of value. Through the visibility of engagement activities, meaningful contributions can be made transparent to the community. Individual actors' enthusiasm accrues and leads to increased dynamics on the platform.

Another aspect that supports the engagement process through visibility of activities is the possibility to explore other peers based on their record of engagement. As noted during the observation of the thinking aloud tests, each actor would like to know who is engaging on the platform and contributing

to ongoing discussions. This creates group dynamics, which promote the development of the performance and target-oriented groups. This dynamic is reinforced by a strong interest in communication with the selected actors via the platform (C2F5).

Facilitating continuous engagement of leading actors and users on the platform to increase group dynamic

A supporting mechanism to increase continuous engagement and group dynamic is to facilitate the steady presence of leading actors and users on the platform. For example, leading and recognized users with domain knowledge should not only be regarded as so-called 'key users', but also have to show a continuous presence on the platform. Therefore, they have to be integrated continuously on the platform as described to trigger platform dynamics (C2F6).

For this purpose, the design variable *communicating change initiative* (C2F5) has a positive impact on the engagement properties, i.e. temporal, informational and relational properties. Additional engagement opportunities are requested by fourteen users, which include the connections and interfaces as they represent accessibility to the platform. Several statements are identified which indicate that users want to be automatically and continuously informed via multiple channels. Thus, new activity on the platform is pushed to all actors to increase platform dynamic. Even the argument of increased information flow yielded during the interviews was accepted by about 90% of the participants, since it was stated out that the interaction and presence on this platform are most important to the actors. Thus, actors are given the opportunity to influence the informational properties, as they can timely give a direction with feedback to other actors. Several participants used the like mechanism and assigned 144 likes and 82 comments for proposed change initiatives to express their opinion, affecting the decision-making. In addition, by multichannel communication, the ability to mobilize support or access to resources is fostered (C2) [42].

Facilitating engagement with managed engagement visibility

However, the visibility and transparency of the engagement activities can also potentially lead to barriers to engage. Some users stated that especially regarding data privacy "the time and content of the engagement activities are transparent to everyone and can lead to a transparent status." For example, two users were concerned about how to formulate change initiatives due to concerns over their proposal being unimportant or evoking critical comments. Thus, through proposing a change initiative, this contribution may be associated with the individual actors as an indirect representation of

their personality. This uncertainty leads to a high entry barrier and reduces engagement. Hence, there are engagement scenarios in which a partial anonymity can positively influence the platform dynamics. For example, by applying the possibility to contribute anonymously, a reduction of the inhibition level for organizational- and hierarchical-critical questions and the possibility of voicing complaints can be achieved. A similar effect can be achieved with a temporary anonymity of the user (C1F3). As soon as the communication or contribution gains more interest or approval, the anonymity is rescinded and results in a clear assignment to the participant.

In sum, the choice of making engagement activities visible indicates a positive impact on actors' recognition and group dynamic and therefore supports resource mobilization. In addition, the visibility of engagement activities preserves the quality of engagement, although every user should be given the opportunity to be able to discuss simple questions without harming themselves. Nevertheless, when choosing the variant of anonymity challenges have to be taken into account, since a high proportion of anonymous contributions leads to reduced personality and, in the worst case, to a so-called "firestorm" [34, 32, 33]. Further, bullying could arise due to the lack of anonymity but has not been an issue within the evaluation. Consequently, not only the design variable for engagement visibility has to be considered in the design process, but also a quality of users' engagement has to be guaranteed through introducing adequate measures (C2F8).

Establishing community management to govern actor engagement

A possible mechanism to (1) govern the crowd and (2) activate users for engaging is to *establish community management* (C2F8). Seven users highlight the importance of such a role for quality management and moderation on the platform. The role of a mediator is necessary because different attitudes of actors as well as existing policies lead to conflicting interests and uncertainties. For this reason, a quality assurance should be guaranteed by a moderator. Also, the moderator could present the development and top themes in the weekly report or directly inform users via newsletter about updates on the platform. Giving these stimuli for resource mobilization, an increased platform dynamic will be the result.

10.5.2 Organizational framing and boundaries: Implications of service systems in context

Even though service systems often comprise additional resources to provide a value proposition, the proposed user engagement platform does not comprise dedicated resources for value creation, since users engage on this platform on a voluntary basis. This is in line with the statement given by Maglio,

et al. [26]: “In this context, economic exchange depends on voluntary, reciprocal value creation between service systems (each system must willingly interact, and both systems must be improved).” Actors such as a community manager supports value creation and the engagement process, but value is only created if external actors and resources of adjacent service systems engage into the value co-creation process. Thus, resource mobilization mechanisms have to be developed to support actors’ engagement. Nevertheless, engaging actors on a voluntary basis remains challenging. For example, actors seek and consume external resources such as knowledge, but are often not willing to share their own resources. Reasons for this phenomenon are diverse. One user stated out that especially in “within a hierarchical organizational structure, the resource knowledge reflects authority and strength which nobody wants to lose.” This behavior attributes to the absence of a culture of knowledge sharing and corresponding incentives. An intermediate-term goal of the organization involved is to achieve a culture of knowledge sharing. To address this goal, the first step is to break down silo mentality and establish a culture of collaboration and cooperation. Therefore, not only users should engage on the platform, but moreover leading actors (C2F6). These actors may engage in defined processes and responsibilities on the platform to provide for example qualified assessments for change initiatives (C2F7). Building on these processes and responsibilities, the evaluation shows that an engagement platform needs strong integration within the organization. Thus, these additional possible service interaction points were identified. As highlighted during the evaluation, the IT department and the corresponding responsibility for portfolio and requirements management derived valuable insights and implications for improvements from a wide range of users. As the example of the head of IT operations shows, he could extract some useful implications to evaluate current training services as well as admit solution proposals into the portfolio. This supports the identification of unrealized benefits for newly introduced software, which is one central purpose of an established competence center within the case company. Accordingly, new potentials and synergies can be created for different actors through further integration, which is realized through adaptation and contextualization of the existing user engagement platform, thereby increasing the value proposition. To integrate the engagement platform into existing service systems, a decision has to be made on the roles and processes to be related to the interaction design. However, this integration also brings unforeseen challenges due to a growing complexity and conflicts of interests as well as value of each engaged actor. Conflicting goals between actors - especially considering varying granularity of actors, i.e. business units or individual actors - should be taken into account when developing cooperative engagement platforms to increase synergies. This has to be mirrored by developing a mutual value proposition for the platform and accordingly, extending it by contextualized value propositions based on actors’ roles. For example,

the engagement platform seeks to establish transparency on change initiatives in general but also contributes to knowledge management, as developments are described within the platform and can easily be integrated with corresponding tools.

Further research is needed to understand what binds actors in a service system together. Although it was recognized that this could not be achieved by standards or technologies, but "a trinity of resources: competences, relationships, and information" [23]. To address these research opportunities, further investigation has to be undertaken to embed the engagement platform in wider service systems contexts through reconfiguration and contextualization. There is a need to examine how diverse actors offer value through integration on the engagement platform and how this platform would be shaped by mutual influence of different actors.

10.6 Conclusion

Engagement platforms represent a promising opportunity for organizations to bundle creativity and diverse potentials of actors and resources through reconfiguration and enhance their ability to develop new services, processes, and improvements. Despite this potential, designing and developing engagement platforms to leverage service systems is considered a challenging aspect that remains poorly understood [6]. Due to the ongoing digitalization, the boundaries between technical and social subsystems to sociotechnical systems disappear [46], and information systems cannot be viewed as an isolated entity that has an impact on their environment but IS and environment have to be viewed as a single entity.

To obtain such a view, the user engagement platform proposed by Semmann and Grotherr [37] has been analyzed from a sociotechnical perspective. Therefore, we used the 'ensemble view' [31] to focus on the interaction and social implication for actors as the dominant perspective of analysis. The aim was to evaluate users' behavior on the platform to draw conclusions on the sociotechnical integration in the organizational environment. For this purpose, the technical and social design features of the engagement platform were compared to the sociotechnical actions and the effects on users' behavior.

As a result, the impact of the engagement platform on its social environment and users' behavior is highlighted. These findings relate to insights on type of engagement (e.g. contribution), the engagement activities (e.g. communication and interactions) and engagement barriers (e.g. user's uncertainties). For instance, we draw conclusions on the visibility of engagement activities that have a strong

impact on users' behavior. Based on these insights prescriptive knowledge [16] on how to design user engagement platforms with their corresponding design variables is derived. This relates to social design features such as the visibility of engagement activities (C1F3), governance mechanisms (C2F8) such as establishing community management, but also to technical features such as supporting the active communication of change initiatives and involving actors (C2F5). Moreover, the resulting implications influence not only users' behavior and engagement activities within daily work practices, but also on an organizational level. Thus, it is shown that the user engagement platform provides further opportunities to be integrated into existing processes to increase the value within the organization. Further, the need for organizational framing and interfaces to other service systems is highlighted with the aim to exploit the value-creating potential of the engagement platform fully. By doing so, this paper contributes on the one hand to the design of service systems by demonstrating the results of a contextualized user engagement platform and deriving design propositions for the design of such service systems [6, 42]. On the other hand, this research contributes to the ongoing discussion of sociotechnical artifacts and their relating effects on their environment [13, 21].

The launch of the engagement platform and the start of the evaluation took place at the same time. Thus, first contributions and comments were made on the platform, but it takes time to establish an engagement platform and empower users to co-create qualitative solutions. Due to the initiation and adoption phase of the user engagement platform, the transfer to sociotechnical effects is therefore not given due to several aberrations. Thus, establishing a new user engagement platform remains challenging. Several activities are necessary to engage users on the platform, which entail a high time and cost for carrying out the evaluation. For instance, the value of the engagement platform and its related function may be not understood by its actors. It takes time to communicate the value from an actors' perspective and to educate users in handling the platform. Further, during the evaluation, the reactivation to engage users on the platform remain challenging.

In addition, due to the explorative nature of these research project, the challenge is to handle and interpret design mistakes. As a consequence of this limitation, the sociotechnical artifact fell back on a purely technical artifact, which thus has reduced or no communication and information capabilities. From a methodological viewpoint, further research is needed to understand the systematic engineering of service system under conditions of instability and change during the design and development process. Furthermore, the challenge to re-engage actors on the user engagement platform after a period of inactivity occurred, leading to novel research opportunities. As complex design science projects are confronted with a time lag between initial design and results of an evaluation, further resources to

timely adapt the artifact are needed. This is especially crucial in naturalistic settings. Also, mechanisms have to be identified on how the initial design could cope with limitations identified while evaluating. Ultimately, the collected results represent a snapshot which gives first important insights but must be verified in distinct organizational settings. Further research is needed to verify the proposed implications for designing a user engagement platform. Therefore, additional evaluation activities should be conducted continuously and in different organizations to gain insights on the sociotechnical impact in different environments.

10.7 Acknowledgements

This research was partly sponsored by the German Federal Ministry for Education and Research in the project ExTEND under the reference 02K14A170. Further information can be found under: http://www.projekt-extend.de/.

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11 Using Microfoundations of Value Co-Creation to Guide Service Systems Design – A Multilevel Design Framework

Grotherr, C., Semmann, M., & Böhmann, T. (2018). „Using Microfoundations of Value Co-Creation to Guide Service Systems Design – A Multilevel Design Framework", International Conference on Information Systems (ICIS), San Francisco, California, USA.

Abstract

Service systems enable value co-creation. However, value co-creation is a complex phenomenon that is difficult to observe, let alone to purposefully enact. This is a serious challenge for the design of service systems. To address this challenge, we propose a multilevel design framework for service systems, which builds on actor engagement as a microfoundation of value co-creation. Based on this work, we conceptualize a design framework, which emphasizes (1) a multilevel perspective to understand interdependencies between the institutional set-up on macro level, engagement platforms as facilitators for resource mobilization and integration on meso level and observable actor engagement on micro level as well as (2) a dynamic perspective through two iterative design cycles to continuously refine service systems. We illustrate how this multilevel framework informs and guides service research and practitioner in a systematic design process, thereby contributing to service systems engineering.

Keywords

Service Systems Engineering, Multilevel Design Framework, Microfoundations, Actor Engagement, Value Co-Creation

11.1 Introduction

In recent years, the adoption of information technology within highly dynamic environments is one key characteristic of digitalization with the aim to enhance the identification of opportunities and create new service systems (Legner et al. 2017). In this regard, open phenomena emerge such as open resources (e.g. open content), open process (e.g. crowdsourcing) and opening effects (e.g. open education) that fundamentally shift business models (Schlagwein et al. 2017). This facilitates resource mobilization and integration within digital enabled service systems and leads to a shift from a single service perspective to open service systems (Böhmann et al. 2018). However, these open service systems substantially depend on resource mobilization and actor engagement (Böhmann et al. 2014; Storbacka et al. 2016).

The concept of service systems as a basic abstraction has emerged as a central research interest in the service science literature (Maglio and Spohrer 2008; Peters et al. 2016; Spohrer et al. 2007; Vargo and Lusch 2016). Although previous research has focused on the systematic development of single services in service engineering (Alter 2008), this perspective does not provide guidance to systematically design complex interconnected systems of services that need contextualization to co-create value (Böhmann et al. 2014). Thus, service research has recognized the need for further investigation that addresses the emergent importance of service systems and their systematic development (Alter 2012; Lusch and Vargo 2011; Maglio et al. 2009), which is the focus of service systems engineering (Böhmann et al. 2014).

Despite thorough conceptualizations of value co-creation in service research (Meynhardt et al. 2016; Ostrom et al. 2015), empirical evidence on the operationalization of value co-creation and relating design decisions in service systems design is scare (Böhmann et al. 2014; Ostrom et al. 2015; Pinho et al. 2014). Service systems do not co-create value per se because designing service systems entails the challenge of identifying the right configurations of actors and resources (Edvardsson et al. 2012). Solely addressing service systems design on an abstract level is not sufficient, and hence, this type of approach lacks consideration of the actors' interactions (Pinho et al. 2014) on engagement platforms and how they are shaped by an institutional logic (Vargo and Lusch 2004). Ensuring actor engagement is crucial for value co-creation within the overall service system and thus is especially difficult to design dynamically and in a contextualized way (Storbacka et al. 2016). Because value co-creation is abstract and the design of complex service systems challenging, the design of service systems requires

guidance to steer the interactions of actors and corresponding design decisions. Furthermore, empirical research addressing the design of engagement platforms within service systems is needed (Gabriela et al. 2017).

Applying microfoundations represents a beneficial way to overcome this issue. Originating in the social sciences, microfoundations seek to bridge the gap between aggregated, macro level research and micro level research on actors and individuals (Barney and Felin 2013). However, few conceptualizations of multilevel research currently exist in service research, that helps to understand value co-creation outcomes and perspectives (Chandler and Vargo 2011; Gabriela et al. 2017). Moreover, none of these research streams provides a holistic perspective on design activities for service systems. By adapting the microfoundation movement of strategic management and applying it to service systems, Storbacka et al. (2016) provide a framework that conceptualizes actor engagement as a microfoundation of value co-creation, bridging the gap between the macro concept of value co-creation in service systems with the empirically observable actor engagement at the micro level. Building on this concept as the foundation, we propose that this multilevel conceptualization of value co-creation is a powerful theoretical framework for designing service systems. This enables a broader perspective for the design of service systems, which evolve around an engagement platform as a major facilitator for highly co-created services that are typical of many digital innovations (Akaka and Vargo 2014; Breidbach and Maglio 2016; Patrício et al. 2018). This leads us to the following research question: *How can microfoundations of value co-creation guide the service systems design?*

Therefore, we conceptualize the service systems design process as a sequence of interactions within the service system and design effort on all levels to address the dynamic nature of service systems and evolution. This provides a foundation with which we can analyze the effects of design decisions on each level and how the dynamic and simultaneous interactions of actors shape the design of the engagement platform and the reconfiguration of the service system (Lusch and Vargo 2014). Moreover, we derive implications for systematically design service systems, which contributes to service systems engineering (Böhmann et al. 2014). These design implications link service system components with applicable design activities on each of the three levels. The design activities are incorporated in two intertwined design cycles that shape the interconnected levels of a service system. On the one hand, the institutional set-up on macro level shapes design decisions for service system components and actors' disposition to engage. Based on interventions and evaluations in actor's environment insights are gathered which leads to refinements on the institutional set-up. This is reflected by the institutional design cycle. On the other hand, actors have to be stimulated to actively and continuously

engage into value co-creation. This requires additional resource integration and mobilization patterns, which are built and reflected within the engagement design cycle.

The multilevel design framework for service systems design is applied to a design science research project to demonstrate the applicability. By doing so, we illustrate how this new multilevel concept of service systems engineering informs the design process of a complex intra-organizational service system in which users generate services for themselves. This helps service practitioner to understand how to apply this framework into real-world scenarios and deriving insights on design decisions and effects on value co-creation.

The remainder of this paper is structured as follows: The next section provides the theoretical foundation for creating the multilevel design framework. The third section presents the conceptualization of the multilevel framework and describes its corresponding design activities. The fourth section demonstrates the applicability of the proposed framework exemplified on a design science project. The fifth section discusses the results regarding previous research. The paper closes with a conclusion and avenues for future research.

11.2 Theoretical Foundations

11.2.1 Service Systems and Service Systems Engineering

Service research has recognized the need to shift the focus from a dyadic perspective characterized by customer engagement (Van Doorn et al. 2010) and supported by numerous approaches in service engineering (Alter 2008; Bullinger et al. 2003) to one that focuses more on complex interrelated systems of services (Alter 2012; Lusch and Vargo 2011; Maglio et al. 2009). Service systems are defined as “complex sociotechnical systems that enable value co-creation” (Böhmann et al. 2014, p. 73), that comprise of a configuration of a distinct set of interconnected resources, such as actors, information, technology and other service systems (Spohrer et al. 2007). The actors include those who are involved in the process of interactive value co-creation with their knowledge and skills (Alter 2012; Vargo and Lusch 2004).

