Service Business Design for Human-Centered Service Systems

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LIST OF ABBREVIATIONS

BISE ..... Business & Information Systems Engineering

BM(s)[1] ..... Business Model(s)

CIS(s) ..... Contact-Intensive Service(s)

DP(s) ..... Design Principle(s)

DR(s) ..... Design Requirement(s)

DSR ..... Design Science Research

HCSS(s) ..... Human-Centered Service System(s)

ICT ..... Information and Communications Technology

NCS(s) ..... Neighborhood Care Service(s)

OECD ..... Organisation for Economic Co-operation and Development

RQ(s) ..... Research Question(s)

SLR ..... Systematic Literature Review

SI(s) ..... Service Innovation(s)

VUCA ..... Volatility, Uncertainty, Complexity, Ambiguity

[1] Abbreviations marked with (s) are used in singular and plural in the dissertation.

ABSTRACT

Service companies in human-centered service systems (HCSSs) strive for information and communications technology (ICT)-related service innovation (SI) to overcome cost pressure, limited resources, and to drive their business. HCSSs, such as care, nursing, or other industries, are of great importance because they cover areas that are essential for society and everyday life. The result of SI is a revised service concept that offers the possibility to enhance value creation and value capture of the services. In reality, the expected benefits from SI never materialize because an integrated design of service business has been insufficiently adressed. The integration of processes and tools from service design and business model design is critical for implementing SI. Given the relevance, the objective of this dissertation is to develop design knowledge that integrates the design of value creation and value capture (service business design) for HCSSs enabling the benefits of ICT-enabled SI.

To improve the service business design for HCSSs, the dissertation includes a two-phase research approach. This approach includes an explorative phase in which the problem and possible solutions are clarified, and an implementation phase in which design artifacts are developed, tested, and formalized. In the first phase, a systematic literature review about ICT-enabled SI in HCSSs is conducted to explore the characteristics of the research area. Based on this knowledge, SI practices are analyzed to show what constitutes service business design. In the second phase, this knowledge is used to develop design requirements and design principles as a design artifact for innovating HCSSs with ICT. This design knowledge is evaluated in a real-world setting that aims at the development and introduction of HCSSs.

The design knowledge included will offer theoretical contributions and practical implications. First, the findings expand the knowledge about SI by summarizing the state of research and detailing the SI process and its implementation with focus on ICT. This SI knowledge gives an understanding of the distinct roles and activities of service design and business model design in the process of ICT-enabled SI. Second, the findings provide a theoretical basis for service business design. This basis includes a combination of value creation and value capture by integrating design approaches and detailing design practices. The knowledge about practices in service business design enables a systematic design. Third, the findings provide a theoretical basis for HCSSs and the concepts for a systematic design. The specified characteristics enable an improved understanding of structures, processes, and business logic. Thus, service providers can optimize capabilities in designing and operating HCSSs.

KURZFASSUNG

Dienstleistungsunternehmen mit dem Fokus auf die Unterstützung von Menschen (HCSSs) streben nach Dienstleistungsinnovationen (SIs), die durch Informations- und Kommunikationstechnologie ermöglicht sind, um Kostendruck und begrenzte Ressourcen zu minimieren und ihr Geschäft voranzutreiben. Das Ergebnis der SI ist ein überarbeitetes Dienstleistungskonzept, das die Möglichkeit bietet, die Wertschöpfung der Dienstleistungen zu verbessern. In der Realität kommt der erwartete Nutzen dieser SI nie zum Tragen, weil das integrierte Design des Dienstleistungsgeschäfts nicht ausreichend berücksichtigt wurde. Die Integration von Dienstleistungsgestaltung und der Geschäftsmodellgestaltung ist entscheidend für die erfolgreiche Implementierung von SI. Ziel dieser Dissertation ist es, Designwissen zu entwickeln, das ein integriertes Dienstleistungsgeschäftsdesign für HCSS enthält und so die Vorteile von SI ermöglicht.

Um das Design des Dienstleistungsgeschäfts für HCSSs zu verbessern, enthält die Dissertation einen Zwei-Phasen-Forschungsansatz. In der ersten Phase wird eine systematische Literaturrecherche über technisch gestützte SI in HCSSs durchgeführt, um die spezifischen Merkmale des Feldes zu untersuchen. Auf Basis dieses Wissens werden spezifische SI-Praktiken analysiert, um zu zeigen, was das Design des Dienstleistungsgeschäfts ausmacht. In der zweiten Phase wird dieses Wissen genutzt, um Designanforderungen und Designprinzipien als Designartefakt für die Innovation von HCSSs mit Informations- und Kommunikationstechnologie zu entwickeln. Dieses Designwissen wird in einer realen Umgebung evaluiert, die auf die Entwicklung und Einführung von HCSSs abzielt.

Das entwickelte Wissen bietet theoretische Beiträge und praktische Implikationen. Die Ergebnisse erweitern das Wissen über SI, indem sie den Stand der Forschung zusammenfassen und den SI-Prozess mit Schwerpunkt auf Technik detaillieren. Dieses SI-Wissen vermittelt ein Verständnis für die verschiedenen Rollen und Aktivitäten des Dienstleistungs- und Geschäftsmodelldesigns. Weiterhin liefern die Ergebnisse eine theoretische Grundlage für das Design von Dienstleistungsunternehmen. Diese Grundlage umfasst eine neuartige Kombination von Wertschöpfung und Werterfassung durch die Integration verschiedener Designansätze und die Detaillierung bestehender Designpraktiken. Die Ergebnisse liefern weiterhin die theoretische Grundlage für die Forschung über HCSS und die Konzepte für deren systematisches Design. Die spezifizierten Merkmale ermöglichen somit ein besseres Verständnis der Dienstleister von Strukturen, Prozessen und Geschäftslogik in HCSSs.

1 INTRODUCTION

1.1 Overall Motivation

Service companies in care-related industries strive for innovation to overcome cost pressure (Davis et al. 2011), limited resources (Berry 2019), and meet business needs (Barrett et al. 2015). These services focus on the needs of people. This is the case in services such as care, nursing, and counseling, which are expected to perform at a high service level as they fulfill basic needs of living (Maglio 2015). They are human-centered service systems (HCSSs), which are configurations of people, information, organizations, and technologies that are based on "human behavior, human cognition, human emotions, and human needs" (Breidbach et al. 2016, p. 458). Due to the changing demographic structure, service providers are facing an increasing number of customers (Gallouj et al. 2015). As the funding of the service is capped because of financial restrictions of the customers (OECD 2015), and the context is characterized by volatility, uncertainty, complexity, and ambiguity (VUCA), improving the efficiency of the service delivery is a major challenge (Ostrom et al. 2015). As a result, these service systems are under pressure to change their service offer and delivery.