Designing service systems entails the challenge of finding the right configurations of actors and their resources to co-create value in a certain context (Maglio and Spohrer 2008). Thus, the systematic development of service systems is addressed by the new discipline of service systems engineering, which advances evidence-based design knowledge (Böhmann et al. 2014). Focusing on the engineering of (1) service architecture, (2) service systems interaction, and (3) resource mobilization, service

systems engineering aims to advance knowledge on the supporting models, methods, and artifacts (Böhmann et al. 2014). To enable novel business models, service systems need to be adaptive to specific contexts to enable multi-sided and networked value co-creation, which is enabled by service architecture (Ekman et al. 2016; Gummesson and Mele 2010). According to the service-dominant logic, value is created through a collaborative and contextualized process (Edvardsson et al. 2011; Vargo and Lusch 2004), and hence, resource mobilization is a key prerequisite for service systems interaction (Böhmann et al. 2014).

Moreover, driven by the emergence of new technologies, digital transformation takes place within society and organizations and thus reshapes the nature of business models and organizational structures (Peters et al. 2016), facilitating the design of new and innovative service systems (Lusch and Nambisan 2015). These fast-changing, real-world environments increase uncertainty and complexity in service systems design. A central feature of service systems is their dynamics and ability to reconfigure themselves, adjusting the configuration of actors and resources to a changing context over time (Frow et al. 2014; Vargo et al. 2008). To find the right configuration of actors and resources for innovative service systems, a dynamic perspective and explorative approach are required to understand how these systems evolve, learn and adapt their configurations over time (Ostrom et al. 2015). To address these issues, research approaches such as piloting (Schwabe and Krcmar 2000) and (action) design science research could be applied (Hevner et al. 2004; Sein et al. 2011). Recent research in various domains calls for a rapid and prototypical build, intervene and evaluate cycles for developing innovative artifacts in service environments, as supposed to for example by lean-startup (Ries 2011) and service design approaches (Yu and Sangiorgi 2018). Applying an iterative and validating design process with a focus on real-world interventions is particularly useful for service systems design because this approach enables service systems designers to become acquainted with the current configurations of service systems and institutional logic (*formulate problem*). This understanding of the institutional set-up must be considered in the design iterations (*build*). The continuous interventions within the real-world environment (*intervene*) allow researchers to observe effects in a certain context in relation to the design decisions (*evaluate*). This leads to valuable insights on the effects and utility of design decision (*reflect*), which might be reflected by the adjustments and changes in the current service systems configuration (*formulate problem*). Hence, this iterative design and validation process captures the uncertainties and dynamics in its context, leading to evidence-based design knowledge for service systems (Böhmann et al. 2014). In addition, applying an iterative process pro-

vides a structure and guides service systems designers to systematically plan and conduct design iterations. This turns the design process into manageable and repeatable activities and serves as a foundation for developing service systems engineering approaches.

11.2.2 Microfoundations for Value Co-Creation

Value co-creation is a complex phenomenon that is difficult to observe, let alone purposefully enact (Payne et al. 2008; Pinho et al. 2014). This is a serious challenge for the design and engineering of service systems (Böhmann et al. 2014). Moreover, an observation of the success of service systems and realized value-in-context on a macro level is not trivial because of the time gap between the initial design of service systems and realized value in the environment of individual actors. To address this challenge, the current paper extends previous research on the multilevel conceptualization of value co-creation. Multilevel conceptualization has been used in previous service research for example to explore the context in which value co-creation occurs (Chandler and Vargo 2011), the division of service concept, system and encounter perspective in service design (Patrício et al. 2011), value co-creation outcomes (Gabriela et al. 2017), or to define actor engagement as a microfoundation for value co-creation (Storbacka et al. 2016). The aim of microfoundations is to search "for potential micro explanations of heterogeneous macro outcomes, tending to focus on bottom-up influence, aggregation, and different forms of emergence." (Felin et al. 2015, p. 588). In this regard, Storbacka et al. (2016) subdivided the concept of co-creation to microfoundational mechanisms explained through actor engagement (see Figure 1). Solely addressing one level to design value co-creation is not sufficient, because value co-creation is a complex set of interdependencies and interactions of individual actors (Pinho et al. 2014), one that is shaped by institutional logic (Storbacka et al. 2016) and facilitated through engagement platforms (Breidbach et al. 2014; Breidbach and Brodie 2017). Therefore, applying microfoundations for value co-creation provides a promising theoretical foundation to bridge value co-creation with observable actor engagement (Storbacka et al. 2016). Regarding abstract co-creation in service systems at the macro level, drilling down toward the meso and micro levels that relate to individual actors is beneficial for investigating manifestations of the value-in-context of a service system (Chandler and Vargo 2011; Edvardsson et al. 2011).

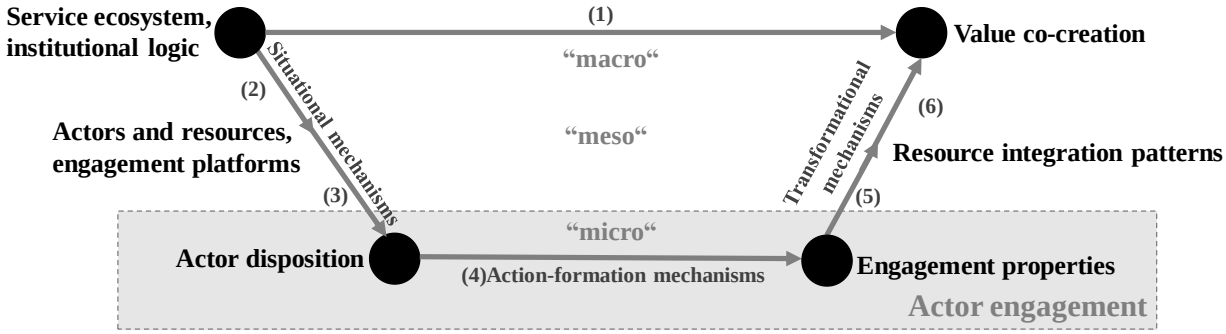

Figure 1. Actor Engagement explains Value Co-Creation (Storbacka et al. 2016)

Storbacka et al. (2016) proposed a three-level model in which co-creation within service ecosystems forms the macro level (see Figure 1 (1)), while the micro level is conceptualized by actor engagement: "Actor engagement is conceptualized as both the disposition to engage, and the activity of engaging in an interactive process of resource integration within the institutional context provided by a service ecosystem." (Storbacka et al. 2016, p. 3008). However, although scholars have noticed that the notion of service ecosystems might be similar to service systems (Vargo and Lusch 2016), a broader perspective is emphasized through the consideration of institutional logic. As Akaka and Vargo (2014) stated, service ecosystems focus on "the interaction within and among service systems" (p. 371). Following this conceptualization, we consider organization as a service ecosystem where different service systems exist and interact with one other.

Service systems at the macro level affect actors as individuals or as groups of individuals at the micro level. The institutional logic of the service ecosystem with its values, norms, and rules guides the interactions between actors. These situational mechanisms (see Figure 1 (2,3)) shape the disposition of actors and the "willingness" to engage. Although actors actively contribute to resource integration, the meso level, for instance, engagement platforms take the role of a multisided intermediary and facilitates resource mobilization and resource integration (see Figure 1 (2)). Engagement platforms are defined as "physical or virtual touch points designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value, between actors in a service system" (Breidbach et al. 2014, p. 596). Ensuring engagement activities through action-formation mechanisms is key to the success of the overall service system and depends on the actors' motives to engage (Van Doorn et al. 2010), leading to engagement properties (see Figure 1 (4)) (Hedström and Swedberg 1998). Engagement properties relate to relational, informational and temporal properties, as well as to co-production and value-in-use activities (Storbacka et al. 2016). Guided by the transformational

mechanism, these engagement properties are transitioned back to the service system ultimately leading to value co-creation (see Figure 1 (5,6)). Accordingly, value co-creation at the macro level subsumes all engagement properties. The configurations of actors and resources are linked by resource integration patterns that capture solutions for recurring design problems (Peters 2016).

11.3 Conceptualization of Service Systems Design as Multilevel Framework

11.3.1 Overview of the Multilevel Design Framework for Service Systems Design

The design of service systems and piloting of real-world service systems provides valuable insights for evidence-based design knowledge (Böhmann et al. 2014). Despite these beneficial attributes, gaining design knowledge remains challenging because of their complex nature and difficult-to-control context. Unknown conditions and dynamic environments necessitate an explorative approach for designing service systems. To attain a systematic approach for service systems engineering, we propose a multilevel framework for service systems design. Our approach enables service system designers to deal with a priori unpredictable findings. The multilevel framework approaches the challenges in service systems engineering from the context of dynamic and complex interactions and is created based on the following two theoretical foundations:

- An *iterative and validating design process* that captures the volatility and uncertainties of designing sociotechnical service systems in highly dynamic environments and that is based on action design research (Sein et al. 2011) and piloting (Schwabe and Krcmar 2000), as proposed by previous research (Böhmann et al. 2014; Patrício et al. 2018)

- A *multilevel perspective* that bridges the goal of value co-creation and the corresponding context with observable phenomena and designable elements that is based on microfoundations for value co-creation (Storbacka et al. 2016) (see Figure 1)

Based on the two foundations, we propose a multilevel framework for service systems design (see Figure 2) that guides service researchers and practitioners in their effort to systematically plan, operationalize, and validate design activities in complex and dynamic service environments.

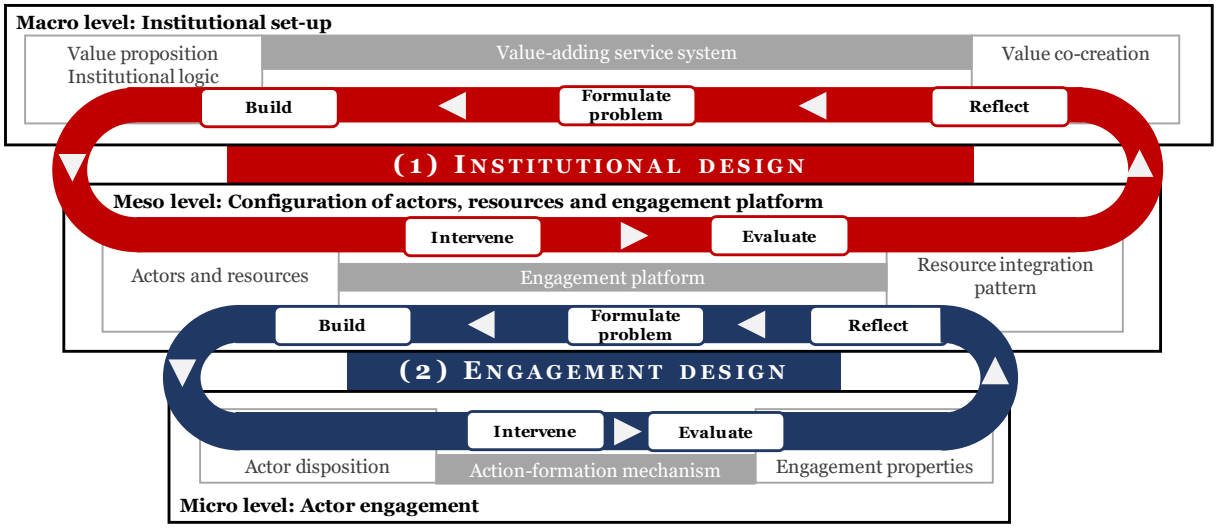

Figure 2. Multilevel Design Framework for Service Systems

First, the contextualization of service systems design by using real-world design approaches is taken into account. Reoccurring and early reflections on the assumptions of formulated problems and design hypotheses are critical when adjusting the design process and ensuring an improved understanding of emerging service systems. Second, the framework emphasizes that the contextualization of service systems and a real-world piloting approaches not only takes place on an abstract level, but also at different levels of abstraction that have various goals, challenges and opportunities. In this regard, the multilevel framework comprises two interdependent design cycles, as follows:

(1) *Institutional design:* This design cycle highlights on the one hand, the shaping role of the institutional set-up on design decisions for resource mobilization and integration. On the other hand, because of reoccurring design cycles, refinements on the institutional set-up might be necessary. Thus, the goal is to build an institutional set-up comprising of commitments or arrangements of actors and resources to facilitate an effective resource integration pattern for value co-creation (see Figure 2 (1)).

(2) *Engagement design:* This design cycle emphasizes the importance of resource mobilizing and actor engagement through engagement platforms. Thus, the goal is to build sociotechnical components such as engagement platforms and engagement patterns, that facilitate engagement of actors with various dispositions and resources (see Figure 2 (2)).

For bridging these two design areas, intertwined design cycles are proposed, which on the one hand connect the levels by repeated experimentation and improvements, that consider the dynamics in context and, on the other hand, also enable a systematic deduction of evidence-based design knowledge

from both design cycles. These improvements can be straightforward as, for example, adding technical features on engagement platforms as part of the reflection phase on the meso level. However, regarding the emergence and evolution of service systems (Ostrom et al. 2015), substantial changes, including the guiding value proposition, assumptions concerning the institutional logic, and the configuration of actors and resources might occur, which have implications at the macro level. Because of these anticipated and unanticipated consequences in service systems design and intervention, system designers should be open to changing service systems as suggested by Gregor and Iivari (2007). Thereby, each design cycle and iteration will increase the understanding of actor engagement, resource integration and corresponding service system design decisions the given real-world environments. This highlights the process of in-depth learning with service systems design in a provided context and facilitates the early identification of an actor's intentions to engage in value co-creation and the discovery of effective configuration of service systems. By doing so, this multilevel framework for service systems design guides service researchers and practitioners when designing and scaling up service systems iteratively by providing several improvements to value-adding service systems.

11.3.2 Implications of Multilevel Interdependence for Service Systems Design Activities

In the following, we provide insights into the dynamics of service systems design by linking abstract value co-creation and observable actor engagement with the corresponding design activities (Figures 3 and 4). We extend this theoretical framework by operationalizing design activities. The proposed framework aims to uncover (1) the interdependence between macro, meso, and micro levels and upwards from the micro to meso to macro level and (2) the dynamics in service systems design and evolution. By doing so, we aim to bridge the gap between information systems scholarship and practice (Nunamaker et al. 2015; Te'eni et al. 2017).

Institutional Design – Incorporating and Transforming Institutional Set-Up

The goal of value-adding service systems design at the macro level is to find the right configuration of actors and resources that represent effective resource integration patterns and lead to value co-creation (Storbacka et al. 2016). To build these effective resource integration patterns, it is essential to consider the institutional set-up of the service system. The institutional set-up provides a frame in which service systems are designed and operated. Thus, the goal of the institutional design cycle is to initially *create* and, through recurring design iteration, to *refine* the *institutional set-up* and related components, such as the value proposition and configurations of actors and resources (see Figure 3). First, the value proposition of the service system creates a frame that shapes the engagement design

and willingness of actors to engage (Chandler and Lusch 2015). Second, substantial refinements of this configuration through agreements, commitments, and the mobilization or modification of actors facilitates resource mobilization and integration by reducing, for example, engagement barriers of actors at the micro level.

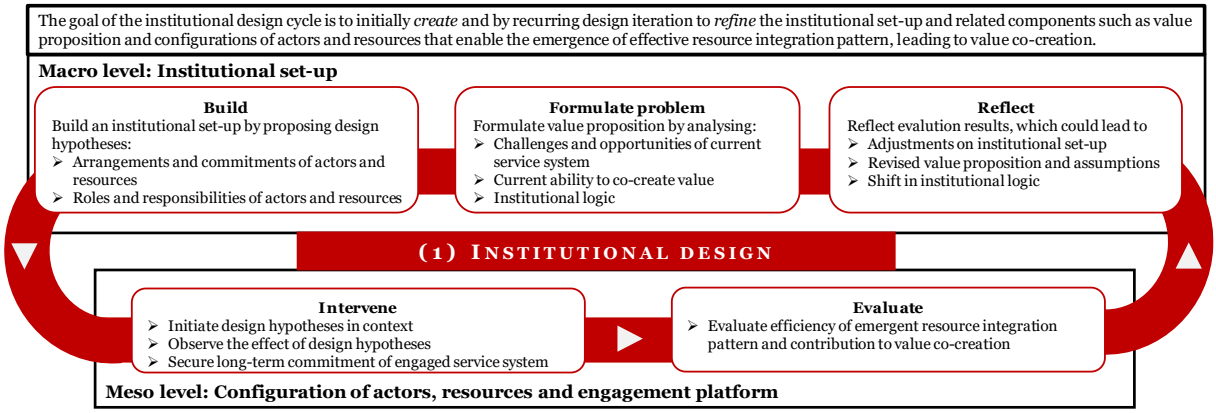

Figure 3. Design Activities and Implication at Institutional Design

As a first step in the *problem formulation* phase (see Figure 3), it is crucial to identify challenges and opportunities in the existing service systems and current value co-creation. Because value co-creation and the evaluation of resource integration patterns depend on contextual factors (Chandler and Vargo 2011; Vargo et al. 2015), empirical investigations are essential (Sein et al. 2011). To set the stage of service systems, the (1) institutional logic of the service system and (2) affected actors and resources of the current configuration must be analyzed. Based on these findings, a value proposition will be derived, guiding further building activities in institutional and engagement design.

To accomplish the defined value proposition, design hypotheses are formulated in the *build* phase. These hypotheses comprise an initial configuration of actors and resources, that integrate knowledge, skills, and time into an interaction with other actors and resources. Leveraging technological opportunities as operant resources (Akaka and Vargo 2014; Breidbach and Maglio 2016), engagement platforms emerge as a promising phenomenon for resource mobilization and integration. Engagement platforms link multiple engagement activities of individuals and provide the opportunity to aggregate individual engagement activities into resource integration patterns. In addition, integrating the engagement platform and service systems outcome into wider service systems at the macro level encourages resource mobilization. This is even more important, because time is a scarce resource (Murphy 2007) and actors' roles must guide value proposition. The benefits of engaging actors need

to be highlighted by drawing on interaction points between the service system and engagement platform and by engaging actors of adjacent service systems (Grotherr et al. 2018).

These design hypotheses are transitioned into the given context during the *intervene* phase and are used to conduct the evaluation (see Figure 3). More precisely, because mobilizing and integrating actors and resources are crucial for value co-creation, a *transition from institutional design to engagement design* is needed (see Figure 2). With this, an ongoing continuity regarding value co-creation can be realized after the service system is initially designed and introduced into the actors' environment. Doing so establishes the possibility of identifying and reacting to changes in context, for example, emerging resource integration patterns and value. However, defining and measuring value co-creation remains challenging. The individual value perceived is difficult to measure and the degree of adaption to an individual context is opaque. Moreover, a lack of understanding concerning the promoted value proposition and resistance in the adaption phase can lead to value co-destruction (Echeverri and Skålén 2011). Even if resource integration patterns are identified, this does not mean that they will contribute to value co-creation. The emerging resource integration patterns must be evaluated by analyzing their contribution to value co-creation (see Figure 3). These insights must then be reflected by the refinements of the institutional set-up and contribute to evolution of the service system: this comprises newly identified challenges (*formulate problem*) that are transformed into adjustments of the value proposition, the mobilization of new actors and resources, or an adapted configuration of actors and resources (*build*) to facilitate actor engagement.

To perform comprehensive interventions in the actors' environment and refinement of institutional set-up, for instance, in an organizational context, securing long-term commitment is crucial (Sein et al. 2011). Here, top-management commitment a key success factor for organizational transformation (Kotter 2007). This is even more important in the case of service systems evolution because top-management serves as a facilitator for resource mobilization by adding additional actors and resources into the service system. Furthermore, the continuous interventions in the context can lead to transformations at the macro level. For instance, in the case that the platform's design contradicts existing institutional logic and when actors engage within the platform, a shift in the institutional logic might arise in the long term. Accordingly, we argue that engagement platforms are both an outcome of service systems design and a medium to foster transformation in service systems. This transformation is in line with the need to take a human-centered focus in service systems design and their transformative role in service research (Patrício et al. 2018).

Engagement Design – Design Implications on Meso level Shaping Actor Engagement

Designing effective resource integration patterns for actor engagement and value co-creation is crucial because they relate to the emergence of service systems that enable innovation (Peters 2016). However, these resource integration patterns cannot be designed deterministically, but rather, they must be derived from action-formation mechanisms and the resulting engagement properties at the micro level. Thus, for successful value co-creation it is necessary to engage multiple distributed actors within the service system. To facilitate value co-creation at the macro level, sociotechnical components such as engagement platform on the meso level support effective resource integration (Breidbach and Brodie 2017). Moreover, from a sociotechnical perspective (Orlikowski and Iacono 2001), engagement platforms need to provide mechanisms that facilitate action-formation mechanisms. Accordingly, the goal of the engagement design is to *build and instantiate sociotechnical components* in a context that enables actor engagement with various dispositions for resource mobilization, thereby facilitating the emergence of resource integration patterns.

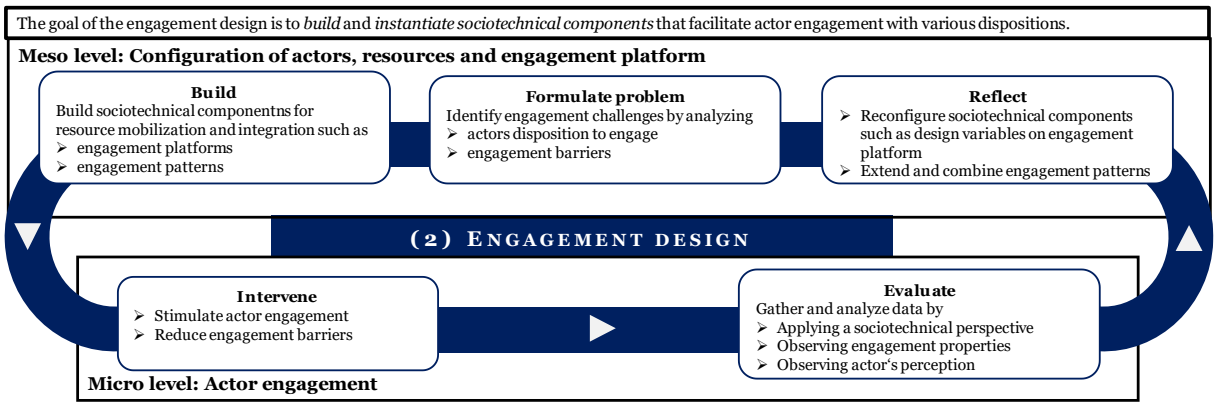

Figure 4. Design Activities and Implication at Engagement Design

Determining the design of service systems and engagement supporting sociotechnical components such as engagement platforms comes with challenges because the actors' disposition to engage is difficult to determine. As a starting point, the institutional logic shapes actors' disposition to engage and might lead to engagement barriers, which must be considered when designing engagement platforms (*formulate problem*).

Actors' dispositions and engagement barriers can be explored by selecting design variables in advance (*build*) and can be based on the insights gained during the empirical investigation and evaluation, meaning that a subsequent adaption of the design variables is required. By providing design variables

on engagement platforms, there are multiple engagement patterns that are applicable (Semmann and Grotherr 2017). This ensures that different actor dispositions are considered within the service system. For example, the visibility of engagement activities can be conceptualized through anonymous contributions, given partial anonymity, or by providing a user profile with a real name (Haines et al. 2014). This leads to advantages and drawbacks for actor dispositions that relate to the call for analyzing trade-offs between patterns. The aim is to evaluate these trade-offs and, if necessary, to identify further mechanisms to foster engagement activities. Moreover, there are relationships between these engagement patterns, which interact with each other for effective resource integration and value co-creation, and must be integrated into a broader pattern, the so-called network-of-pattern architecture (Storbacka et al. 2016).

To perform a comprehensive *intervention* and evaluation activities, it is crucial to mobilize the actors to engage (see Figure 4). Several engagement-supporting mechanisms that are intended as action-formation mechanisms for facilitating resource mobilization must be applied to the engagement platform to stimulate actor engagement. For example, providing initial contributions on the platform reduces engagement barriers and instructs actors on how to engage within the platform. These engagement patterns motivate actors to engage, have a positive impact on actor dispositions and facilitate resource integration. In addition, continuously engaging recognized actors who are leaders increases group dynamics because they have an exemplary function and promote engagement (Grotherr et al. 2018).

To build a basis for *evaluation,* data must be gathered during the intervention (see Figure 4). These data include engagement platform activities such as log files and observations of actors' perceptions and interactions during engagement with the platform. Through a comprehensive evaluation of the engagement platform and perceived value of the actors, insights can be gathered on (1) how the institutional logic of the service system shapes actors' disposition to engage, (2) actors' past, present, and possible future disposition to engage with the engagement platform, and (3) how the design of the engagement platform and inherent engagement patterns influence social actions. Based on these results, resource integration patterns emerge, consisting of a distinct combination of actors, resources, and a mediating engagement platform, ultimately resulting in action-formation mechanisms and engagement properties (Storbacka et al. 2016). Based on the evaluation, implications can be derived for the redesign of the engagement platform, hence supporting resource mobilization and integration (*reflect*) and promoting the maturity of resource integration pattern to complement the service system. Changes in the design variables of an engagement platform will likely influence actors' disposition

to engage, thereby leading to new opportunities for action-formation mechanisms. Even if actor engagement can be stimulated through engagement pattern in the engagement design, changes may need to occur in the institutional set-up for sustainable and long-term actor engagement. This reflection on the meso level represents the *transition from the engagement design to the institutional design* (see Figure 2). Moreover, during the continuous intervention, heteropatric resource integration patterns may emerge, which have conceptualized the emergence of opportunities and in which new capabilities, such as structures, concepts or mechanisms, evolve (Peters 2016).

11.4 Exemplary Application of the Multilevel Design Framework

In this section, we demonstrate the interconnectedness of the macro, meso, and micro level by applying the proposed multilevel design framework to the aforementioned design science research (DSR) project. Table 1 provides a brief overview of the service systems context and data generated during the evaluation and will be explained regarding the multilevel design framework in the following.

Table 1. Brief Service Systems Context Overview and Usage Data on Engagement Platform

Service systems context			**Data gathered platform**		
	Type of organization	Public organization, port agency		*User profiles*	**40**
	Number of employees	1,800 employees		*Change initiatives*	**27**
	Institutional logic	Environment of stability, top-down hierarchy, administration, clearly defined tasks		*Tags*	**53**
	Value proposition	Empowering users with user-generated services for effective software introduction and use		*Likes*	**144**
	Resource integration pattern	Software-specific improvements by proposing, discussion and realizing "change initiatives"		*Comments*	**82**
	Applied principle	Internal crowdsourcing		*Solution proposals*	**20**
	Tool support	IT-enabled engagement platform		*Realized change initiatives*	**5**
	Research approach	Design science research			
	Data collection & analysis	Interviews, thinking alouds, usage data, qualitative content analysis			
	Affected business units	Multiple business units			
	Number of participants	50			

11.4.1 Setting the Stage – Capturing the Service System and its Institutional Logic

The design science research project was conducted over a timeframe of two years. To ensure the relevance and applicability in practice, the project was conducted collaboratively with a public organization with 1800 employees. The organization serves as source for problem input as well as for the piloting of an engagement platform in a real-world environment. As the first step of a design science research project and within the *institutional design* is to *formulate the problem* (see Figure 3). In our example, this phase aimed at identifying problems within the current service system, here being "software introduction". Therefore, we conducted 20 semi-structured interviews with employees of the public organization to obtain an empirical framing (Rubin and Rubin 2011). The interviews took between 45 and 60 minutes and were recorded, transcribed and analyzed using qualitative content analysis (Schreier 2014). The interviewees comprised members of the software introduction project and actors from different involved business units. Participants were asked what their experiences were with the chosen software introduction example and what they desired to do differently. By doing so, we gained insights on (1) the current challenges in software introductions and realizing value and (2) the institutional logic of the case company, here with an emphasis on the service system at hand (see Table 1). In general, common norms and values for public organizations have been shown to affect resource mobilization and integration (Wagenknecht et al. 2017). The empirical framing revealed that each business unit was responsible for funding further customization efforts. However, possible synergies, such as a consolidation of the customization requests between business units, had been neglected, which would have been particularly feasible during the introduction of enterprise software. This so-called "silo mentality" also inhibits knowledge exchange and general sharing across business units. These norms and values are based on the underlying institutional logic. Most public organizations focus on functional expertise and environmental stability which embodies top-down approaches. In addition, public organizations often deal with routines and administration. One interviewee phrased it as a "work-to-rule" mentality. Furthermore, the actors confirmed that little is known about the processes and channels for submitting change proposals for the newly introduced software. These issues have been extensively discussed in previous research because top-down approaches for software introduction are common although bottom-up approaches are especially important during the introduction and adaption phase of software (Markus 2004; Semmann and Böhmann 2015). These insights into the challenges of the service system "software introduction" led to the value proposition "empowering users with user-generated services for effective software introduction and use" (see Table 1). This guiding value proposition and identified institutional logic were considered in the subsequent design activities.

11.4.2 Transitioning from Service System to Engagement Platform

The interviews and previous research conducted in benefits management (Semmann and Böhmann 2015) borrowed to the service system "software introduction" serves as a baseline for the second stage of the design science research method 'objectives of the solution'. Owing to our design vision of engaging actors in the co-creation of value in the service system of "software introduction", we transition to the 'design and development' stage of the DSR methodology and *built* the design hypothesis (see Figure 3) that an engagement platform is needed to empower actors to create and realize change initiatives with the goal of improving the introduced software (Semmann and Grotherr 2017). A mechanism to enhance actor engagement here is internal crowdsourcing, in which emphasis was given to collaboration between actors. Research carried out on internal crowds (Zuchowski et al. 2016) has shown that user-driven services can be provided. This approach emphasizes the transition of an actor's role from a passive and consuming role to an active facilitator for the co-creation of value. In this regard, we determine "software-specific improvements through proposing, discussing and realizing change initiatives" as a promising resource integration pattern for value co-creation in the service system of "software introduction." (see Table 1). As part of the 'demonstration' phase of the DSR methodology we started with a reduced web prototype that mirrored the resource integration pattern in the first iteration, and introduced the engagement platform into the organization to specify the design variables of the platform as described in Semmann and Grotherr (2017) (*intervene*).

11.4.3 Action-Formation Mechanisms for Actor Engagement

For determining the design variables and incorporating the institutional logic in the design of the engagement platform (see Figure 4), the case organization was involved in the *build* phase within the *engagement design cycle* through recurring workshops and interviews with experts in all hierarchy levels (Semmann and Grotherr 2017). Next, we introduced and established this platform into the public organization for 6 months (*intervene*) so that actors could engage continuously through the platform in a naturalistic environment. During this intervention, we gathered usage data (both quantitative data, such as usage statistics, and qualitative data, such as submitted contributions and comments) and conducted 33 thinking alouds to get insights on user's perception (McDonald et al. 2012). Participants were selected across different business units and hierarchical levels and thinking alouds were conducted with a duration of 30-45 minutes. Tasks were given to become familiar with the platform and to observe the user during the interaction with the platform. As the engagement platform is placed in a naturalistic environment in which actors engage, taking a sociotechnical perspective is required (Goldkuhl 2013). To *evaluate* the impact of the platform design on actors' disposition and engagement

properties (see Figure 4), we specifically applied the "ensemble view," which focuses on how the artifact is embedded and used in the social context (Orlikowski and Iacono 2001). The data gathered during the intervention is mapped to this analysis framework. As part of the 'evaluation' phase of the DSR methodology, implications for further design activities were identified within the reflection phase. Examples are highlighted in Table 2, briefly described in the following and in detail in Grotherr et al. (2018).

Table 2. Overview of Evaluation Results and Implications for Design Activities

#	Micro level Results	Meso level Implications	Macro level Implications
1	Lack of use/need for triggers to engage actors	Establish community management, provide initial content and newsletter on the engagement platform	
2	Risk of improper use of the platform, leading to value co-destruction	Provide community guideline, establish community management	
3	Lack of use/need for triggers to engage actors	Integrate knowledge management on the engagement platform	Integrate into adjacent service systems, commit knowledge management to retain change initiatives
4	Lack of skill and knowledge to realize technical change initiative	Engage the IT department on the platform	Mobilize the IT department's resources

Nevertheless, actors can be concerned about engaging within the platform. Thus, we built several engagement patterns that stimulate engagement and reduce engagement barriers, leading to resource mobilization. For instance, engagement patterns that facilitate actor engagement by temporarily engaging in the resource integration process stimulate actor engagement, for instance, by providing initial content on the engagement platform. By providing automated and regular newsletters we aimed to increase actor awareness (see Table 2, #1), which relates to the additive aggregation in resource integration, whereas the resulting action-formation mechanisms of actors are conceptualized as complex aggregation (Barney and Felin 2013). However, there were relations between these engagement patterns, which have to be reflected in the engagement design (see Figure 4, *reflect*). If an actor discovered a promising change initiative via the newsletter, he could forward it to other actors via the sharing function. By doing so, actors could engage on the platform, leading to action-formation mechanisms and engagement properties, such as likes and comments. To secure the quality of engagement properties, community guidelines could define the rules for contributions (see Table 2, #2). Based on

the evaluation results, a change in the design variables was implied, revealing the need for establishing "community management" with the goal of the crowd governance and fostering of engagement activities (Grotherr et al. 2018). The transparency and visibility of engagement activities can lead to engagement barriers because the contribution of time and content are transparent to every actor. Therefore, the possibility to contribute anonymously may reduce entry barriers, but can lead to, in the worst-case scenario, the so-called "firestorm" (Rost et al. 2016). Consequently, engagement visibility must be considered in the design process and managed through mechanisms such as community management. Moreover, a community manager may engage with the platform, facilitating awareness or becoming more actively engaged by modifying resources and thereby relational properties.

11.4.4 Encapsulating Effective Resource Integration Patterns

The continuous empirical intervention led to action-formation mechanisms and observable engagement properties on the platform, such as comments, likes, or tags. Accordingly, 27 change initiatives and 20 solution proposals were submitted, which were based on 82 comments, 144 likes, and 53 tags (see Table 1). To find a solution proposal for a change initiative, several interactions between these actors was necessary to gain insight into the actor's context, generate solution proposals and realize the change initiatives. However, there are scenarios in which an actor does not engage but indicates that a change initiative should be questioned by simply not participating. This can be an indication that the desired change initiative solely relates to one individual actor and will not create value in the entire service system. Accordingly, the resource integration pattern "change initiative" encompasses a combination of actors, their resources, and shared resources and engagement properties. Thus, we derived in the *evaluation* phase within the *institutional design cycle* a configuration of an effective resource integration pattern "change initiative", that consisted of (1) 2…n engaging actors who could provide (2) the time, knowledge, and skills related to software adaption and customization in their work context as resources, leading to (3) 2…n engagement properties.