One attractive solution to overcome this problem is substituting or augmenting human tasks in the service delivery with digital elements (Srivastava and Shainesh 2015; Wünderlich et al. 2013). Thereby, existing services will be redesigned with information and communications technology (ICT) to offer new or improved services to the customers, which is known as service innovation (SI). This ICT-enabled SI is particularly relevant where ICT is not the primary resource of the service delivery, as those innovations create new value for the customer (Breidbach and Maglio 2015). This non-ICT focus is true for different HCSSs that create value in human interaction (Maglio 2015). Because ICT is not the core business, SI provides opportunities for improvement in the initiation, agreement, and coordination of such services (Breidbach and Maglio 2015). The practices in ICT-enabled SI are different to usual business as they "change the very nature of innovations in organization" (Yoo et al. 2012, p. 1405). Existing descriptions of SI processes include high-level observations but not specific activities or deployed methods (Essén 2009; Nambisan et al. 2017). Researchers and practitioners suffer from a lack of theory-based knowledge for leveraging ICT for SI (Fielt et al. 2013).

In theory, such HCSSs for care, nursing, and counseling form the ideal basis for SIs, as they aim at improving value and reconfigure one or more parts of a service system

(Breidbach and Maglio 2015; Maglio et al. 2015). Thereby, value proposition, which describes the benefits for the customers (Osterwalder et al. 2015), is the starting point for service business design that includes the logic of value creation and value capture in the service (Al-Debei and Avison 2010). Value proposition is the key element in service design (Patrício et al. 2011) and business model (BM) design (Osterwalder and Pigneur 2010; Wirtz et al. 2016) that should connect both design strands. However, the adaptation of the value creation in service design includes the reorganization of the service concept with the service encounter as an interface between service providers and customers (Patrício et al. 2011). In turn, in BM design this adaptation has effects for service providers capturing the resulting value (Lepak et al. 2007). The adaptation of the value capture includes the exposure of business opportunities by redefining the value exchange involved in the services (Zott and Amit 2010). Hence, matching value creation and value capture is relevant for the design and implementation of SI (Lepak et al. 2007; Witell et al. 2016).

In practice, many of the expected benefits from SI never materialize because ICT-related knowledge is missing in HCSSs. The development or adaption in SI includes frictions in the transfer of the value proposition to the service design and BM design. Explicit knowledge in operationalizing ICT for value creation, value capture, and scalability in HCSSs is missing (Lewis et al. 2011). Human interaction is at the core of the value creation and cannot simply be digitized (Maglio and Spohrer 2008). SI includes changes in the service design and BM design that overlap but work on different levels of abstraction (Chew 2016). This is misleading, as BMs and their components cover the essential activities and functions of services (Wirtz et al. 2016). The main objective of service design includes the planning and organization of services in order to improve the interaction between the service provider and customers and thereby the overall customer experience (Patrício et al. 2011). The main objective of BM design is to expose business opportunities by defining a value for the participants involved in the service system (Zott and Amit 2010). An integrated design of the services business is desirable in the SI (Witell et al. 2016) but has so far been insufficiently implemented (Chew 2016; Kuk and Janssen 2013).

In summary, the design knowledge for implementing ICT-enabled SI for HCSSs is limited. The literature to date has only studied ICT-enabled SI in HCSSs without considering the integrated design of services and BMs along the implementation and adoption of those innovations. Systematic prescriptive knowledge to combine service design and BM design is missing (Böhmann et al. 2014). The existing approaches describe high-level processes for SI but not activities nor the methods to be deployed

(Goldstein et al. 2002). A commercialization of the service system is usually not a component of the service design (Witell et al. 2016). Only a few established models, methods, and tools are used to support the systematic development of services and BMs (Biemans et al. 2016). These tools include templates such as the value proposition canvas (Osterwalder et al. 2015), the BM canvas (Osterwalder and Pigneur 2010), or the service blueprint (Teixeira et al. 2017). The non-ICT focus of the service providers become a challenge in the design and implementation as the lack of competences and knowledge leads to unstructured implementations (Böhmann et al. 2014). Use cases of ICT-enabled SI are still limited (Hess et al. 2016; Storey et al. 2016).

Therefore, this dissertation forms the basis for the further development of this design knowledge:

Overall Objective of the Dissertation

The objective of this dissertation is to develop systematic design knowledge for service business design enabling the benefits of ICT-enabled service innovation in human-centered service systems.

To achieve this objective, this dissertation includes various aspects of ICT-enabled SI, service design, and BM design as a joint focus of this dissertation. The topic of service business design therefore contains theoretical and practical components, which are reflected both in the methodologies and in the results. The result should include design knowledge that reflects existing knowledge but also creates new prescriptive knowledge to ensure further development.

1.2 Research Questions

The dissertation is divided into three research questions (RQs), which examine individual aspects of service business design and thus form an overall framework of this dissertation. Each of the RQs is answered by an individual research approach that uses different types of methods and knowledge. Accordingly, for each RQ there is an interim result that contributes to the achievement of the overall objective. In the following, the research design with the three RQs is briefly summarized. The detailed methodological introduction is specified in Section 3.

Research question 1

RQ 1: What is state of the research in ICT-enabled service innovation for human-centered service systems?

Approach: Systematic literature review (vom Brocke et al. 2009; Webster and Watson 2002)

Result: Specification of ICT-enabled service innovation in human-centered service systems

In numerous studies, ICT has been shown to be an enabler of SI in HCSSs. The resulting findings, however, have not been presented in a systematic way. Therefore, RQ 1 specifies the knowledge base for service business design enabling ICT-enabled SI in HCSSs. In order to examine the knowledge base, a systematic literature review (SLR) (vom Brocke et al. 2009; Webster and Watson 2002) on ICT-enabled SI in HCSSs will be conducted. Applying an analytical framework in the review, the thematic characteristics, the research background, and the research methods used in this area will be explored. The result will be a specification of ICT-enabled SI in HCSSs. This analysis allows an improved specification of the research opportunities in the research area.