11.4.5 Value Co-Creation Facilitated through Service Systems Evolution

In the reflection phase, we identified in the institutional design the need to integrate the output of the resource integration pattern "change initiative" into the context of the service system and adjacent service systems to enhance synergies and fully exploit value co-creation (see Table 2, #3). For instance, lightweight change initiatives, such as workarounds or how-tos, can be integrated as a resource into the adjacent service system "knowledge management," thereby preserving this resource and in-

creasing accessibility to other service systems and actors. Another proposed change initiative highlights that technical change initiatives especially can provide detailed, contextualized solution proposals, but additional actors, such as the IT department, must engage and integrate their resources to realize these types of change initiatives (see Table 2, #4). Thus, committing and mobilizing additional actors leads to the evolution of service systems, ultimately contributing to value-adding service systems (see Figure 3). Furthermore, during the naturalistic intervention, heteropatric resource integration patterns emerged, which conceptualized the emergence of opportunities, in which new structures, concepts or mechanisms could evolve (Peters 2016). In this regard, actors recognized and stated out that there are "many helpful and technically experienced colleagues." As a result, actors engaged outside the platform to discuss suitable solutions for a proposed change initiative. During the discussion, further relational factors were identified, leading to future cooperation between these actors and serve as a starting point for a shift in the institutional logic (see Figure 3, *reflect*).

11.5 Discussion

Service research has significantly expanded service design (e.g. Wetter-Edman et al. 2014; Yu and Sangiorgi 2018; Zomerdijk and Voss 2010) and service engineering approaches (e.g. Bullinger et al. 2003). Recent research has called for a shift from the dyadic customer and service provider perspective to a systems perspective for services (Alter 2012; Maglio et al. 2009). Accordingly, service systems engineering has emerged as a new research discipline, here calling for evolving service systems engineering approaches within the given context and empirical insights on engineering activities, which contributes to evidence-based design knowledge for service systems (Böhmann et al. 2014). By taking a sociotechnical perspective of service systems, the research considers information technology as an opportunity for service innovation and value co-creation (Breidbach and Maglio 2016; Lusch and Nambisan 2015). However, the design of service systems faces several challenges and therefore is a complex endeavor. Dynamics in context, changing environments and various actors' dispositions make it difficult to plan design activities in a systematic manner. This is particularly important in the case of the active engagement of actors because their disposition is difficult to plan in advance, and engagement properties contribute toward value co-creation at different degrees of efficiency (Gabriela et al. 2017). Thus, drilling-down towards micro level enables an analyzing and understanding of actor engagement (Storbacka et al. 2016). This has already been emphasized in service research because abstract value co-creation is lacking in operationalization (Ostrom et al. 2015).

The proposed multilevel design framework for service systems provides a novel understanding of designing complex, contextualized service systems. By applying (1) two interleaved, iterative and validating design cycles and (2) a multilevel perspective, we aim to provide guidance for service researchers and practitioners to extend knowledge on service systems design activities in complex service systems. The goal of this multilevel, iterative design approach is to provide a foundation for a step-by-step design process for service systems. Applying the multilevel perspective provides valuable insights and helps in understanding how design activities, decisions, and interventions with the engagement platform and individual actors at the micro level are impacted and interrelate with the institutional set-up of the service system at the macro level. Thus, in contrast to recent approaches that solely are described on an abstract level, the novel understanding of service systems design implies a broader perspective on the design objects. Specifically, it goes beyond engagement platforms towards resource integration patterns and assimilation on institutional arrangements and commitments of actor's environment. However, this does not mean that high-level design is not feasible. Rather, it is essential to create an institutional set-up by means of tangible, actor-specific design interventions, which in turn affects resource mobilization at the meso level and hence actors' disposition to engage at the micro level. For instance, the evaluation results can indicate competence shortcomings regarding the available skills of engaging actors, which can be addressed by establishing training initiatives. Moreover, it is a key objective to reflect the assumptions made at the outset, for example, in relation to understanding of the institutional logic to guide further building activities.

Because the design activities need to be responsive to a changing context, the framework enables a better understanding of how the interaction of service systems' design in a given context leads to the emergence of service systems. In fact, by depicting the dynamics in context and the resulting implications at various levels, a contribution is made to service systems engineering. In contrast to previous proposed engineering approaches, this multilevel framework emphasizes the complexity of specific contexts at different levels of abstraction and the subsequent design iteration with different goals, design activities, and effects on value co-creation. This supports service researchers and practitioners in coping with the complexity of service systems design. Moreover, we propose that the design activities of service systems comprise of a continuous interplay between *development* and *scaling-up design activities* for both the institutional design and engagement design. On the one hand, the goal is to develop effective resource integration patterns that contribute to value co-creation at the macro level. On the other hand, the success of the service system depends on actor engagement and, consequently, on resource mobilization and service systems growth. Thus, scaling-up service systems

through continuous resource mobilization is required. Solely addressing one level will insufficiently represent complex and evolving service systems that have multiple, engaged actors.

Furthermore, linking microfoundation for value co-creation with corresponding design activities on multiple levels raises several implications to the ongoing discourse on design science research. This paper shows based on an underlying design science research project how to systematically derive design knowledge for service systems from a real-world application. The multilevel perspective with validating design cycles is suitable for designing service systems, which facilitate resource mobilization and integration of various actors with mediating sociotechnical components such as engagement platforms. The iterative and reflecting nature of the design cycles captures uncertainties and dynamics in actors' environments by continuously evaluating and refining resource integration pattern as well as the institutional set-up. This is in line with current design science research literature, which propose a shift from purely technical artefacts to sociotechnical artefacts (Drechsler 2013; Orlikowski and Iacono 2001; Silver and Markus 2013). Due to several uncertainties and dynamics in actors' disposition to engage, traditional design science research methods with a priori problems and defined objectives are not appropriate to lever outcomes. Thus, the effect of sociotechnical interventions into actor's environment need dynamic consideration that imply a shift towards a context and outcome-dependent explorative design approach as facilitated by the novel framework. This emphasis on sociotechnical systems as dynamic, unknown and complex environments which evolve as actors engage in their daily environment (Germonprez et al. 2011), is in line with the effectuation concept from entrepreneurship research (Sarasvathy 2001) and is reflected in current design science research discourses (Drechsler and Hevner 2015). Moreover, this perspective captures more appropriate uncertainties in the context to find "new solutions for new problems" (intervention) (Gregor and Hevner 2013, p. 345).

11.6 Conclusion and Outlook

Value co-creation is a complex phenomenon that is difficult to observe and even more challenging to design. Following the shift of perspective to complex service systems, value co-creation is solely described abstractedly, and the systematic design of service systems is challenging. To contribute to the systematic development of service systems, we developed a multilevel design framework for service systems that is based on microfoundations for value co-creation and iterative design approaches, which can be used to build and intervene in real-world environments. Furthermore, we conceptualize the design process as a sequence of interactions within the service system and design effort at all

levels to address the emergent character of service system evolution. Based on these theoretical foundations, we deduced a *multilevel perspective* with three levels and *two iterative, validating design cycles*. Applying a multilevel perspective to service systems design bridges the gap between macro level phenomena and micro level observations. Thereby, the interdependencies among these levels can be analyzed, enabling scholars and practitioners to design service systems at the macro, meso and micro level. This perspective goes beyond the design of engagement platforms as IT artefacts with an emphasis on actor's environment, it's institutional logic and corresponding social norms. By applying two iterative and validating design cycles linked with the multilevel perspective, different levels of abstractions, goals, and corresponding design activities can be addressed. This enables service researchers and practitioners to break down design activities and the resulting implications into actionable interventions. We emphasize that service systems design in both design cycles focus on an interplay between *development* and *scaling-up activities*. On the one hand, the aim is to develop the mechanism and configurations of actors and resources that leads to an effective resource integration pattern and contribute to value-adding service systems. On the other hand, because of the dynamics in service environments, an explorative approach is needed to support continuous service systems growth and provide a mechanism for resource mobilization and actor engagement. In this regard, the *institutional design* cycle focus here is on the initial creation and continuous refinement of the institutional set-up of the service system at the macro level. The institutional set-up provides a frame for the design of service systems and shape design decisions made at the underlying meso and micro level. More precisely, through refinements made on agreements, commitments, and configurations of value propositions, actors and resources, resource mobilization is facilitated. These refinements are linked with changes in actor's disposition to engage and the resulting engagement properties might lead to a shift in the institutional logic of the service system and thus constitute the transformative character of service research. Mobilizing and engaging actors is key for the emergence of resource integration patterns and value co-creation in service systems. Thus, the aim of the *engagement design* cycle is to design validated sociotechnical components, such as engagement platforms and engagement patterns that facilitate actor engagement with various dispositions. Building on a design science project that aims to foster the value co-creation of actors with user-generated services, we demonstrate the application and utility of this multilevel framework.

However, designing service systems in real-world settings remains time and resources-consuming for building and establishing value-adding service systems. Several design activities are necessary to create and refine the institutional set-up and engage actors continuously into value co-creation. In this

regard, defining and measuring value co-creation remains challenging because of a time lag between the initial service systems design and the intervention in the given context and value co-creation. As the snapshot of one evaluation episode provides limited access and limited conclusions can be drawn on the extent of the resource integration patterns for the entire service system, further investigations need to be carried out to determine the output of resource integration patterns and value co-creation at the macro level. Therefore, it is necessary to consider the design of service systems from a short, medium and long-term perspective.

To draw conclusions on the service systems design, taking the perspective of observable engagement properties at the micro level seems reasonable. However, because of the explorative nature and various actor's dispositions, several issues arise. For instance, encouraging actors to leave their traditional, conventional modes of interaction and engaging continuously with other actors is challenging. In addition, mechanisms must be identified regarding how the initial design could cope with limitations identified while evaluating, especially in the intervention phase. From a methodological viewpoint, further research is needed to understand the systematic engineering of service systems under conditions of instability and change during the design process and to provide guidance for service researchers and practitioners within these dynamic service environments to design sustainable and value-adding service systems.

11.7 Acknowledgements

This research was partly sponsored by the German Federal Ministry for Education and Research in the project ExTEND (http://www.projekt-extend.de/) under the reference 02K14A170.

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12 Multilevel Design for Smart Communities – The Case of Building a Local Online Neighborhood Social Community

Grotherr, C., Vogel, P., & Semmann, M. (2020). "Multilevel Design for Smart Communities – The Case of Building a Local Online Neighborhood Social Community", 53rd Hawaii International Conference on System Sciences (HICSS), Grand Wailea, Maui, USA.

Abstract

Smart cities and communities aim for social well-being. Mobilizing and integrating various institutions, actors, and resources are crucial when building and instantiating smart community initiatives. The design of such an arrangement is a complex phenomenon, difficult to conduct systematically and to observe empirically. We address this challenge by applying a multilevel design framework for service systems to an ongoing design science research project. The research project pursues the goal of building a neighborhood community as an instantiation of smart communities by activating and leveraging local institutions, actors, and resources on an IT-enabled engagement platform. We demonstrate how this multilevel perspective informs the design process for building smart communities. Based on micro-level observations, the interdependence of engagement-stimulating mechanisms related to the platform's design at the meso-level, and design implications for the institutional arrangement at the macro-level are emphasized as inseparable design activities for mobilizing and integrating actors and resources.

Keywords

Design Science Research, Engagement Platform, Multilevel Design, Microfoundation

12.1 Introduction

Developing smart cities, which are driven by new technology to enhance citizen well-being, has become a major priority for urban and rural governments [1]. Local governments invest heavily in exploring new ways to become smarter, connected, and more sustainable [2]. Although the broader concept of smart cities has been investigated in previous research [3], current research seeks to dig deeper into the design of smart communities, which are connected to improve well-being [4]. Thus, we focus on neighborhoods as instantiations of smart communities in smart cities. Social exclusion is an increased risk which affects the aging population, especially in growing metropolitan regions, and leads to increasing anonymity in residential neighborhoods [5]. This cycle of growing anonymity is overcome by initiatives that integrate infrastructure, technical and human resources, into social neighborhood communities [6]. In this context, cities have begun to address the challenge of an aging society by implementing neighborhood services, which are facilitated by information technology [7]. Technological advancements can help increase social inclusion and improve accessibility to urban environments. The positive effect on social well-being of integrating various actors with information technology has been shown in previous studies [7, 8].

Although extant research recognizes that building smart communities is a multidimensional effort [9], little is known about how to utilize this concept. Designing smart communities is even more abstract, and designing collaboration between actors challenging [10]. From a sociotechnical perspective, mobilizing and integrating various actors requires more than technological advancements [11]. Individuals are shaped by technological design, and at the group level by social control, norms, and values [12, 13]. This results in integration activities of technological advancements, institutions, and infrastructures with human interests. Diverse interests and changing environments lead to uncertainties when building smart communities. In turn, building smart communities should not be a matter of coincidence, but systematically coordinated and supported by institutional arrangements.

As knowledge of how to manage and systematically conduct design actions for building smart communities with the use of technology is scarce [14], new approaches are required which adapt to varying circumstances. This leads us to the following research question: *How can design activities be conducted systematically to build smart communities?*

To investigate this research question in detail, we analyzed a social community building project that aims to improve peer-support services and access to resources of local service providers. By applying

mechanisms of local neighborhood communities, we aim to capture insights into building smart communities by engaging multiple actors, ranging from institutions to individual actors (citizens). Specifically, we build on an IT-enabled neighborhood service platform, which facilitates mobilization and integration of resources, and aims to ensure a high quality of life for citizens.

The aim of the ongoing research project is to ramp up and build conditions for an emergent smart community. Especially among an aging population [5], individual needs must be captured, to facilitate a rethinking of mental models toward an open, networked, and informed smart community. Based on this research project, we enhance our understanding of building smart communities in smart cities by adopting a service systems perspective, with an emphasis on peer-support services, facilitated by technology use. We adapt a multilevel perspective for service systems design that helps to operationalize and manage design activities to build a smart community. We conclude that smart cities, smartness, and related components are not only multidimensional [9] but also relate to a multilevel perspective. The proposed multilevel model helps to manage complexity on (1) multiple levels and (2) with dynamics in changing environments, by pointing out the path to social well-being with corresponding design activities and elements. This means engaging citizens at the micro-level, facilitated by intermediaries, such as engagement platforms at the meso-level, which leads to value co-creation at the macro-level. This perspective extends beyond the adaption of information technology by integrating actors and institutions as designable elements and results in a systematic approach to build smart communities. We further derive recommendations for engagement-facilitating mechanisms, and provide a novel perspective on social community building.

The remainder of this paper is structured as follows: Section 2 summarizes related work on smart and neighborhood communities, and service systems conceptualizations. Section 3 describes the methodology and the research project. Section 4 provides an in-depth research project description according to the multilevel framework. Section 5 discuss the evaluation results, followed by implications in section 6. Finally, section 7 summarizes the research results and identify future research work.

12.2 Theoretical background

12.2.1 Smart and neighborhood communities

The technological, institutional, and human dimensions of smart cities are frequently discussed [9]. Institutional aspects relate to regulations, governance, and policies, while social dimensions aim to respond to human interests, such as health or education issues [15]. Technology components range

from smart infrastructure to the application of information technology to integrate citizens within an engagement process via engagement platforms [10, 16]. Previous research on citizen engagement aimed at creating participatory innovation platforms, on which the democratic culture is reflected in shaping policy decisions and open innovation approaches [17, 18]. This reflects the integrated perspective of technology as a key enabler for smart cities to engage citizens in the decision process with the aim of increasing environmental sustainability [19].

Recent research extended citizen engagement to the concept of smart communities, in which the community members and infrastructures are connected via technology to improve well-being [15, 20]. Smart communities can be defined as "a community broadly ranging from a small neighborhood to a nation-wide community of common or shared interest, whose members, organizations and governing institutions are working in partnership to use IT to transform their circumstances in significant ways" [9, p. 286]. In this sense, smart communities connect local governments and institutions, and inhabitants to impact life and work in the local region positively [9].

Engaging citizens via technology to increase geographic and social proximity is key to the success of smart communities [21]. A strategy for engaging in local communities is to build on online social networks (OSNs) [22, 23]. Online social networks provide the opportunity to connect organizations, and citizens among themselves. Thus, bridging access to local actors and resources by using online social network technology, such as engagement platforms, raises the opportunity to integrate offline and online activities into one unified instance [16]. However, although online social networks are not limited to regional boundaries, the networks do not address the specific needs of local communities [24]. Establishing neighborhood communities is a challenging process, due to the focus on localness. Stricter requirements regarding trust and privacy among participants, in conjunction with a limited number of actors, may hamper the formation of a critical mass of neighbors.

12.2.2 Service systems and engineering

Service systems have emerged as a service research priority, are defined as "complex sociotechnical systems that enable value co-creation" [25, p. 73], and focus on actors, resources, and institutional arrangements for value co-creation [26]. Value is created through an interactive process of engaging actors, and resource mobilization is key for service systems interaction [27]. Adapting information technology, such as engagement platforms, emerged as a phenomenon that facilitates communication and coordination of relationships between actors and the creation of new service systems [28, 29]. Finding the right configuration of actors, resources, and information technology is a key activity for

interactive value co-creation [30]. The systematic design is addressed by the service systems engineering discipline [25], which focuses on the design of (1) service architecture, (2) service systems interaction, and (3) resource mobilization with models, methods, and artifacts [25].

From a service systems perspective, smart communities are sociotechnical systems [31] that comprise various actors, ranging from the government, organizations, and institutions to individual citizens, as well as their resources, such as local infrastructures. The shift of the actors' role from passive consumers to active contributors to co-create value in service research [26, 30] is reflected in smart community initiatives, which aim to transform the role of the citizen as a passive inhabitant into an active contributor to policy decision making or data-generation, or as an actor in a local, connected community, by using information technologies [32]. Despite thorough conceptualizations of smart cities and smart communities [15, 32], knowledge of how to operationalize value creation and related design activities is scarce [33]. Solely addressing an abstract level of smart communities is not sufficient, as this perspective lacks consideration of actor engagement on an individual level. Therefore, we apply a multilevel design framework as part of the service systems engineering which enhances our understanding of design decisions, and the resulting effects on actor engagement [34]. We demonstrate the applicability of the multilevel framework by applying it to our research project for building a neighborhood community as an instantiation of smart communities.