The findings of the SLR present an integrated and representative overview of the literature on ICT-enabled SI in HCSSs and provide opportunities for further research. By showing the state of research on ICT-enabled SI, this SLR includes three contributions. First, the SLR includes conceptualizations for both HCSSs and ICT-related SI. Thus, the SLR promotes further understanding in those areas for researchers and practitioners. Second, an analytical framework for assessing the found literature is developed. This framework provides a simple and condensed insight into previously conducted research. Third, the findings show emerging research gaps. Thereby, those findings give starting points for further research.

Research question 2

RQ 2: What constitutes the design of human-centered service systems in ICT-enabled service innovation?

Approach: Practice research (Feldman and Orlikowski 2011; Nicolini 2009), Canonical action research (Baskerville and Myers 2004; Davison et al. 2004)

Results: Practices for design of services and their corresponding business models

Building on this knowledge of ICT-enabled SI in HCSSs, the service design and BM design practices for service business design in HCSSs will be explored. The objective of this RQ is to identify and describe the concepts and ideas and identify areas that overlap. First, the activities, methods, and decisions for scaling HCSSs with ICT will be analyzed, and the recurring patterns and relationships across the actions will be derived. The research draws on an in-depth analysis of three contact-intensive services to

examine SI practices (Nicolini 2009; Sandberg and Tsoukas 2011). The insights into the practices enable service providers to iteratively revise their service offerings and the logic of creating value for the service. Second, the BM design process that fosters the extension of BMs for ICT-enabled HCSSs to support SI is examined. Using an action research project (Baskerville and Myers 2004; Davison et al. 2004), the BM design process are iterated and revised in a collaboration with three end-user companies.

The knowledge about practices for the design of services and their corresponding BMs allow an assessment of the current state of research for service business design in HCSSs and ICT-enabled SI. By showing design practices in SI, the RQ identifies and describes the practices for scaling HCSSs. In contrast to existing research, this cyclic and iterative process provides details of the SI process that have hitherto been considered only on a meta level. The BM design process enables those responsible for SI to structure, analyze, and make decisions for alternative BM extensions. Although prevailing approaches offer the possibility to design BM extensions, the proposed BM design process provides operationalized steps that allow for the integration of HCSSs, which can be used for established services, and enable a combination of BM design and SI. The contribution is included in the prescriptive knowledge.

Research question 3

RQ 3:	How to systematically design ICT-enabled service innovation in human-centered service systems?
Approach:	Design science research (Hevner et al. 2004)
Result:	Design knowledge for an integrated design of services and business models

To integrate the activities and knowlegde of service design and BM design in RQ 3, design principles (DPs) are developed to systematically innovate the service business of HCSSs. This design knowledge enables an integrated design of value creation and value capture for ICT-enabled SI. The integrated design is derived in an iterative process combining findings from both research streams. The approach involves building and evaluating the various components in a design science research (DSR) approach (Peffers et al. 2007) to deduce design knowledge that guides ICT-enabled SI in HCSSs. Due to the combination of theoretical and practical problems, DPs for the ICT-enabled SI can be formalized. The expected result of RQ3 will be design knowledge that enables researchers and practitioners to improve value creation and value capture in ICT-enabled SI.

The DPs for ICT-enabled SI in HCSSs, their evaluation, as well as the redesigned HCSSs themselves offer theoretical contributions and practical implications. These contributions include enhanced guidance in the design and implementation of SI and knowledge about innovation spillover in social innovation. First, the DPs provide a knowledge contribution for service providers for improving HCSSs. The DPs represent an "improvement" type of theoretical knowledge contribution, as they provide a new solution for a known problem. Second, the developed DPs contribute to the literature of SI and social innovation as they offer a first example of the diffusion of SI to social innovation. The knowledge about innovation spillover effects to social innovation shows the integration of personal, technical, organizational, and societal issues in SI.

1.3 Structure of the Dissertation

The following sections provide a summary of the structure. Figure 1 gives an overview of the structure and the individual contents to the individual chapters. To put the overall objective and the RQs into a common context, the dissertation follows a structure in which different studies are combined to form a comprehensive work. Section 1 provides the overall motivation for the dissertation and the theoretical and methodological background. Followed by motivation, the RQs are presented with their individual contributions. Additionally, an overview of the included publications is given.

Section 2 provides the theoretical background and related work on the topics of HCSSs, SI, service design, and BM design. In the specification of the HCSSs, the special characteristics are shown and a general differentiation in the research context is made. Because the research context can be defined generically, the subgroups of contact-intensive services (CISs) and neighborhood care services (NCSs) are defined as applications. Subsequently, the topics of SI and design are introduced that enable the improvements of HCSSs. The components of SI, service design, and BM design are explained and specified individually.

Section 3 provides the general methodological background to the dissertation. Explicitly, the DSR approach used is explained first because it is the basis for the structure and supports the prescriptive approach. Second, the qualitative methods used are explained, which, on the one hand, create the basic knowledge in the design science approach, and on the other hand, make it possible to evaluate the developed knowledge.

Based on the theoretical and methodological background, sections 4 to 7 present studies that address the RQs and thus form the core of this dissertation.

First, section 4 specifies the knowledge base for ICT-enabled SI in HCSSs and thus addresses RQ 1. The current state of research is reviewed in the SLR. Based on descriptive and thematic findings, the basis for further research in the area is laid.

Second, section 5 provides insights into the practices that are used in SI and thus forms the first part of RQ 2. Explicitly, an in-depth case study analysis is used to explore the practices of scaling CISs. The insights provide a new perspective on how service providers deal with the challenges in ICT-enabled service. The service scaling model shows how an iterative approach includes different practices and activities and can be used to improve scaling of the services.

Third, section 6 provides insights into the practices used in BM design. The findings from action research workshops show how service providers can extend existing BMs. Thus, the analysis forms the second part of RQ2 and provides insights into what constitutes the design of HCSS in ICT-enabled SI.

Fourth, section 7 contains the development of design knowledge for designing HCSSs. Based on previous findings, requirements are defined which reflect the characteristics of ICT-enabled SI as well as the characteristics of the services. DPs that are derived from the requirements represent prescriptive knowledge and help the service providers to innovate their services.

The findings of the four studies are summarized in Section 8. The synthesis provides a summary of the main findings from the individual studies. This summary makes it possible to answer the RQs and to discuss the findings based on the research gaps from the motivation and the theoretical background.

Sections 9 and 10 then give an overview of the contribution of this dissertation and the implications of those contributions. In section 9, the theoretical contributions are explicitly described by the research strands on SI, service business design, and HCSSs. In section 10, the practical implications of those theoretical strands for the service providers are discussed.