12.3 Methodology

Realizing value in smart communities is difficult to plan and observe, due to the time gap between the initial design and the realized value for the smart community initiative. Building on the micro-foundation movement, and actor engagement as a micro-foundation for value co-creation [27, 35], drilling down to a granular and empirical observable level bridges the gap between the abstract concept of value co-creation at the macro-level with empirically observable actor engagement at the micro-level. We build on a multilevel conceptualization of service systems design to link the abstract goal of building smart communities, to achieve social well-being with manageable and observable design activities (see Figure 1). The framework provides an analytical perspective, and helps to address the dynamics in smart community building and evolution. The framework increases understanding of value co-creation outcomes by analyzing the effects of the design decision at each level, and enables a systematic derivation of design knowledge for non-deterministically plannable actor engagement [36].

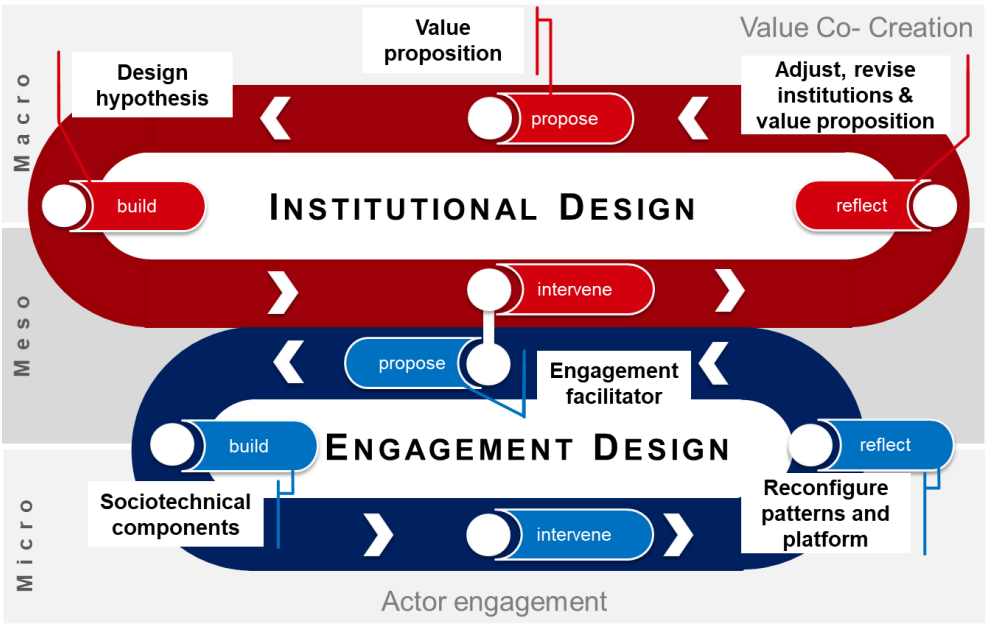

Figure 1. Multilevel design framework for service systems (based on [34])

The multilevel framework is conceptualized by (1) a multilevel perspective with macro-, meso- and micro-levels and (2) two iterative design processes [34]. The three-level model entails a macro-level institutional setup, which incorporates the value proposition and a configurations of actors and resources. The meso-level mediates with sociotechnical components that facilitate engagement. The micro-level is represented by actor engagement, which "is conceptualized both the disposition to engage and the activity of engaging in an interactive process of resource integration within the institutional context provided by a service ecosystem" [27, p. 3008]. Actor engagement can be empirically observed by temporal, informational and relational engagement properties [37]. Actor's interaction and willingness to engage is shaped by the social context and platform's design [36]. This is in line with the sociotechnical perspective, which defines the technology and social behavior of individuals as an inseparable instance of analysis [11]. Finally, actor engagement activities are transitioned back to the macro-level as an aggregated unit of value co-creation [27].

Due to the contextual nature of value co-creation and the simultaneous interaction of the actors, a dynamic perspective is required. Therefore, the design process is conceptualized as a sequence of design activities at all levels. The designable components are linked within two intertwined design cycles: (1) institutional design and (2) engagement design. We distinguish with the multilevel perspective between the individual encounter design of engagement platforms and supporting interventions (engagement design), and the design of the institutional setup related to the configuration of the

engaged actors and resources, and the guiding value proposition (institutional design). This requires different methods and measurements. The engagement design relates components to engagement-facilitating mechanisms, such as engagement platforms [34]. User experience with a sociotechnical perspective is crucial for the design of the artifact, which can be captured through user-oriented methods, such as design thinking, and low-fidelity prototypes [38]. Further, piloting of engagement platforms is crucial to achieve progress in building smart communities. This approach provides tangible results, evaluates the impact of smart community initiatives, and keeps motivation high for further engagement [39]. Based on the evaluation results, indications of the impact and further actions can be derived for engagement or institutional design.

To derive design implications for smart communities, we apply this framework by conducting a case study based on Yin's work [40] within one of our design science research (DSR) projects in the context of smart communities (see Table 1). As part of this DSR project, we build an engagement platform within a neighborhood (online) communities as described in the following section.

Table 1. Case research project for building smart communities

Service system: Neighborhood community comprising of several actors and guided by value propositions
Actors: institutions, neighbors, service providers
Resources: infrastructures and services of actors
Value proposition: Engaging actors and resources in a local and social neighborhood community for improving social well-being
Applied principle: Local (online) neighborhood social networks
Tool support: Engagement platform
Research approach: Design science research
Data collection and analysis: Thinking aloud, interviews, focus groups, evaluation diaries

12.4 Case description: research project for building smart communities in neighborhoods

In the following, we describe and analyze our DSR project (see Table 1) and the multilevel design framework (see Figure 1). We first describe within the institutional design cycle our research context, and *propose* the guiding value proposition, which is based on challenges, as well as opportunities, for smart communities (section 12.4.1). We *build* a design hypothesis to improve the social well-being in smart communities and intervene in the natural environment of two neighborhood communities by *proposing* and building an engagement platform as an intermediary for collaborative interactions in a

neighborhood community as part of the engagement design (section 12.4.2). We *intervene* in a neighborhood environment by using a prototype, and *reflect* the design decisions, leading to implications for further design activities for engagement and institutional design (section 12.5).

12.4.1 Overall research context and objectives

Smart cities shift the focus from the technical equipment of infrastructures to building social systems and evolving ecosystems [14, 41]. Building on the smart community concept, local governments have recognized the need to facilitate social capital and the formation of smart communities. In 2016, the public health authority of a large German metropolitan region funded this smart community initiative to respond to the social and healthcare needs of an aging society in urban environments [6]. To ensure relevance and applicability in practice, we have been carrying out a DSR project for three years in a naturalistic environment. We engaged in two urban neighborhoods with 1200 and 4800 inhabitants in a large metropolitan area in Germany. Due to our piloting approach [42], these two quarters provide a rich set of intervention and evaluation activities.

As the first step, we identify the current issues and opportunities for smart communities as part of the institutional design. Building on a literature review on neighborhood social networks [43], we extended our insights by conducting two workshops. As engaging the potential users is crucial in smart city projects [44], the workshops were conducted with 3 representatives of a neighborhood management service (quarter 1) and with 12 citizens (quarter 2).

Despite the presence of increased anonymity issues in metropolitan regions, participants confirmed a lack of transparency concerning services offered by local organizations, as well as opportunities to provide services by neighbors for neighbors along the lines of peer-support services [45]. Limited access to online platforms leads to limited access to services of local service providers and institutions, such as the police or church. Consequently, the primary goal of the project is to build on mechanisms that support integrating services and volunteering, which increase citizens' quality of life and well-being [6]. This entails connecting younger citizens and the elderly population with each other, as well as with local infrastructures, to increase social inclusiveness, accessibility, and service proximity [46]. This leads to the following value proposition, which guides further design activities: "Engaging actors and resources in a local and social neighborhood community to improve social well-being".

12.4.2 Applied mechanism and artifact for intervention in the actor's environment

Our research is motivated by the aim of increasing the social inclusion and accessibility of local actors and infrastructures. This faces the challenge of an aging society [5]. Therefore, we applied OSNs and neighborhood social network mechanisms. Prominent examples of online social networks, such as Facebook, serve as mechanisms for building local social networks [24]. A specific type of local social networks is neighborhood social networks, which aim to enhance social support and increase self-efficacy [47]. However, knowledge of how to design local neighborhood social networks by using online social network technology is scarce [43]. In addition, (online) social networks and existing neighborhood services do not consider the needs of the elderly population [48, 49].

Encouraging technologies as intermediaries unlocks new solutions from which inhabitants can benefit. The goal is to utilize the community's ability to provide peer-support services, local service provider offerings, and institutions as facilitators with technologies, such as engagement platforms. This platform thinking is gaining more importance since the platform economy emerged as a promising opportunity to adapt collective intelligence and resources [45]. Engagement platforms are defined as "physical or virtual touch points designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value between actors in a service system" [50, p. 596]. Thus, engagement platforms provide a promising design hypothesis for engaging local neighbor actors in a social community.

As value co-creation in smart communities depends on individual contextual factors, an empirical investigation into an actor's natural environment is essential to observe the effects of design decisions in certain contexts [51]. This reflects the transition from institutional design to engagement design. Actors' disposition to engage is difficult to determine in advance, and is related to multiple possible design decisions [52]. Thus, building sociotechnical artifacts requires human-centered approaches to gain insights into human behavior. For instantiating the engagement platform, we first used human-centered design approaches, such as design thinking, personas, and user stories, to identify a suitable solution design [53]. Then, we developed the engagement platform in several propose, build, intervene, and reflect iterations, starting with low-fidelity, paper-based prototypes, leading to a technical instantiation. In general, the platform implements technical features to stimulate peer-support services in the neighborhood community. This is done with features, which enable inhabitants to request and offer assistance, for example, for replacing incandescent lights or offering a service to conduct daily

shopping. Further functionality to stimulate engagement is implemented, such as detailed profile information to discover other peers, contribution functions, such as likes and comments, and notifications to inform users about updates [54].

Service providers and local organizations are integrated on the engagement platform to make offline services visible and accessible to the community members. Therefore, the engagement platform implements features to create an organization profile with relevant information, such as opening hours, and promote offerings in the neighborhood.

As engaging actors are limited to the design of the platform, the underlying constraints must be gathered, and analyzed regarding the effects on individual behavior, which, in turn, leads to adjustments of design decisions. Therefore, we conducted naturalistic evaluation activities according to Venable, et al.'s work [55]. First, we conducted a user experience workshop with 20 potential users. Users aged between 53 and 85 years were selected to examine the needs of elderly users. Second, we conducted a field test with 35 inhabitants over a period of three months. Participants were granted access to the mobile application. Data were collected via evaluation diaries [56], as well as via personal support. As the artifact is placed within the naturalistic environment, we apply a sociotechnical perspective with an "ensemble view" to derive insights into the use and social effect of the artifact [57].

12.5 Findings and insights

Table 2 provides a brief reflection based on the observed micro-level results and implications for the sociotechnical components as part of the engagement design at the meso-level, and the institutional setup as part of the institutional design at the macro-level.

Trust and privacy concerns are emphasized during the evaluation. Fake accounts and information sharing outside the platform are issues, which must be addressed during the design process (Table 2, #1).

Table 2. Findings and insights of evaluation

#	Micro-level results	Meso-level implication	Macro-level implication
1	Trust and privacy concerns	Providing and verifying real user profiles information	Engaging trust-supporting actors
2	Lack of access	Establish offline support and training	Mobilize actors and resources
		Age-friendly platform design	
3		Provide initial contributions	

	Need engagement stimulation	Engage neighborhood community management	Employ neighborhood community management
4	Facilitate engagement of various actors	Integrate local institutions and service providers	Mobilize and commit actors
		Install spaces and screens to promote exchange between actors	

We decided to register users with their real names and addresses, and restricted access to the platform with a registration process to improve trust in the neighborhood community [58]. This requires a process to confirm user profiles, and institutions of trust, such as local churches or police stations, have to be mobilized and integrated, to mediate as non-profit organizations in verifying real names and addresses.

The evaluation results further indicate various necessary interventions to provide access to the platform for older actors in particular (Table 2, #2). Young actors expect technical support via electronic channels, such as e-mail, but older actors chose to receive in-person support. For providing support structures, actors have to be mobilized to meet the inhabitants' expectations. This requires resources and responsibilities; specifically, we coordinate neighborhood community management to offer on-site support. In addition, some older users struggle when using the platform on mobile devices. To this end, we provide bi-weekly smartphone usage training to prepare older actors to use the mobile application. For future technology training support, public libraries may serve as anchor institutions to provide basic technology courses [59].

However, even if the research project aims to build an age-appropriate platform (see Table 2, #2), the design and guiding value proposition may not deter younger and older actors. This is also reflected in previous studies, which indicates that older inhabitants prefer to live within the community instead of residential care [60]. The inclusion of the elderly in the neighborhood networks inevitably requires the entire community be connected, older and younger. Solely restricting and actively promoting age-appropriate functions, thus, would be a signal for forcing older communities exclusively, and would negate the integrative approach. Therefore, the inclusion of older people is the focus, and supported by features and services. However, the overall goal is to improve well-being in the overall urban space, and to eliminate boundaries between younger and older citizens.

Therefore, we enforce peer-support services on the platform. However, peer-support services may be restricted due to lack of engagement by actors (Table 2, #3), as we also faced a causality dilemma: The actors' willingness to participate in peer-support services may be genuine, but without any open support requests, there is no opportunity to volunteer help. As previous research demonstrates [34],

initial contributions and events populated by neighborhood management reduce engagement barriers. To facilitate interaction, neighborhood community managers are employed, to support inquiries between individual actors and local service providers.

Further, as previous research highlights, the role of institutional actors, such as public libraries, as facilitators in building smart communities is recognized [59]. Access to local service providers, institutions, and infrastructures is a prerequisite for facilitating actor engagement (Table 2, #4). Key enablers are among others, churches, police stations, and non-profit organizations, which enhance trust within the neighborhood community. Thus, we link local service providers, neighborhood managers and institutions on the engagement platform to stimulate engagement via events, and create a marketplace for peer-support services. They organize leisure and health education events, as well as increase accessibility for older citizens by partnerships with health and elder care services. Additionally, to promote neighbor relationships outside the engagement platform, cross-generational spaces and large outdoor touchscreens are available, which facilitate the exchange between the engaging actors. Health-promoting offerings in the neighborhood, such as Nordic walking, and other inhabitant-relevant information, such as cultural events or building sites are provided. Consequently, several dedicated actors and resources must be engaged to stimulate activity in the neighborhood community.

12.6 Discussion

Our research contributes to the realm of building smart communities, as we investigate design activities on multiple levels. Decomposing smart community building on multiple levels, and applying iterative design cycles, captures dynamics in context and turns the process into manageable activities for the researcher and the practitioner. Second, we derive design implications based on the ongoing DSR project, which aims to build an online neighborhood community as a manifestation of smart communities.

We conclude that smart communities can be referred to as fluid organizational forms, which must be managed as such. The formation of smart communities is a complex process, as various actors simultaneously engage on a voluntary basis and try to satisfy their goals. These goals are guided by the actors' disposition to engage. This leads to possibly conflicting goals and values. Even if actors engage in collaboration activities, individual actions can be contrary to collective action, and thus, hinder joint value creation, ultimately leading to value de-construction [61]. Therefore, the interests of individuals must be aligned with the interests of the smart community. In this sense, actors should not be

treated as recipients of a designed artifact, but actively engaged in the design project, which requires human-centered methods [62].

As our results shows, applying a service system perspective is particularly useful to grasp the objectives of smart community building. Local (online) social neighborhoods as an instantiation of smart communities integrate technology, humans, institutions and local service providers, and physical components as resources. Previous research on smart cities focuses on technology [63] and governance [64], but we propose to apply an integrative, multilevel perspective, which enhances our understanding of the interrelations of sociotechnical components and engaging actors, ranging from individual engagement to institutional actors' engagement. This perspective bridges macro-level goals with micro-level observations and explanations [65]. Especially, as information systems are multilevel [66], we explore how this perspective support analysis of sociotechnical artifacts and organizational and institutional boundaries, affecting the actors' engagement and technology use.

In particular, the multilevel framework helps to decompose a value proposition into manageable and measurable steps, and connect them. We propose a guiding value proposition of smart and connected communities for social well-being as a strategic improvement at the macro-level, which is based on the basic concept of collaborative and interactive value co-creation [26]. These objectives are reflected by neighborhood (online) social networks, and are incorporated by engagement platforms as facilitators to generate peer-support services at the meso-level. Intervening in the actor's environment helps to observe the effects of design decisions at the micro-level, which, in turn, must be reflected at the meso- and macro-levels. As the results indicate, the actors' engagement is limited due to the functions of the platform. At the same time, several engagement-supporting interventions, such as promotions and training, affect actors' willingness to engage, and have to be applied to the engagement platform. This is in line with the sociotechnical perspective, which describes technical elements and social practices as inseparable elements when analyzing and designing artifacts [11, 57].

However, designing sociotechnical artifacts is not solely related to the design of the system. Even if platforms design assumes to address the target group needs, the design implications are twofold. We propose that engaging individual actors requires engagement-stimulating mechanisms, such as sociotechnical platforms and functions (e.g., communication and peer-support requests), as well as supporting institutions and organizations, which stimulate engagement and enhance perceived value expectation. The need for an age-friendly design of the smart community is not mainly fulfilled by

the design of an age-appropriate platform, but by specific interventions, such as training, or incorporation of trust-building institutions, such as churches (see Table 2, #2). These institutions should be mobilized and integrated, and reflect the (re-)configuration of the institutional setup of the actors and resources at the macro-level.