In section 11, the limitations of the findings are explained and what this means for further and future research. As a supplement to section 4, this section shows which research areas are open or have opened as a result of the findings and how further research in the research area should be approached. Section 12 concludes the dissertation with a high-level summary.

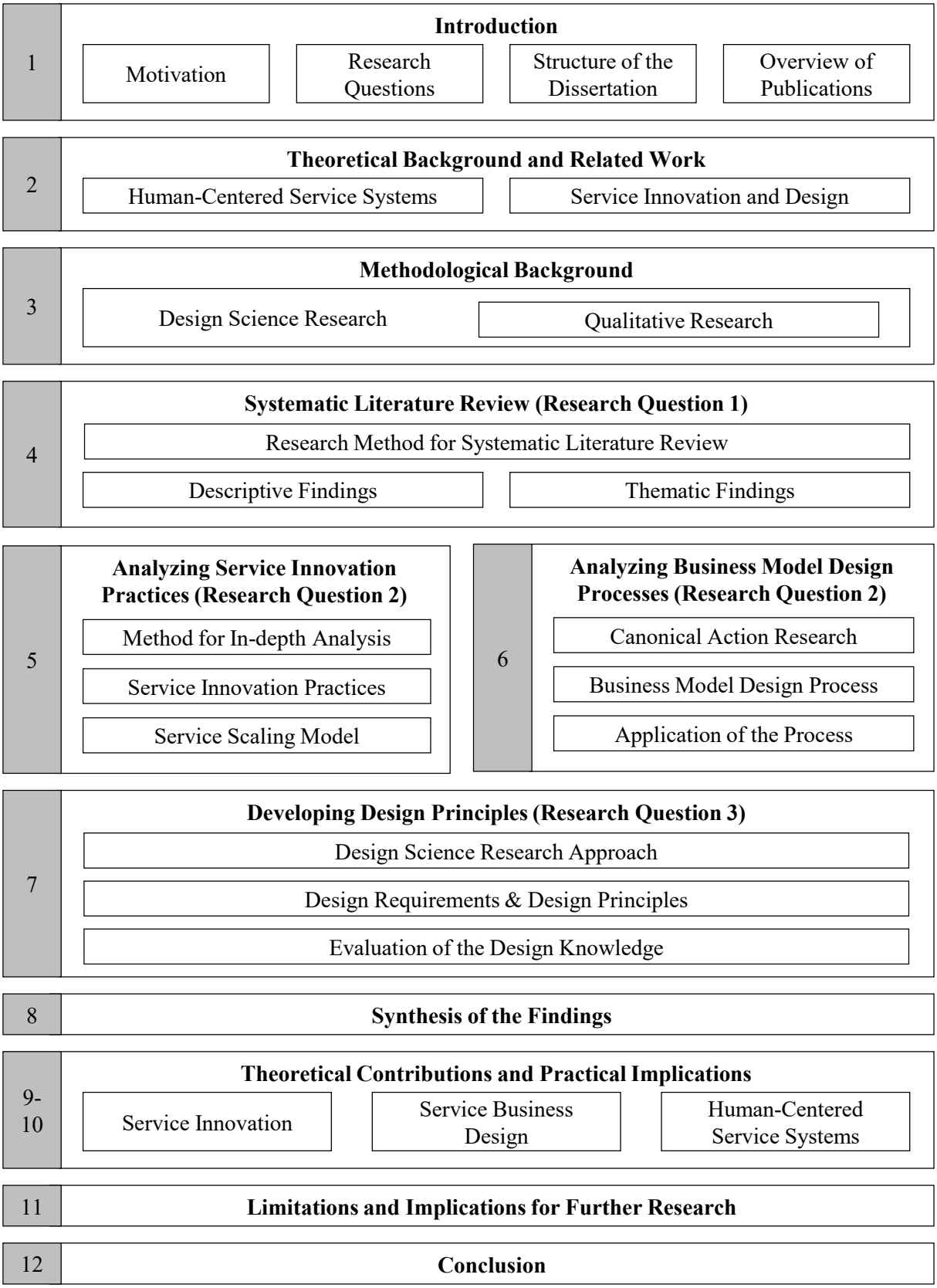

Figure 1: Dissertation Structure

Source: Own Illustration

1.4 Overview of Publications

In accordance with Article 37 of the Award Regulations [PromO 17] and Article 38 of the Implementation Provisions for the Award Regulations for Doctor's Degrees of the University of St.Gallen, parts of this dissertation have been published in earlier form in conference proceedings or journal articles. Table 1 contains references to the publications and an indication of where the publications are used in the dissertation and which RQs the studies address.

No.	Publication	Chapter	RQ
1	Kleinschmidt, S., Peters, C., and Leimeister, J. M. 2016. "ICT-enabled Service Innovation in Human-centered Service Systems: A Systematic Literature Review", Proceedings of the 37th International Conference on Information Systems (ICIS), Dublin, Ireland, pp. 5478–5495.	1, 2, 4,	1
2	Kleinschmidt, S., Burkhard, B., Hess, M., Peters, C., and Leimeister, J. M. 2016. "Towards Design Principles for Aligning Human-centered Service Systems and Corresponding Business Models", Proceedings of the 37th International Conference on Information Systems (ICIS), Dublin, Ireland, pp. 2877–2887.	2, 3	n/a
3	Kleinschmidt, S., and Peters, C. 2017. "Towards an Integrated Evaluation of Human-centered Service Systems and Corresponding Business Models: A Systems Theory Perspective," Proceedings of the 25th European Conference on Information Systems (ECIS), Guimarães, Portugal, pp. 3060–3070.	2, 3	n/a
4	Kleinschmidt, S., Peters, C., and Leimeister, J. M. 2017. "Achieving Scalability of Human-centered Service Systems: Insights from the Active and Assisted Living Context", Proceedings of the 15th International Research Symposium on Service Excellence in Management (QUIS), Porto, Portugal, pp. 60–69.	2	n/a
5	Kleinschmidt, S., and Peters, C. 2017. "Fostering Business Model Extensions for ICT-Enabled Human-centered Service Systems", Proceedings of the 13th International Conference on Wirtschaftsinformatik (WI), St. Gallen, Switzerland, pp. 897–911.	2, 6	2
6	Kleinschmidt, S., Peters, C., and Leimeister, J. M. 2019. "How to Scale up Contact-Intensive Services: ICT-Enabled Service Innovation", Journal of Service Management 31(4), 793–814.	2, 5	2

Table 1: Overview of Publications

Source: Own Illustration

2 THEORETICAL BACKGROUND AND RELATED WORK[2]

This section gives an overview of the theoretical background and related work to the dissertation. The objective of developing the design knowledge is that it can guide those responsible for SI in designing the service business in HCSSs and include established approaches and methods of the knowledge base. For this purpose, the dissertation draws on existing knowledge in the research area of IS design theory (Gregor 2006; Gregor and Jones 2007), BM design (Al-Debei and Avison 2010; Wirtz et al. 2016), service design (Andreassen et al. 2016; Joly et al. 2019; Teixeira et al. 2017), and SI (Skålén, Gummerus, et al. 2015; Sudbury-Riley et al. 2020; Witell et al. 2016). From a domain perspective, the dissertation is embedded in HCSSs that, with the characteristics of the service systems and the challenges of the industry, create an environment that is open to innovation. The concepts used are briefly explained. Parts of the explanations give details where it makes sense for the following chapters.

2.1 Human-Centered Service Systems

Service and service systems are essential concepts for the understanding of HCSSs. Service is a process of co-creating context-specific value (Vargo and Lusch 2004, 2016). This process takes place in service systems because it includes several participants, one of them being the beneficiary (Vargo and Lusch 2016). These service systems are "configurations of people, information, organizations, and technologies that operate together for mutual benefit" (Maglio et al. 2015, p. 2). Put simply, services include problem-solving based on the capabilities and interaction between the different actors. Value co-creation does not happen by itself. It requires a knowledge source and a way of communicating this knowledge to the customer of the service system in a structured and thoughtful way. The various parts of the service system are connected via coordination and cooperation to create services (Vargo and Lusch 2016). Capabilities, interaction, change, and engagement are fundamental to the value co-creation in the service system. However, because this dissertation investigates the role of ICT-enabled SI, this definition of service system emphasizes technology rather than the more general role of institutions.

[2] Parts of this chapter have been published in an earlier version in different conference proceedings and research journals. For details please refer to the Overview of Publications (section 1.4).

HCSSs are service systems with a focus on human interaction and personal services (Maglio et al. 2015). They differ from other service systems because personal interaction between the actors is essential for the value creation. These service systems are of great importance because they cover areas that are essential for our society and our everyday life (Peters et al. 2016). This is the case in diverse industries such as hospitality, healthcare, retail, finance, government, and infrastructure but not limited to these (Maglio et al. 2015). The more a service system depends on knowledge and customization to the beneficiary, the higher the value co-creation of all actors in the service system is (Maglio and Spohrer 2008). This has two opposite effects for HCSSs. On the one hand, it allows the service personnel to react individually to situations and thereby improve the service output. On the other hand, the customer contact theory suggests that the potential efficiency of highly interactive service systems is "a function of the degree to which the customer is in direct contact with the service facility relative to total service creation time for the customer" (Chase 1981, p. 700). Therefore, these service systems are complex systems that are not necessarily planned in advance (Barrett et al. 2015; Spohrer et al. 2007). As interaction is critical to the value creation, the leveraging of ICT for SI in this area can have huge potential for changing the way how HCSSs work.

Based on emerging trends such as an increase in digital innovation, there is an expansion of ICT in service systems (Barrett et al. 2015). ICT is fundamental to many HCSSs (Maglio 2015). In this regard, ICT and people are an integral part of the ICT-enabled value creation (Breidbach et al. 2013). As coordination and cooperation are critical to value creation, the leveraging of ICT for HCSSs influences how HCSSs work. Explicitly, ICT enables SI, which helps to improve and expand the service systems (Barrett et al. 2015; Ostrom et al. 2015). Looking at a continuum, service providers in HCSSs are the opposite of digital ventures. The high degree of human-to-human interaction does preclude standalone self-services (Breidbach et al. 2013). The complex personal interaction as the core of value creation impedes the separation of service resources and service delivery (Yoo et al. 2012). Knowledge that is necessary for the value creation is usually implicit and unique and is thereby slowing down the processes of change (Skålén, Gummerus, et al. 2015). Overall, these circumstances impede the expansion, growth, and transformation of these service systems (Lewis et al. 2011).

In summary, HCSSs are characterized by their basic characteristics in personal interaction for value creation and in most industries through social innovation. The concept of HCSSs is difficult to grasp and becomes accessible in applications. For this reason, specific applications of HCSSs in the form of CISs and NCSs will be examined.

2.1.1 Contact-Intensive Services

Personal interaction is central to CISs that rely on personalization, competence, and trustworthiness of employees (Patrício et al. 2008). The characteristics of CIS – being labor-intensive with high personal interaction and individual service delivery (Jaakkola et al. 2017) – imply a resource intensity that constitutes a decisive factor when it comes to adapting service capacity that is relevant in innovation. Due to the intensity of contact, scaling, i.e., the ability of changing the capacity, is of importance.

These services entail a high degree of contact intensity in the personal interaction between service providers and their customers (Teixeira et al. 2017). Thus, these services include customer value as value-in-exchange, which means that the "value is uniquely and phenomenologically determined" by the customer (Martelo Landroguez et al. 2013). The innovation of CIS presents a challenge for service providers. The way CIS creates value impedes the use of horizontal scaling because CISs are "customized services that are labor-intensive with high customer interaction in service delivery" (Jaakkola et al. 2017, p. 337). In horizontal scaling, new resources are added to increase the capacity of the service. On the one hand, the high degree of contact intensity in these services determine the value creation for the customer and limit the innovation capability (Jaakkola et al. 2017; Vargo and Lusch 2016). This includes the limitation of resources because employees can serve only a fixed number of customers (usually one) at a time and individuality is a necessary condition in the value creation for the customer (Chase 1981). On the other hand, the service capacity is difficult to adapt when the demand changes because service personnel as resources are limited and not divisible. Additionally, a strong interdependence between the organizational context and the ICT in service companies exists (Storey et al. 2016; Troilo et al. 2017). Personal interaction can rarely be outsourced (Jin Zhang et al. 2015). Generally, extension via horizontal scaling is associated with difficulties because of restrictions in resources such as service personnel (Witell et al. 2017). In vertical scaling, the existing service personnel are enabled by adding resources to adapt to the capacity. Therefore, this vertical scaling can be realized with existing service personnel and is the preferred option in CIS (Barrett et al. 2015) and is used synonymously with the term 'scaling'. Given the high interdependence between the organizational context and the ICT in companies providing CIS, understanding design restrictions is crucial for scalability. However, as of now, the understanding of design restrictions is an under-researched topic.