To sum up, to get smart and connected individual and institutional actors, the resources and infrastructures must be mobilized and integrated. By engaging service providers, local organizations, institutions, and non-profit organizations, we emphasize their role as intermediaries of values such as trust. This requires the engagement of multiple actors in the institutional design of smart communities. Therefore, creating the institutional setup with corresponding design elements, such as the guiding value proposition and the configuration of engaging actors and resources, is crucial for building the preconditions of successful actor engagement and value co-creation [34]. At the same time, refinements of the institutional setup are required to find the right configuration of actors and resources. These design activities facilitate resource mobilization, help to increase local smart community growth, and reduce, for example, the identified engagement barriers of individual actors at the micro-level [34]. Thus, the value proposition and the configuration of engaging actors and resources must be adapted, and evolve over time. However, these developments require a long-term effort to reinforce the new structures and increase public value. These continuous refinements and adjustments of the institutional setup require a long-term commitment of several actors, and to measure the achieved value. This, in turn, leads to transformation results for engaging individual and institutional actors.

However, there is no silver bullet to increase smartness. Various engaging actors, different infrastructures and institutional arrangements, as well as rapidly changing contexts, make it difficult to systematically plan and operationalize design initiatives [67]. One central requirement for building smart communities is the ability to react to these dynamics, and reconfigure actors, resources, institutions, and information technology. An explorative approach is required to understand the design decisions about the networked value co-creation of multiple engaging actors, and to understand how this community evolves over time. The proposed iterative design and validation cycles create a continuous process of change, which includes experiments and improvements, and leads to a deeper understanding of anticipated and unanticipated implications of the design decisions.

12.7 Conclusion

Smart communities have emerged as a priority for local governments and researchers. Building smart communities necessitates a focus on human behavior. The effects of design decisions and engaging

actors on perceived trust and usefulness is central to an actor's willingness to engage, and must be analyzed and translated into implications for actions. However, little is known about how to systematically conduct design activities for building smart communities.

This paper contributes in two respects: It provides (1) a case discussion of how engagement platforms serve as a mediator of actors and resources with corresponding design implications based on an ongoing DSR project and (2) a multilevel perspective for analyzing and systematically deducing design implications. We provide two implications for practitioners and researchers. First, considering individual citizens when designing technology-mediated engagement is crucial for building smart communities (engagement design). Second, institutions as facilitators and promoters play a role in initiating and scaling up smart communities (institutional design). Linking both design activities with an engagement platform as an intermediary is the key to scale and sustain actor engagement.

We draw on insights from an ongoing DSR project that aims to build a smart community. By applying local (online) social neighborhood mechanisms and engagement platforms, we seek to integrate physical resources, services of local organizations, and peer-support services within a local neighborhood context. This enables the exploration of the evolution of smart communities, and prompts implications for mobilizing and integrating resource.

Informed by a service systems perspective, smart communities as a system of engaging actors and resources are guided by the value proposition of social well-being. However, engagement may be restricted due to sociotechnical issues and the institutional setup, which lead to limited expectations for the value contribution. We emphasize the multilevel process that comprises several measuring and reflection stages. Thus, the ramping-up phase revealed the need for several interventions and engagement of institutions to set up the conditions for smart communities. We conclude that building smart communities entails the task of designing and refining sociotechnical components, as well as the institutional setup, to stimulate engagement of individual and institutional actors. Several actors, resources, infrastructures, and institutions should be integrated while considering institutional arrangements, trust, and privacy issues. However, knowledge of how to manage such a complex undertaking is scarce.

The applied multilevel perspective shed light on building smart communities, which helps decompose abstract design goals into manageable and observable design implications. The two intertwined design cycles seek to bridge the gap between designing sociotechnical components at the meso-level and integrating the engagement of supporting actors and institutions at the macro-level. From a managerial

perspective, this framework offers an explanatory framework and prescriptive guidance to systematically plan and conduct design activities, and contribute to the management of smart cities and communities.

Future research should investigate the roles of institutional actors, such as universities, schools, and libraries, and measurements of the value achieved. Therefore, we plan to conduct a full public launch of the platform, combining several further qualitative evaluations and quantitative analysis of platform usage.

12.8 Acknowledgements

This research was funded by the German Federal Ministry for Education and Research (ExTEND, reference 02K14A170) and the European Regional Development Fund and the City of Hamburg (AGQua, reference Z|74012|2016|G500-02.10|10.009-03-EFRE).

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13 Waking Up a Sleeping Giant: Lessons from Two Extended Pilots to Transform Public Organizations by Internal Crowdsourcing

Grotherr, C., Wagenknecht, T., & Semmann, M. (2019). "Waking Up a Sleeping Giant: Lessons from Two Extended Pilots to Transform Public Organizations by Internal Crowdsourcing", International Conference on Information Systems (ICIS), Munich, Germany.

Abstract

Digital transformation is a main driver for change, evolution, and disruption in organizations. As digital transformation is not solely determined by technological advancements, public environments necessitate changes in organizational practice and culture alike. A mechanism that seeks to realize employee engagement to adopt innovative modes of problem-solving is internal crowdsourcing, which flips the mode of operation from top-down to bottom-up. This concept is thus disrupting public organizations, as it heavily builds on IT-enabled engagement platforms that overcome the barriers of functional expertise and routine processes. Within this paper, we reflect on two design science projects that were piloted for six months within public organizations. We derive insights on the socio-technical effects of internal crowdsourcing on organizational culture, social control, individual resources, motivation, and empowerment. Furthermore, using social cognitive theory, we propose design propositions for internal crowdsourcing, that guide future research and practice-oriented approaches to enable innovation in public organizations.

Keywords

Public Transformation, Internal Crowdsourcing, Design Propositions

13.1 Introduction

The adoption of information technology is a key characteristic of digitalization, and enhances the process of creating service innovations (Barrett et al. 2015). Due to the rise of sociotechnical phenomena, not only organizations but also society and individuals are impacted (Gallivan and Srite 2005; Janowski 2015). This leads to new forms of resource mobilization and integration, and the emergence of open phenomena, such as open innovation or crowdsourcing, which build on the engagement of individuals (Schlagwein et al. 2017). Consequently, due to the privatization of public services and the responsibility of public organizations to facilitate digitalization (Dunleavy et al. 2005; Fang 2002), public organizations are seeking to transform and leverage, the benefits of digital transformation (Holgersson et al. 2017).

However, the changes induced by digital transformation are disruptive. Initiatives to foster these developments need to deal explicitly with organizational, social, and leadership aspects, despite a narrow technological focus (Bertot et al. 2016; Markus 2004; Matt et al. 2015). Reaching digital maturity will not only be achieved through technologies but depends heavily on the skills and engagement of employees. This emphasizes the need to investigate how to engage employees in their work environment, facilitating work motivation, and finally, leading to improved work practices (Rainey and Steinbauer 1999; Wright 2001). In this regard, IT-enabled engagement platforms are a powerful mechanism for empowering employees and implementing digital transformation initiatives (Tilson et al. 2010). Specifically, the concept of internal crowdsourcing, a novel approach that seeks to mobilize unused resources, aims at leveraging benefits of employee engagement, by empowering them for open communication and engagement in decision-making and realization of change initiatives (Zuchowski et al. 2016).

To ensure lasting success, it is important to create a culture of openness and social feedback (Zuchowski et al. 2016). This characterization differs from the characteristics of public organizations (Baarspul and Wilderom 2011). Public organizations are faced with fundamentally different goals and in structure, as they are focused on serving public interests (Rainey and Bozeman 2000). The support structure is therefore manifest as function-oriented with routine processes (Willem and Buelens 2007). Accordingly, the approach is disrupting the organizational culture, and requires long-term efforts accompanied by substantial changes in organizational governance and interventions to change individuals' behavior. Despite the relevance of the topic, research on how IT-enabled engagement platforms, as sociotechnical artifacts, shape and change individual behavior within the organizational context, is scarce (Doherty and King 2005; Goldkuhl 2013; Luna-Reyes et al. 2005; Orlikowski and Iacono

2001). Little is known about the long-term effects of open collaborative platforms in public organizations. Research is needed that goes beyond the design and prototyping of engagement platforms to usage and use scenarios in work environments of individuals and how they reshape cultural properties (Markus 2004). Although first initiatives implemented internal crowdsourcing in the private sector (Benbya and Leidner 2016; Feldmann et al. 2014), applying these approaches to the public sector remains challenging (Bozeman and Bretschneider 1986; Dawson et al. 2016). This leads us to the following research question: *What design propositions guide internal crowdsourcing with IT-enabled engagement platforms that aim for employee engagement and empowerment in public organizations?*

The aim of this paper is to shed light on how individuals engage in novel forms of open collaboration, which are facilitated by internal crowdsourcing and IT-enabled engagement platforms. We propose validated design propositions that guide the design and establishment of engagement platforms and internal crowdsourcing, thus facilitating employee engagement and in the long term the shaping of cultural properties. To observe such change, we build on two design science projects situated in the public sector and evaluate two internal crowdsourcing systems. We piloted the concepts with two engagement platforms extensively for six months, each in a real-world setting. Both engagement platforms aimed to empower employees to collaboratively propose, discuss, and develop improvements for identified strategic (Pilot 1) and tool-specific (Pilot 2) issues. The case organizations delegated decision-making power by approving the crowd not only to propose and discuss change initiatives, but also to implement solutions. We reflect on the design decisions we made before and during the piloting phase. We applied a social cognitive theory perspective (Bandura 1989), to assess the impact of the pilots regarding their ability to open up organizational culture. This approach helps to explore the effects of engagement platforms on individuals' behavior, which are guided by social norms (Bandura 1989). We identify design propositions for establishing supportive interventions, as well as design decisions about the platform, which facilitates the introduction of the platform to employees' daily work environment. On one hand, the design decisions made about the engagement platform affected individuals' behavior, such as reduced engagement barriers, with the visibility of engagement activities, thus affecting social norms. On the other hand, supportive and activating interventions, such as management engagement and realistic expectation management, were required that stimulate recurring engagement of individuals. These experiences led us to right-size our approach for sustaining digital transformation efforts within public organizations. The results support researchers and practitioners in starting the digital transformation of organizations, by making use of the internal

crowdsourcing concept, and thus, aims at bridging the gap between information systems scholarship and practice (Nunamaker et al. 2015; Te'eni et al. 2017).

The paper is structured as follows. In Section 2, we describe the theoretical foundations followed by the applied methodology in Section 3; in section 4, we describe the artifacts and previous design results, the evaluation is presented in Section 5. In Section 6, we discuss these results, and propose validated design propositions. In Section 7, we conclude our research.

13.2 Theoretical Foundations

13.2.1 Internal Crowdsourcing

Crowdsourcing has emerged as an approach that leverages the skills and creativity of engaging actors, and organizations have begun the process of adapting crowdsourcing to internal processes, such as ideation, design activities or decision-making, building on employees (Feldmann et al. 2013; Muller et al. 2013). This mechanism extends previous perspectives that employees are not be seen as passive idea generators but actively contribute to value co-creation by knowledge integration and realizing change initiatives (Semmann and Böhmann 2015; Zuchowski et al. 2016). Zuchowski et al. (2016) define internal crowdsourcing as "an IT-enabled group activity based on an open call for participation in an enterprise" (p. 168). By using internal crowdsourcing, untapped individual resources, such as knowledge and skills, are mobilized, leading to knowledge sharing across hierarchical levels and business units and resources exchange for realizing design challenges (Zhu et al. 2016; Boudreau and Lakhani 2013). By integrating distributed knowledge, the internal crowd is suitable for addressing complex problems, as these employees are better integrated into the operational business (Benbya and Leidner 2016). Therefore, technologies, such as engagement platforms, play a crucial role, as they provide "physical or virtual touchpoints designed to provide structural support for the exchange and integration of resources, and thereby co-creation of value, between actors in a service system" (Breidbach et al. 2014, p. 596).

However, because the internal crowd is a closed system within the organization and empowers employees to contribute beyond their work routines, challenges arise concerning the corporate culture, motivation, hierarchical structure, and distribution of tasks, which are not addressed by external crowdsourcing literature (Majchrzak and Malhotra 2013). For example, task allocation differs between external and internal crowds, because external crowds work on individually assigned tasks, as the example of Amazon Mechanical Turk demonstrates, whereas internal crowds collaboratively

solve complex problems (Hetmank 2014; Zuchowski et al. 2016). Moreover, external crowdsourcing refers to a large number of unknown participants (Estellés-Arolas and González-Ladrón-De-Guevara 2012), but internal crowds consist of employees who are in an employment relationship with contractual ties (Hetmank 2014; Simula and Vuori 2012). Reflecting the cultural properties of the organization, hierarchies, day-to-day business, and a long-term relationship must be taken into account (Zuchowski et al. 2016). Erickson et al. (2012) highlight that internal crowdsourcing hinges on a shift in traditional practices, as organizations often build on hierarchical structures and fixed processes, while internal crowdsourcing, in contrast, can be perceived as open and democratic, as it encourages idea generation and realization, while enforcing egalitarian (flat) hierarchies and flexible processes (Erickson et al. 2012; Riemer et al. 2015). Thus, the internal crowdsourcing system subverts the hierarchy through social cooperation, leading to increased transparency between management and employees, and to an improved cooperative culture.

13.2.2 Social Cognitive Theory

One theory commonly used in information systems for analyzing organizations, individuals, and the influences of sociotechnical artifacts on their behavior is social cognitive theory (Bandura 1989; Bichler et al. 2016). Cultural properties of an organization affect social control, which is a mediator of expectations for and perceptions of employee behavior (Leidner and Kayworth 2006; O'Reilly and Chatman 1996); see Figure 1. Social control and cultural properties affect employee engagement and empowerment, which in turn reshape cultural properties. Moreover, social control influences individual resources and motivation.

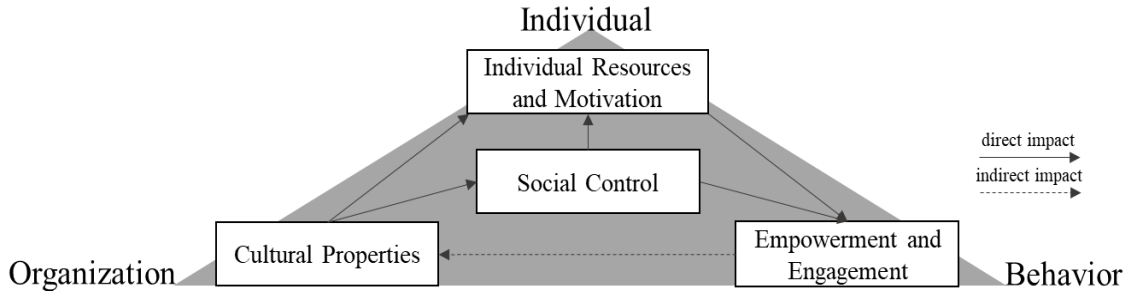


Figure 1. Research Model for Engaging Employees Based on Social Cognitive Theory

Cultural properties, stemming from an organizational culture with norms and values, define a set of shared assumptions (Deshpande and Webster 1989), which affect employees' behavior (Davison and Martinsons 2002). Cultural properties vary considerably, and are difficult to capture in an explicit form (Jackson 2011). One useful way is to classify cultures in terms of learning and development

approaches, knowledge sharing, participative decision making, collaboration, and tolerance for conflict and risk-taking (Hurley and Hult 1998). Cultural properties further determine the interaction between social groups and information systems (IS), and how they react to IS implementation processes (Jackson 2011). Employees are more likely to adopt new software if they perceive its value matches the cultural norms of a given organization (Nevo and Wade 2010; Silva and Hirschheim 2007). However, in the case of a misalignment, systems might remain unused, and employees could even resist implementing them (Markus 2004; Tyworth 2014). Just as organizational cultures shape the adoption of IS, technology can contribute to a cultural change, as individuals apply new work practices, which in turn leads to subsequent changes of cultural properties over time (Luna-Reyes et al. 2005; Nevo and Wade 2010).

Social control as a representation of cultural properties mediates expectations for and perceptions of individuals' behavior in organizational settings (Leidner and Kayworth 2006; O'Reilly and Chatman 1996). Social control manifests cultural properties in the action and behavior of individuals or groups of individuals. Therefore, collective values within organizations shape an individual's behavior and disposition to future interactions, and willingness to share information (Marwell et al. 1988; Wasko et al. 2004). In this regard, behavior can be positively rewarded by gaining reputation, sharing information, and establishing relations, thus enabling changes in social control (Constant et al. 1996; Storbacka et al. 2016). As reputation is a key resource and motivator for individuals, building on this facet contributes to overcoming social control, as witnessed in physical encounters (Jones et al. 1997).

Individual resources and motivation of employees such as knowledge and time are required for changing cultural properties (Lawrence et al. 2009). Individuals must be able to integrate their resources, as well as other individuals' resources, to engage in a collaborative process of value co-creation (Vargo and Lusch 2015). The provision and integration of resources depend on individuals' three types of motivations for engagement (Storbacka et al. 2016): (1) Relational properties determine the roles and position of individuals within an organization. (2) Informational properties define the knowledge and data that individuals contribute to and builds the basis for engagement. (3) Temporal properties refer to the duration, regularity, and frequency of the engagement. Building on individuals' motivation and their willingness to help others differs in voluntary engagement processes (Marwell et al. 1988). Motivation can be understood as a two-sided concept subsuming intrinsic and extrinsic motivation (Venkatesh 1999). Thus, motivation-increasing effects have been studied, and can be actively designed. For instance, researchers have shown that access to peers, possibilities to engage and learn, and receipt

of information useful for work practice contribute to motivation to engage (Constant et al. 1996; Wasko and Faraj 2000).

Empowering and engaging employees involves giving them the authority to make decisions to get tasks done (Hammer and Champy 1993). This relates to information sharing, performance-based rewards, intensive training, and employee involvement in management decision making (Bowen and Lawler 1992; Wilkinson 1998). Empowerment initiatives intend to increase employee commitment and contributions (Wilkinson 1998). In turn, by applying new work practices, engagement of individuals shapes cultural properties over time (Lawrence et al. 2009). However, Davisonand Martinsons (2002) question whether employee empowerment can automatically improve business performance in all types of organizations, as individual motivators vary among employees. Although some may be interested in receiving money, others thrive for status and promotion. Notwithstanding this possible limitation, one way to support employee empowerment may be to implement an internal crowdsourcing system.