2.1.2 Neighborhood Care Services

Additionally, NCSs provide an application of HCSSs. Such services include private or professional service in a residential area that improve the quality of life in the social context (Edwards-Schachter and Wallace 2017; Gallouj et al. 2018). A successful example of such NCSs is the Buurtzorg Model implemented in the Netherlands to help self-organized caregivers (Kreitzer et al. 2015). Such NCSs are provided by local care providers (service providers) who employ care personnel in the neighborhood (caregivers) to support those in need of care (customers).

Social innovations are a fundamental characteristic of NCSs. Such social innovations solve societal needs through change in social practices (Edwards-Schachter and Wallace 2017). This includes the general idea of innovation, that is, "the creation of (and consequent change in) market offerings, business processes, or models" (Nambisan et al. 2017 p. 224). The difference in social innovation is that the focus is placed on solving social problems and creating value for society (Oeij et al. 2019). Therefore, social innovation is regarded as important as it fulfils a function that is not facilitated by short-term profit-driven business (Phills et al. 2008). Nonetheless, the simultaneous achievement of business objectives and the solution of social problems is considered desirable (Pol and Ville 2009). Examples of social innovations include emissions trading, fair trading, socially responsible investing, microfinancing, and NCSs (Phills et al. 2008). The question for research is how both goals – social innovation and profit-driven business – can be combined (Oeij et al. 2019).

Beyond the objective of serving social needs, NCSs are defined by four other distinctive characterizing dimensions that have been frequently discussed in literature on social innovation (Edwards-Schachter and Wallace 2017; van der Have and Rubalcaba 2016; Pol and Ville 2009). The second dimension is that social innovations solve problems by improving social relationships, systems, and structures (Edwards-Schachter and Wallace 2017). This scope of the services is the natural starting point for social innovation. The third dimension is that social innovations involve the participation of civil society actors (Edwards-Schachter and Wallace 2017). This participation means that actors (like individuals, groups, organizations, government, and others) in health, education, urban planning, or social work are involved in the innovation process as initiators, users, or co-creators. Fourth, the idea of social innovation includes the potential to scale up (Borzaga and Bodini 2014). This dimension is controversial because it involves complexity on an interpersonal and cultural level as well as temporal dependencies (Oeij et al. 2019). The potential is therefore mainly the implementation and dissemination of the social services such as NCSs (van der Have and Rubalcaba

2016). Fifth, social innovations include positive effects on quality of life (Pol and Ville 2009). This outcome means that the social benefits derived from the innovation minus the social costs associated with it should be positive (Borzaga and Bodini 2014). These five characteristics show that NCSs are complex constructs for which there is no "one best way" to design (Oeij et al. 2019). A related research opportunity lies in learning how to use the distinctive dimensions of social innovation for the design of services (van der Have and Rubalcaba 2016).

Dimension	Characteristics of Social Innovation	Specification in Neighborhood Care Services
Objective	Solve social problems faced by individuals, groups, or communities	Improve home care for customers while lowering costs for society or customers paying privately
Scope	Improving social relationships, systems, and structures	Increasing empowerment, authority, and responsibility of local nursing teams
Participation	Involve civil society actors	Embedded care within formal and informal neighborhood networks
Potential	Scaling up	Reduced care hours and lower overhead, simplified billing, higher employee retention
Outcome	Positive effects on quality of life	Improved care, reduced costs, increased nurse and customer satisfaction

Table 2: Specification of Neighborhood Care Services
Source: Own Illustration

NCSs are a typical example of social innovations, as they put the presented five characterizing dimensions into practice. NCSs are private or professional services that improve the healthcare of individuals and communities by bringing together various actors at a local level (Johansen and van den Bosch 2017). Specifically, small teams of caregivers are responsible for helping a limited number of customers within a local area (Kreitzer et al. 2015). Caregivers visit customers at home and deal with individual and everyday problems. The relationship between the caregivers and the customers is the starting point of the care service, but the neighborhood setting with different service providers and neighbors can leverage a successful care setting (Kreitzer et al. 2015). This NCS has already been rolled out on a large scale in the Netherlands as "Buurtzorg" and is being tested in other countries (Johansen and van den Bosch 2017). The advantage of the care system via the neighborhood is that long-term care can be provided with higher quality, the caregivers are more satisfied with their work, and the relatives are relieved in their everyday life (Kreitzer et al. 2015). Table 2 gives an overview of the characteristics of social innovations and how they specifically work in NCSs.

2.2 Service Innovation and Design

The design and innovation of services and their corresponding BMs are aimed to create value for customers and service providers (Gustafsson et al. 2020; Zomerdijk and Voss 2010; Zott and Amit 2010). Hence, matching service design and BM design is highly relevant, as it enables companies to offer services that are able to deliver a convincing customer experience and affect the performance of the service providers (Barrett et al. 2015; Vargo and Lusch 2016). Expressions thereof are the introduction of service concepts such as "everything as a service", where a changed value proposition affects the service delivery and the revenue streams (Banerjee et al. 2011). Similar SIs can be observed in different contexts such as the hotel industry (Airbnb) or the taxi business (Uber) (Leimeister 2020). In these examples, the value proposition is the key element of service design (Patrício et al. 2011), BM design (Osterwalder et al. 2015), and digital business (Al-Debei and Avison 2010). When people buy the mental picture of a service, organizations have to deliver a service experience and are in need for structural guides or methods (Goldstein et al. 2002; Leimeister 2020). Therefore, value creation and value capture are critical output dimensions for evaluating service system and BM design (Foglieni and Holmlid 2017). Service and BM innovations in different contexts show that the combination of the value generation logic with the operational customer processes improves the overall value creation of services (Christensen et al. 2016). This knowledge is considered as a research priority for research in areas such as business and information systems engineering (BISE) (Böhmann et al. 2014; Veit et al. 2014) and service research (Ostrom et al. 2015).

In previous literature, the activities of SI (Helkkula et al. 2018; Witell et al. 2016), service design (Patrício et al. 2011; Zomerdijk and Voss 2010), and BM design (Osterwalder and Pigneur 2010; Zott and Amit 2010) are considered separately but not divergent in content (Gustafsson et al. 2020). The separation is problematic because service design and BM design are based on the same customer value proposition (Chew 2016). The output of the activities are interrelated (Al-Debei and Avison 2010), but the BMs (Brea-Solís et al. 2015) and service (Foglieni and Holmlid 2017) are evaluated independently. A problem that results from this separation is the resource-intense coordination of the development strands and the prevention of direct benefits from the integrated view (Chew 2016).

2.2.1 Service Innovation

SI includes the revision of service offerings and the logic of earning money with the service. Thereby, SIs are used for enhancing intangible offerings and/or new or

enhanced ways to deliver them (Helkkula et al. 2018; Troilo et al. 2017). Those SIs are based on a reconfiguration of new or existing resources (Gustafsson et al. 2020; Lusch and Nambisan 2015; Witell et al. 2016). Successful realization encompasses progress from the creative act to the commercialization (Priem et al. 2018; Wooder and Baker 2012). Nonetheless, objectives are individual to the service providers (Witell et al. 2016, 2017). However, two dimensions of SI performance are the strategic competitive advantage and the commercial success (Storey et al. 2016). The logic behind this process is reflected in the research framework of Chen et al. (2009), which is depicted in Figure 2.

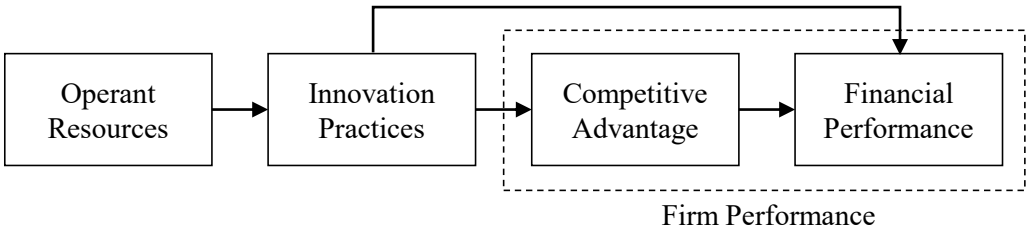

Figure 2: Service Innovation Process
Source: Chen et al. (2009, p. 38)

Based on Breidbach and Maglio (2015) and Gustafsson et al. (2020), this dissertation defines SI as a reconfiguration of a service system with the aim to increase the value for one or more stakeholders. This view includes (in deviation from Gustafsson et al. (2020)) that SI can be a process as well as an outcome. One or more parts of a service system – people, information organizations, technologies – can be replaced or changed to increase the value (Breidbach and Maglio 2015; den Hertog et al. 2010). The SI process is related to new service developments (Biemans et al. 2016; Papastathopoulou and Hultink 2012) but focuses on existing offers (Witell et al. 2016). Thereby, ICT represents a "critical factor underpinning all SI dimensions" (Troilo et al. 2017, p. 620). This connection implies that ICT is an enabler and resource in the service delivery process, which increases productivity and efficiency (Barrett et al. 2015; Chen et al. 2009; den Hertog et al. 2010). Examples can be found in previous research about scaling service infrastructure (Huang et al. 2017; Lewis et al. 2011) or individualization of services using data (Troilo et al. 2017). Nonetheless, the details of this SI process still remain unclear and represent a research gap because previous studies in this research area observe the process on a meta level (Nambisan et al. 2017).

SI practices, the activities in the SI process, focus mainly on the service concept, the service processes, and the customer experience (Troilo et al. 2017). These key aspects of SI are related to a broader view of service design (Patrício et al. 2011) and are expressed in the usage of methods and tools from service design. In the service concept,

the service provider defines the "customer needs to be satisfied, how they are to be satisfied, what is to be done for the customer, and how this is to be achieved" (Goldstein et al. 2002, p. 123). The "what" of the service is the value proposition that communicates "a superior value package to targeted customers" (Payne et al. 2017, p. 472). The specification of this value proposition should be explicit, granular, and focused (Skålén, Gummerus, et al. 2015). The service processes and delivery relate to the "how" and are revised according to the service concept (Bitner et al. 2008; Helkkula et al. 2018). These revisions influence the interfaces between customers and service providers (Teixeira et al. 2012). Lastly, the outcome of SI is linked to the service experience (Patrício et al. 2011) and thus is related to the interaction between provider and customer that occurs within the service (Helkkula et al. 2018). Thereby, the service experience focuses on the outcomes of the interactions (Patrício et al. 2008). Despite the existence of studies concerning the SI process, research is still lacking an integrated view of its key aspects (service concept, service processes, and customer experience) and their (inter)relationship (Chew 2016).

The details of the SI practices are of particular interest (Droege et al. 2009; den Hertog et al. 2010). Unlike practices in service design and new service development (Yu and Sangiorgi 2018), the content of the practices has not hitherto been reviewed (Skålén, Gummerus, et al. 2015). Therefore, Table 3 provides details and definitions for the three key aspects of SI: service concept, service processes, and customer experience. Prototyping and feedback are accompanying constructs of all key aspects in SI, as they aim at iteratively improving the service offered (Ojasalo and Ojasalo 2018). Service prototyping is "about making services visible, to learn and communicate about services" (Blomkvist and Holmlid 2010, p. 9). Service providers involve customers at various points for ideas for improvement, feedback (Edvardsson et al. 2012; Russo-Spena and Mele 2012), and evaluation (Meiren and Burger 2010; Skålén, Gummerus, et al. 2015).

Key aspect	Description	Innovation practice	Key reference(s)
Service concept	Representation of the service offering and business model to the customer; includes the value proposition, form and function of the service offering, and outcome/problem solution to the customer.	Refining the value creation for the customer	Meiren and Burger (2010), Ojasalo and Ojasalo (2018), Skålén, Gummerus, et al. (2015)
		Refining the value capture for the service provider	Chen et al. (2014), Martelo Landroguez et al. (2013), Möller et al. (2008)
Service processes	Representation of the service delivery system that allows the value creation for the customer in the service offering; includes internal and external resources.	(Re)planning the service delivery of the service provider	Bitner et al. (2008), Chen et al. (2009), Voss and Hsuan (2009)
		Integrate external participants in service delivery	Agarwal and Selen (2011), Lusch and Nambisan (2015)
Customer experience	Representation of the interaction between the service provider and the customer; includes (infra)structure and customer integration, and customer touch points.	Revising service encounter and interface	Karlsson and Skålén (2015), Meuter et al. (2000)
		Revising customer integration	Edvardsson et al. (2012), Russo-Spena and Mele (2012)