13.3 Methodology

By applying rigorous IS research methodologies to cumulative research (Briggs et al. 2019), we develop IT artifacts to enable sociotechnical changes and contribute to theory by evaluating them (Hevner et al. 2004). Extant research has demonstrated that to realize organizational change, social and other non-technical elements must be taken into account (Gregor et al. 2006; Markus 2004; Silva and Hirschheim 2007; Ulbrich 2010). Thus, we do not limit our research approach to quantitative research, but emphasize qualitative methods (Besson and Rowe 2012). These methods are applied to leverage the experiences gained during a long-term piloting phase in the field (Briggs et al. 2019). Pilot projects are conducted to "develop and implement technological innovations in their natural organizational and social environment" (Schwabe and Krcmar 2000, p. 3). Given this nature of piloting, we conducted two design science projects in two public organizations (see Table 1), with the aim of designing and evaluating sociotechnical artifacts throughout a six-month period. This approach emphasized that the sociotechnical artifacts were an integral part of the organizational context, and enhanced the sense of ownership of affected employees, and the promotion of collaboration among employees. Pilot 1 was conducted at a public-sector employment agency in rural Germany. The organization had around 120 employees located in three offices, serving a constituency of more than 200,000 citizens. The second pilot was conducted at a government port agency with 1800 employees, which is responsible

for property management and port maintenance. In Pilot 2, the target group included a sample of 100 IT-knowledgeable employees.

Following the design science research methodology (Peffers et al. 2007), we started the research based on inhibitors that hinder the realization of benefits a digital transformation (*problem formulation*). Although both cases differ in the number of employees and their aim, both organizations refer to similar cultural properties and social control mechanisms of public organizations. Both pilots started with the vision to give employees a voice by switching shift from top-down to bottom-up logic (see Table 1). Pilot 1 aimed to engage employees on a broad level. They were free to introduce proposals for everything related to their work lives, including work routines, and physical changes to the building. The organization already had a board meeting in place, which decides on strategic issues. They opened this physical-only meeting up to all employees, that they could propose suggestions and gain commitment that the board would then have to discuss how to implement during their strategic meeting. Using an internal crowdsourcing system, employees were able to propose, comment on, and like proposals for all subjects of interest to them. In contrast, Pilot 2 aimed at engaging employees with newly introduced software, to realize emergent benefits of the tool. In general, organizations struggle with a significant portion of unrealized benefits of software introductions (Semmann and Böhmann 2015). To address this challenge, a novel approach for engaging employees in the usage phase was established, to foster exploration and exploitation of the newly introduced software. It has been assumed that users can be an important driver for user-generated change initiatives, due to the users' context-specific knowledge and the need for short-term changes. Therefore, users are empowered to propose, discuss, rate, and, implement change initiatives.

Table 1. Summary of Characteristics of Two Pilots

Table 1. Summary of Characteristics of Two Pilots		
	Pilot 1	**Pilot 2**
Type of organization	Public organization	
Aim of organization	Employment agency	Port agency
Number of employees	120 employees	1800 employees
Vision	Fostering empowerment, engagement, switching culture from top-down to bottom-up	
Specific aim	Strategic improvements	Tool-specific improvements
Applied mechanism	Internal crowdsourcing	
IT-enabled engagement platform	Yes (see Table 2 for Pilot 2)	
Research approach	Design science research	

Data collection and analysis	Workshops, interviews, observation, usage data (see Table 2), qualitative content analysis	
	Focus group (4)	Thinking alouds (33)
Range of affected units	Multiple business, digital and IT units	
Business units focus	Broad	Focused on business units strongly tied to IT (CIO, CDO)

As mentioned above, the organizational culture and the social control of public organizations must adapt to new modes of coordination, such as openness, transparency, and social feedback. These properties of empowered employees are at the core of internal crowdsourcing (Zuchowski et al. 2016), which was applied to both pilots (*objectives of the solution*). Due to the specificities of the corporate culture, design decisions directly affect employee's motivation to engage, and must mindfully enable the shift to bottom-up appraisals. Building on these properties of both case organizations, it was necessary to develop solutions with a sociotechnical mindset (Orlikowski and Iacono 2001). This enables us to compare design decisions made in the internal crowdsourcing system to the social cognitive theory components and how they were affected. Therefore, we instantiated the mechanisms of internal crowdsourcing conceptually in three core components (C1: Initiate Change; C2: Gain Crowd Commitment; and C3: Realize Change), with corresponding design features on the engagement platform (*design and development*) (Semmann and Grotherr 2017). The proposed internal crowdsourcing systems encouraged employees to integrate their knowledge across functional and hierarchical boundaries. Accordingly, following a literature review, we designed the artifacts based on the requirements gathered from future users, at junior and senior levels, and implemented IT-enabled engagement platforms in both organizations (see Table 1). By making use of multiple mock-ups and clickable prototypes, we *demonstrated* the relevance of IT-enabled organizational transformation, and designed two IT artifacts as a solution, in several workshops and interviews (Rubin and Rubin 2011). Following previous research on IS implementation in public organizations (Ulbrich 2010), we used a multimethod approach for the *evaluation*. The evaluation included (1) collecting and analyzing data from user-generated content (i.e., proposals, comments, and likes; see Table 2) and (2) interviewing key personnel of the organizations in both pilots. In Pilot 1, we also conducted four focus groups (Krueger and Casey 2014) with team managers, as well as four non-management employees. In Pilot 2, we ran 33 thinking alouds (Boren and Ramey 2000), which lasted 45 minutes, with system users. We recorded, transcribed, coded, and analyzed all interviews using qualitative content analysis (Schreier 2012). Based on this analysis, we aimed to derive insights into the sociotechnical implications of internal crowdsourcing in public organizations (Orlikowski and Iacono 2001): Specifically, we applied the social cognitive theory perspective (see Figure 1). This perspective enables to compare the

effects of different design decisions in both public organizations. Finally, we reflect on the pilots to derive design propositions, and contribute to the research on digital transformation in public organizations.

13.4 Core Components of Engagement Platforms

In the following, we describe the two artifacts, which were previously designed and developed (Semmann and Grotherr 2017; Wagenknecht et al. 2017). The internal crowdsourcing mechanisms were translated into the artifact and conceptually implemented in three core components on the engagement platform.

Component 1: Initiate Change: The aim of this component was to empower employees by providing the ability to contribute ideas for change initiatives. The component had to address an individual's resources and their mobilization. We supported proposing new ideas by enabling tags, the integration of images, and standardized templates, which is in line with common design choices of internal crowdsourcing systems (Zuchowski et al. 2016). To defuse social control and to embolden reticent employees (Haines et al. 2014), within Pilot 1 employees were able to selectively propose initiatives anonymously using a feature called "opt-in anonymity." In Pilot 2, employees did not have this opportunity. By providing the opportunity to participate anonymously, employees might be willing to engage in crowdsourcing activities, and express their opinions, as they feel free from social norms and cultural properties such as hierarchy. Note that the "opt-in anonymity" feature was designed to reduce the likelihood of a crowd member acting maliciously, as this feature encourages employees to switch to anonymous contribution only for sensitive subjects. However, if the users are not anonymous, the contributions can be allocated, and thus, achieve higher-quality results. In addition, this enables a network of experts to be established for specific topics. These different design choices helped us investigate the effect of anonymity on employee engagement.

Component 2: Gain Crowd Commitment: The overall purpose of this component was to leverage employees individual resources to engage in a collaborative process of advancing proposed change initiatives and to gain supporters. This includes mechanisms for providing feedback and rating change initiatives, as well as developing suggestions for solutions (Pilot 2). These mechanisms go beyond traditional suggestions boards, as employees are empowered to actively contribute to solution realization. In both cases, employees could engage on the platform, and provide feedback via comment and like functions. Regarding social control, this allowed colleagues to show appreciation and recognition. Moreover, both platforms provided opportunities to discover relevant change initiatives using

search and filter functions. A simplified search for relevant initiatives was promoted via a tagging mechanism (Pilot 2). In Pilot 2, employees were also able to rate and share change initiatives, which has a positive effect on social control as it motivates other individuals to engage. Based on the employees' preferences, the platform also recommended interesting initiatives via notifications and newsletters to increase an individual's motivation to engage. In addition, defining mechanisms for governing the crowd is crucial (Zuchowski et al. 2016). In both pilots, we provided community guidelines to motivate employees to engage and stimulate positive discussions. In Pilot 1, designated employees on each organizational team acted as multipliers who received special training on how to best use the system. In Pilot 2, community management was employed to govern social control by motivating employees to engage and to resolve conflicts by guiding the crowd for fairness. In terms of incentives for crowd commitment, we did not implement monetary rewards. Monetary incentives are not common in public organizations, and thus, might conflict with daily work routines and employment contracts.

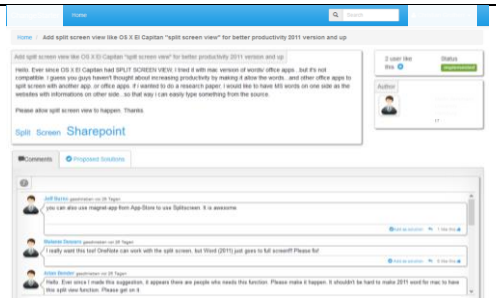
Component 3: Realize Change: The aim of this component was to empower employees to realize change initiatives. By doing so, employees are not merely seen as passive idea generators, but increase autonomy in decision-making and realizing collaboratively proposed changes initiatives. Especially in Pilot 2, the goal was not solely the discussion of change initiatives, but to actively solve identified issues. The organization transferred the decision-making and realization power primarily to the crowd, as they were responsible for selecting tasks, developing solutions for change initiatives that guide their colleagues step-by-step, explaining to them how they can use the newly introduced software in the right way, or implementing lightweight change initiatives. There are two possibilities for engaging individuals: implicitly via newsletters from the platform (Pilot 2), or explicitly via e-mails addressed to potential employees (Pilot 1). The benefits of empowered employees can be demonstrated by providing success stories of beneficial change initiatives. This was done in Pilot 2, leading to a contextualized demonstration of the value of engaging on the platforms on an individual level. If the solutions involved technical changes (Pilot 2), the initiative had to be supported by IT operations. Pilot 1 returned the primary responsibility for implementing organizational change initiatives with the incorporation of employees to senior management. A risk of frustration could arise if the implementation process of change initiatives takes a long time. To address these motivational issues, there were several functions affecting individual motivation to engage. First, implicit communication features, such as newsletters, or explicit ones, such as direct suggestions sent by users or community management via e-mail to tagged experts, facilitate constant information and engagement flow. Second, in

Pilot 1, employees had limited time to choose which change initiative should be posted on the management board. Each user only had one vote per two-week period. Thereafter, the board decided on whether, and how, the proposal could be implemented. This time constraint facilitated timely feedback and implementation activities, leading to success stories. In contrast, Pilot 2 implemented a continuous phase model without restrictions on time frames.

13.5 Evaluation

Following Venable et al. (2016)'s approach, we gathered data during piloting (see Table 2). In this section, we give an overview of the usage and evaluation results. In the following discussion section, we reflect the effects of the design of the sociotechnical artifacts, according to social cognitive theory and related behavioral, individual, and organizational perspectives, and deduce design propositions.

Table 2. Exemplary Depiction of Engagement Platform and Data Gathered in Both Pilots



	Pilot 1	**Pilot 2**
User profiles	81	40
Proposed initiatives	13	27
Likes	77	144
Comments	20	82
Realized initiatives	n/s	5
Example	Company bike	URL Shortener

Pilot 1 found that throughout a six-month period, there were 13 idea proposals, 20 comments, and 77 likes contributed by 81 registered users. However, participants reported that motivation to engage in the system decreased over time. According to them, this was due to the decreasing number of new change initiatives, as well as the slow realization of the proposals that had received the highest number of user votes. In an interview, the managing director of the public organization said that the latter was simply due to the varying complexity of the ideas. For instance, although the managing director welcomed the idea of a "company bike" requesting funding, releasing a tender offer, and acquiring the bikes were lengthy tasks. Nevertheless, they confirmed that "*Employees who were anyway already participating, as well as more cautious ones, dared to act on the platform.*" (Pilot 1). In Pilot 2, 40 users contributed 27 change initiatives, 82 comments, and 144 likes over a six-month period. This led to 20 solution proposals, and finally, to 5 realized change initiatives. These initiatives varied regarding their scope (Grotherr et al. 2018). On one hand, users created lightweight how-to's and guidelines, emphasizing shortcomings with current software training. On the other hand, some solution proposals required technical support from the IT department. This is predominantly highlighted by the example

of "URL Shortener for SharePoint". This user-generated change initiative found approval among crowd members, resulting in likes and the discussion of solution scenarios. In addition, some users searched for open source solutions, and came up with proposals. This work is particularly useful from an IT department perspective as highlighted by the head of IT operations: "*Solutions based on open source projects help us to ensure timely implementation without the need for finding internal partners that could fund the initiative.*" In this regard, with quality assurance for training and portfolio management in mind, the head of the IT department engaged continuously on the platform. However, concerns might be expressed regarding quality assurance and the potentially low quality of employee-contributed results. Especially in the case of missing knowledge regarding technical expertise, community management had to engage and attract potential experts.

Despite the data gathered on the platform, concerns were expressed during the piloting about social control and the culture of sharing. On an individual level, barriers to engage were identified, because some users were uncertain about the role of the platform, including appropriate behavior on the platform as part of the social control. Participants are concerned about how to formulate salutations ("*Should I write 'Dear ladies and gentlemen'?*", Pilot 2). In addition, some participants ask for the opportunity to comment anonymously, as "*we don't have a culture of failure – nobody wants to fail in public*" (Pilot 1). Such barriers were addressed in Pilot 2 by prepopulating guiding first user-generated change initiatives. For both pilots, we found that public organizations follow a hierarchical organizational structure. The internal crowdsourcing system with its open structures and flexible processes seems to contrast with the organizational structure and culture. Based on the interviews in Pilot 1, we found that the organization had specialized teams in which members collaborated closely with each other within their teams. The absence of a culture of knowledge sharing was also reflected by the statement made in Pilot 2, that "*within a hierarchical organizational structure, the resource knowledge reflects authority and strength, which nobody wants to lose*". Moreover, as there were prescribed and pre-defined procedures from a federal institution, the degree of freedom in how to conduct most tasks was very limited, and individual resources and motivation seemed to be closely tied to daily work routines. In both pilots, employees stressed that these tasks needed to have the highest priority. This prioritization is encouraged by the choice of a single winner (Pilot 1). This has the effect that the employees worry about whether their idea has a chance and in case of uncertainty tend not to participate because "*it is not worth the effort*".

In addition, employees engaged on a voluntary basis; thus, the platform did not necessitate dedicated resources. Employees were concerned "*that the activities are transparent on the platform and that*

the supervisor might think that you are not working at full capacity and then get even more work", which reflects conflicting interests of work routines and the willingness to engage. Although we proposed to top management in Pilot 1 and Pilot 2 that they should reserve some time for users to contribute to the crowdsourcing engagement, the organization's leadership neglected to do so formally. General public organization values which seek to act efficiently and fulfill the obligations of government functions hinder explorative and experimental approaches (van der Wal and Huberts 2008), which was also reflected by an interviewee: "*Even though we are also confronted with the digital transformation, we still have one central and fundamental distinction compared to private businesses: the target group. While private businesses are doing well with the approach of reaching 80% of the target group, we are bound to provide our services to 100% of the target group—belonging to the whole without exclusion.*" In effect, employees had to be motivated intrinsically, somehow freeing up time in addition to their regular tasks.

13.6 Discussion

As the evaluation results reveal, an area of tension exists regarding the concept of internal crowdsourcing as a catalyst for digital transformation in public organizations. We compared the design decisions made in both projects and derived design propositions (see Table 3), to contribute to the research call for "delineating design principles for value co-creation-enabling IS instances" (Haki et al. 2018, p. 13).

13.6.1 Design Propositions for Facilitating Employee Engagement

Table 3. Design Propositions (DP) for Internal Crowdsourcing in Public Organizations

1	Determine the degree of top-management engagement (committed, supportive, active), as well as the time needed to participate in the engagement process to exemplify the relevance, value, and behavior as a role model for employees.
2	Middle management support is crucial, to communicate the value of the internal crowdsourcing initiative in daily work routines, and to mobilize employees' resources to engage on a voluntary basis, given top-management commitment and engagement as a starting point.
3	The platform must be designed to be lightweight, and integrated into the employees' work context, to reduce social and technical entry barriers, such as access, adoption of a new platform, and modes of collaboration.
4	Setting up realistic expectations and defining simple tasks for an internal crowdsourcing platform is crucial, to avoid overwhelming employees and the organization with novel, explorative approaches, given the limitation that resources are scarce in public organizations.

5	Building heterogenic crowds by defining and maintaining adjacent business units and functions lead to visibility of the overall project, facilitates company-wide acceptance, and leads to action, demonstrates the relevance and value of the platform, and reduces resistance in relation to new ways of working.
6 & 7	Providing real names on the platform increases group dynamics based on employee recognition, and the possibility of exploring other peers, assuming that in public organizations, employees behave professionally. Enabling anonymous employee contributions is valuable regarding sensitive and organizational critical subjects, to reduce uncertainties and entry barriers in front of superiors and other employees.
8	Providing initial content that employees use as a point of reference, to provide contextualized examples for using the platform, thus reducing uncertainties and entry barriers.

Zhu et al. (2016) emphasize the risk of "not-invented-here" syndrome as a cultural property, and the potential lack of internal drivers that advertise internal crowdsourcing. In this regard, gaining top management commitment is crucial (Erickson et al. 2012; Kotter 2007), as they determine the time and budget for the internal crowdsourcing systems. Although top management engages in initiating a crowdsourcing system, it does not mean that they will also act as role models. The observations reveal the "readiness" of the public organizations for such sociotechnical change, as it demonstrates that empowering employees as a bottom-up initiative is in contracts to the organizational culture and structure of public organizations. Managers assume a dual role of top-down promoters for innovative new work practices, but also have to secure effective daily work-routines. That is, despite top managers, as well as the workers' councils, were very committed upfront in Pilot 1 and Pilot 2, they did not contribute to the platform. The evaluation results indicated ambivalence in terms of top-management's commitment and engagement. On one hand, engagement on the platform could represent a role model that employees might follow. For instance, the mere participation by top managers may encourage, and authorize employees to participate. Moreover, top management should value crowd members for their engagement as a motivational mechanism, and show that time spent on the platform is beneficial (Kotter 2007). On the other hand, when management engagement becomes a burden, the effect might be reversed. In Pilot 1 we observed that some employees were deterred by the managing director's invitation to personally explain a successful proposal to him. This is particularly curious as employees in the private sector, which tends to be more competitive (Jackson 2011), might actually be encouraged by such an invitation, whereas employees of public organizations are discouraged. Thus, it is even more important to *determine the degree of top-management engagement (committed, supportive, active), as well as the time needed for participating in the engagement process* (DP 1). Moreover, as internal crowdsourcing should encourage employees from different business units to collaborate, business unit management might be restricted to steer their department locally. Especially, within functional organizations, business unit management tends to design work routines to be stable and

efficient (Holgersson et al. 2017). "*Business unit management has got a key performance indicator to perform efficiently within their unit, but they have no KPI for working cross-functional*" (Pilot 2). In contrast, empowering employees is characterized by collaboration across departments. Accordingly, the mobilization of resources outside employees' daily work routines is important, and therefore, *middle management support is crucial* (DP 2), which has to be in line with top-management understanding of employee engagement (Giritli Nygren et al. 2014).

On an individual level, conflicts with daily business activities arise. On the one hand, creativity has to be encouraged, and on the other, processes provide the predominant working structures. Everything that is required of employees has to be considered as work hours. It is necessary to find regulations with the business unit management and work council for larger time investments. This correlates with lack of acceptance at the management level, as there is no dedicated time or appreciation as mentioned before. The organization has to consider how crowdsourcing and day-to-day business can coexist. However, in public organizations, resource conflicts exist, due to defined processes and the agencies' stable and efficient work structures (Holgersson et al. 2015). There is no organization-wide commitment providing dedicated resources, and providing dedicated resources at the starting point of such an explorative transformation is not feasible. Therefore, *the platform should be designed to be lightweight and integrated into employees' work context* (DP 3). First, tasks should not be determined too time-consuming by platform objectives. Second, reducing entry barriers through technical arrangements, such as a single-sign-on mechanism, limits media disruptions and the platform does not trigger resistance. This is required to go beyond the mere experimentation phase towards continuous use scenarios in real-world environments of employees, which is facilitated with piloting (Briggs et al. 2019).

Regarding task crowd alignment, it is difficult to judge in advance the scope of change initiatives, due to unknown organizational barriers. However, the realization of change initiatives through an internal crowd represents a greater challenge than proposing change initiatives (Miron-Spektor et al. 2011). Due to different levels of knowledge in the crowd, there is a risk that employee engagement will lead to the emergence of the role of experts regarding specific topics. In both pilots, employees were concerned about "*becoming a dedicated expert*" (Pilot 2) and "*being responsible for realizing change initiatives*" (Pilot 1). After some proposed initiatives were selected in Pilot 1, the contributors were invited by their managers to provide feedback. However, the contributors were concerned about implementing the proposed change initiatives. Especially, in the case of solving change initiatives, it

was stated that users neither possessed the knowledge nor wanted to engage in this phase due to capacity constraints of daily business routines (Pilot 2). This is counteracted by *setting up realistic expectations and defining simple tasks for the internal crowdsourcing platform* (DP 4) that avoid the formation of such roles. To avoid overwhelming the organization and employees, the purpose of the platform has to be aligned regarding the knowledge base of the engaged employees. Accordingly, the aim is to define manageable tasks that everybody can solve, but allow complex initiatives, providing the opportunity for profiling of engaged employees.

Another goal when introducing internal crowdsourcing is to define the crowd members (Zuchowski et al. 2016). Pilot 2 built on a crowd comprising users of newly introduced software. Pilot 1 included all employees, senior managers, and lower-level employees. Although Pilot 2 restricted employee engagement to the user level, in both pilots, several users with various backgrounds engaged on the platform, leading to fruitful discussions and realized change initiatives (see Table 2). Accordingly, *building heterogenic crowds through defining and maintaining adjacent business units and functions leads to high visibility of the overall project, facilitates company-wide acceptance, and leads to action taking* (DP 5). Within public organizations, long-term employment relationships are common as a cultural property. In this regard, similar initiatives (i.e., company suggestion programs) may have been implemented, and employees might have been affected in the past. Even if this function pursues a different focus, there are intersections and the platform should not be set-up on a green-field. If these initiatives were successful, a competitor could be seen on the new platform. If they were unsuccessful, there is a risk of "*scorched earth*" (Pilot 2). A possibility for increasing synergies is to define processes with adjacent business functions. The goal is to stimulate connectivity, which can be achieved through engaging business units for quality assurance and incorporating the proposals into work routines. Pilot 2 demonstrated the link to knowledge management, which maintains knowledge for the entire organization.

Finally, defining collaboration structures is a prerequisite for continuous engagement, but neglects the effects of social control caused by open communication and the transparency of the activities of engaging employees. Especially in organizations with power distance, this leads to engagement barriers (Wasko et al. 2004). We handled the subject of identifiability as opposed to anonymity differently in both pilots. Pilot 1 included a feature that enabled "opt-in anonymity". Pilot 2 asked users to provide their real names. During the evaluation of Pilot 2, participants noted that colleagues might be afraid of expressing themselves through comments due to a fear of "*loss of face*" with respect to managers and colleagues. Surprisingly, many participants themselves were not concerned about using

their real names. In Pilot 1, employees were also concerned about discussing sensitive issues that might contradict their superiors' opinions. As we learned during the interviews, the opt-in anonymity feature led even otherwise reticent employees to participate. Nevertheless, it is difficult to assess whether the opt-in anonymity feature led to more ideas. Moreover, employees recognized the presence of "*many helpful and technically experienced colleagues*" (Pilot 2), and by providing real names, interest groups emerged based on their records and met outside the platform. In addition, certain employees tried to represent themselves through meaningful contributions, and influence each other based on their roles. To summarize, *providing real names on the platform showed a strong indication of increased group dynamics based on employee recognition, influence, and possibility to explore other peers* (DP 6). However, *enabling anonymous user contributions for sensitive subjects* (DP 7) might embolden reticent employees (Haines et al. 2014).

Social control, through long-standing relationships and a common group history (Valacich et al. 1992), acts as a positive norm enforcer. As public employers achieve high retention rates over longer periods of time, employees know each other well in a professional context. Thus, we did not observe any disinhibited language in either pilot. To the contrary, "*speaking the right language*" was perceived as a minor challenge (Pilot 2). This proves professionalism in the public organization but may prevent open and light conversations. Thus, by *providing initial content that participants use as a point of reference* (DP 8), Pilot 2 addressed this challenge. Providing initial content demonstrated how to use the platform and reduced engagement barriers, "*since no one wants to be the first to place on anything*" (Pilot 2). This ensures an improved understanding on the employee level, as the initial content facilitates the translation step from the abstract vision of employee engagement to concrete and easy-to-understand cases. In addition, the benefits of the platform, and the fact that employees' contributions are taken seriously, can be highlighted by success stories, thus facilitating task importance and work motivation (Wright 2001).

13.6.2 Theoretical and Managerial Implications

As employees are central to drive transformation within organizations, research calls for an in-depth understanding of how individuals respond to new practices and how they overcome organizational barriers (Lenka et al. 2018). Providing internal crowdsourcing through a piloting mechanism stimulates a rethinking of current work practices, and enables new forms of cooperation in the work environment (Zuchowski et al. 2016). Although private organizations have gained first experience with internal crowdsourcing, the need for innovation in the public sector is driving organizations to adopt

new sociotechnical artifacts. Prevailing cultural properties of public organization, which are manifested for example by defensive decision making across all hierarchical levels, have to be overcome by mechanisms which empower employees and establish a social control of openness (Artinger et al. 2019). As both pilots demonstrated, internal crowdsourcing offers an opportunity for public organizations to open their organizational culture up to increased knowledge sharing and a higher tolerance for critique and failure. The two long-term pilots in public organizations provided evidence that internal crowdsourcing has the potential to reshape the nature of interaction to generate new social connections and cognitive models, that unleash collaborative engagement in a broader social and institutional context. Moreover, crowdsourcing encourages an entrepreneurial spirit and drive innovation and represents a feasible mechanism to turn the abstract process of digital transformation into tangible and measurable reality of designable artifacts as previous research has called for (Gawer and Phillips 2013). From a practical perspective, we shed light on the concept of new work (Ashford et al. 2007) by proposing internal crowdsourcing as a promising approach to overcome organizational barriers. Consequently, individual behavior, and interactions within the organization affect the organizational culture and transformation, which refers to institutional work that is originated in organizational studies (Lawrence et al. 2013).

However, both pilots showed that crowdsourcing in public organizations is anything but a sure-fire success. Both pilots suffered from barriers to motivation. Some of the reservation was arguably related to the fact that the organizational cultures contrast with the values encouraged by internal crowdsourcing systems. However, entrepreneurship is only rarely invigorated in the public sector. On a group level, public employees are rarely encouraged to act informally and in a non-conformist manner. However, these competencies would arguably be required for a successful crowdsourcing engagement (Riemer et al. 2015). The reasons can be attributed to the organizational culture, as public agencies, compared to private organizations, face unique accountability, as one interviewee stated: "*Public organizations are watched by various groups and stakeholders, […], this makes it even harder to establish a culture of experimentation.*". Thus, it is difficult for public organizations to adopt measures to increase employee engagement, which would be easy to implement in private organizations (Benbya and Leidner 2016). For instance, offering monetary rewards, or allocating work hours, is considerably more difficult to achieve in the public sector, where collective wage agreements and oversight by federal supervisory institutions are widespread. To circumvent the suboptimal incentive situation, top management could provide a vision (Hendry 1999), while middle managers help to prepopulate the discussions and engage on the platforms to act as role models (DP 1 & DP 2). However, even

when employees approved a change initiative, top management struggled with the bureaucracy, as public organizations are owned by the government, and funded by taxes. In effect, realizing these initiatives took a considerable amount of time, and thus, discouraged further employee input, as the employees did not see their ideas acted on quickly enough.

The characteristics of public organizations revealed the need to pursue processes that realize the potential of digital opportunities to exploit public services (Dunleavy et al. 2005). This requires not only technological advances but also a rethinking of collaboration practices and organizational culture. These developments are closely linked to the reorganization of organizational boundaries and research has shown the need to investigate more in-depth into sociotechnical and organizational changes (Luna-Reyes et al. 2005). By applying social cognitive theory, we highlighted these interdependences of organizational, group, and individual dimensions referring to organizational culture, social control, and individual motivation, which affect, and are directly related to, design decisions. This is reflected by the variety of design propositions, which demonstrated, from a sociotechnical perspective, the need to investigate technological design (DP 3, DP 6, and DP 7), as well as an engagement-stimulating mechanism, ranging from supportive (DP 8) to comprehensive interventions (DP 1, 2, 4, 5), which in turn affect social and individual behavior. In general, the paradox of innovation presented by Miron-Spektor et al. (2011) demonstrates that more structure is needed for open collaboration. The challenge is to find a balance among regulations, structures, processes (top-down approaches), and self-determination of empowered employees (the bottom-up approach); thereby considering existing work environments of employees. Therefore, future initiatives have to combine public administration objectives and explorative approaches to create new service innovations. We agree with previous researchers who proposed a service and institutional logic perspective as a fruitful approach for managing activities that create new innovation opportunities, and drive organizational transformation (Barrett et al. 2015; Chesbrough 2010; Kurtmollaiev et al. 2018; Lusch and Nambisan 2015). We propose that a multilevel consideration of information technology and corresponding design decisions on a social and organizational level, is a worthwhile approach. This perspective helps to understand and reflect the effects of information technology to individuals, on the micro-level; to the social group, on the meso-level; and to the organization, on the macro-level (Bélanger et al. 2014; Burton-Jones and Gallivan 2007; Zhang and Gable 2017). This approach broadens the perspective of sociotechnical artifacts towards designable elements on different levels, which transfers the activities for institutional work to interaction design between individuals and the design of organizational structure (Barrett et al. 2015; Grotherr et al. 2018; Silva and Hirschheim 2007). Although the platforms have not yielded

ground-breaking changes, they contributed to the aim of collaboration and openness. Even if a culture of failures, as known from Lean start-ups (Ries 2011), contrasts with stable and efficient work routines in public administration, long-lasting digital transformation requires experimental approaches. Accordingly, Zuchowski et al. (2016) describe internal crowdsourcing as a form of organizational learning, and as our design propositions indicated, value co-creation in public services is a collaborative process in which individuals engage, which requires mechanisms that facilitate engagement on the macro-, meso-, and micro-level (Storbacka et al. 2016). Thus, internal crowdsourcing can be used to solve the problems of knowledge-intensive services, facilitating adaptive learning from a short-term perspective. In the mid-term, business units should be integrated to improve environment-oriented learning. In the long term, internal crowdsourcing should be integrated an overarching structure as part of the work methods, to facilitate culture transformation.

13.7 Conclusion and Outlook

Driven by the ongoing digitization, organizations are investing heavily in digital transformation projects, which are guided by a combination of strategic visions, and facilitated through digital platforms. However, organizations are faced with the related transformation of structures, services and human behavior, as such changes cannot be sustained exclusively from a technological perspective. In this study, we addressed internal crowdsourcing as a mechanism that can help transform public organizations. The aim was to strengthen ties between employees, and to establish internal crowdsourcing as a beneficial mode of collaboration. Shared experiences, shared successes, and growing familiarity of employees were facilitated. These aspects resulted in beneficial interactions of employees as the platform represented a locus for exchanging knowledge, thus facilitating digital skills, such as openness, networking, and collaboration. Building on this novel mindset, public organizations can benefit by broadening the predominant organizational culture, and in the long run, transform their corporate culture toward openness, decreased hierarchies, and a culture of exchange. However, little is known about how to implement and establish internal crowdsourcing, and how supportive sociotechnical artifacts evolve over time. Principles, guidance, and interventions are required for establishing employee-engagement mechanisms. Moreover, introducing engagement platforms as sociotechnical artifacts into employees' environments requires several design decisions concerning the platform as well as organizational design.

Reflecting on the need to engage employees to drive organizational transformation and engagement platforms as intermediaries, in this study, we aimed to provide insights into how the design of IT-

enabled engagement platforms as sociotechnical artifacts shape individual actions, subsumed in social norms, and holistically, in the organizational culture. The social cognitive theory highlights the interdependence of cultural properties, which shape social control and individual motivation, and in this context, the behavior to engage. This helps scholars and practitioners understand the effects of internal crowdsourcing mechanisms, engagement platforms and corresponding design decisions from multiple perspectives, and how this reshapes the organizational culture in the long run. Moreover, the effects of establishing internal crowdsourcing to stimulate engagement and empowerment, and IT-enabled engagement platforms, which influence social control and individual motivation to engage, can be analyzed regarding design decisions. This enables scholars and practitioners to systematically explore and exploit a design mechanism that fosters organizational transformation toward collaborative and open working practices.

The pilot projects were built on two engagement platforms that were used in a natural environment for engaging employees for six months to change the mode of interaction in two public organizations. By utilizing the design science research methodology and social cognitive theory for reflecting both pilots, we derived design propositions, and contribute to the debate on engaging employees to increase innovativeness, and stimulating digital transformation, in public organizations by using sociotechnical artifacts. As both pilots achieved progress, establishing internal crowdsourcing has the potential to drive cultural and institutional change within public organizations, as the introduction of engagement-facilitating IT platforms as sociotechnical artifacts imply a shift in the collaboration practices of individuals, which are shaped by the design of the platform and introduction into their daily environment. Internal crowdsourcing shifts a strict process- and hierarchy-driven environment, by empowering open and visible propositions. Employees are enabled to express ideas free from organizational restrictions and even more go beyond by collaboratively gaining commitment and realizing proposed initiatives. Although necessary to establish changes, such an open engagement conflicts with the organizational culture and social control in public organizations. Such efforts need to be followed with endurance, to enable an organization to adapt to changes and observe benefits.

Nonetheless, further investigations are needed to explore the long-term effects of employee engagement regarding organizational performance. Going forward, we aim to explore how the design propositions affect both public organizations. Longitudinal research will show how internal crowdsourcing systems can change organizational cultures. Especially, a combination of a service- and institutional-oriented perspectives for organizational transformation and service innovation with concurrent activities seems worthwhile to investigate, thus, leading to a generalizable set of instruments that help

encourage digital transformation. Moreover, as this study focused on public organizations, future research could investigate how the same internal crowdsourcing systems affect private organizations.

13.8 Acknowledgements

This research was partly sponsored by the German Federal Ministry for Education and Research in the projects ExTEND (reference 02K14A170) and Participation as Service (PaaS, reference 01IS150120).

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15 Appendix A: Declaration on oath / Eidesstattliche Versicherung

Hiermit erkläre ich,

Christian Grotherr, geboren am 19. September 1989,

an Eides statt, dass ich die vorliegende Dissertationsschrift

„Multilevel Design for Service Systems“

selbst verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

I hereby declare, on oath, that I have written the present dissertation by my own and have not used other than the acknowledged resources and aids.

Hamburg, den 22.06.2020 _____

City, Date Signature