Table 3: Specification of Service Innovation
Source: Own Illustration

Service prototyping can refer to the core of the service concept on a strategic level (Meiren and Burger 2010) or on an operational level, like the service processes (Bitner et al. 2008) and the service delivery (Chen et al. 2009). Thereby, the service interface and interaction with the customer are operational parts of the service concept (Karlsson and Skålén 2015; Meiren and Burger 2010). The reconfiguration of resources in SI is primarily directed towards the customer value as the perception of what a service is worth to a customer and the firm performance as improvement in competitive advantage and financial performance (Chen et al. 2014; Martelo Landroguez et al. 2013; Möller et al. 2008). Obviously, the customer value is not solely influenced by the service provider itself but increasingly by a network of different actors (Agarwal and Selen 2011; Lusch and Nambisan 2015). After the SI, the service concept should match the business concept (Agarwal and Selen 2011) to enable improvements in firm performance (Chen et al. 2009). Thus far, detailed activities in these SI practices are missing (Skålén, Gummerus, et al. 2015).

In literature, ICT is a significant facilitator and tool in SI and design (Amit and Han 2017; Chandler and Lusch 2015). Thereby, ICT is one of the most discussed dimensions of innovation (Breidbach and Maglio 2015; Lusch and Nambisan 2015). Existing

disagreement concerns whether ICT use in service systems initiates and/or enables SI by improving the integration of resources and value co-creation. Ryu et al. (2014) examined this question and found that ICT is rather a dimension of a SI than an operant resource or a mediator. Thereby, an "innovative assembly of ICT as well as non-ICT resources" (p. 245) is considered as highly valuable in services (Srivastava and Shainesh 2015). This connection can be defined as human–technology integration. To offer such services, there are various data-driven and nonhuman technologies, such as big data, artificial intelligence, or service robots (Aleksander 2017; Demirkan et al. 2015). The objective of their integration is usually to increase the efficiency of service delivery (Srivastava and Shainesh 2015) but also the use of business opportunities created by new technologies (Barrett et al. 2015). These technologies have the potential to make life easier for customers and service employees (Bitner et al. 2000; Hilton et al. 2013). Successful examples can be seen on an individual level with location-based smart devices that people use in everyday life (Constantiou et al. 2014) or at a large scale in data-based healthcare settings that foster support systems (Gianchandani 2011).

There is a difference between ICT SI and ICT-enabled SI. Based on emerging trends such as an increase in self-service and automation, there is an expansion of ICT in service systems (Davis et al. 2011). To a large extent, the analysis of SI is centered around ICT artifacts instead of service systems (Breidbach and Maglio 2015). For example, with their contribution, Ryu et al. (2014) examined whether ICT is the focus of SI or an integrated part of it. The integration of different actors in the service system is challenging, as ICT can substitute employees, which implies different adoption processes (Ostrom et al. 2015). This insight is especially relevant for HCSSs, as personal interactions are essential for the value creation (Breidbach et al. 2016). An innovation towards a technology-centered service system will change the entire service (Bitner et al. 2000). Individual behaviors and actions that create value have changed. Therefore, in HCSSs, ICT and people should be regarded as an integral part of the ICT-enabled SI (Maglio 2015).

Not all service providers have the knowledge to implement such ICT components into their services. To leverage potentials such as the mobilization of resources, the enhancement of contextualization, and the use of innovative service architectures, a systematic design of the services is needed (Böhmann et al. 2014; den Hertog et al. 2010). The crucial part in redesigning such services is the alignment with human users (Breidbach et al. 2016). Although this need affects all technologies, it has been insufficiently implemented so far (Barrett et al. 2015). In this context, early attention on service design can lead to an effective symbiosis between people and ICT (Aleksander

2017). For design and implementation, most service providers identify individual parts of the services that can be digitized (den Hertog et al. 2010). Thereby, personal interaction of customers with service providers creates a large part of the value in service delivery (Giebelhausen et al. 2014). There are two different approaches to supplement services with digital components. On the one hand, activities are executed by the ICT that have hitherto been performed by people routinely and on a daily basis (Aleksander 2017). These are mostly activities that are not the core of the value proposition of the service provider. On the other hand, customers take over parts of the service delivery with self-service technology (Breidbach et al. 2013). These are activities that are executed more quickly by customers because they have direct access to knowledge or data (Hilton et al. 2013). This redesign needs training of employees and customers about the benefits of ICT (Aleksander 2017; Davis et al. 2011). What is missing for the service providers are knowledge to understand user needs and technological options (den Hertog et al. 2010).

2.2.2 Service Design

Service design is the "systematic application of design methods and principles to the creation of service concepts for new or improved services" (Holmlid and Evenson 2008, p. 341). Because service design is considered as multidisciplinary, this definition is, similar to others, kept open to fit a wide range of application domains (Nisula 2012). Concerning content, it comes down to two application areas. First, human-centered methodology includes the definitions of customer experience and expectations. Second, the methods for modeling, prototyping, and enacting include the definition of the participating entities with their activities and the testing and resolution of problems (Holmlid and Evenson 2008). The latter is linked to the activities in new service development (Papastathopoulou and Hultink 2012). Service design is mostly customer- and experience-centric (Teixeira et al. 2012; Zomerdijk and Voss 2010). A procedure for the service design is hard to find because it usually has to be adapted to the context of the service domain and customer problem (Edvardsson et al. 2011; Essén 2009). There are approaches like service systems engineering that employ engineer thinking to make service design more systematic (Böhmann et al. 2014). These approaches offer a comprehensive methodology to identify linkages among service systems and structure the development accordingly.

A specific problem that service providers in HCSSs have to deal with is that they are unable to cope with the growing number of inquiries and that either not all customers will be served or the quality of service will decrease (Zhao and Di Benedetto 2013).

Neither case is desirable for the service providers or the customer. Service scaling means the flexible adaptation of service resources to meet the needed capacity. Scalability is a (mainly technical) design characteristic of systems, networks, or processes when adapting to growing volumes (Bondi 2000; Hill 1990). Service providers have the option to use vertical or horizontal scaling for influencing the characteristic of scalability in their services. In the context of HCSSs, those new resources predominantly include investments in new personnel (Chase 1981). Complete scaling of a business requires three activities: outsourcing of high-cost tasks, providing self-customized value propositions to users, and enabling a flexible adaptation of the value creation capacity for the customer through modular design (Täuscher and Abdelkafi 2018). Although different examples of service scalability can be found in the literature for digital settings – such as scaling infrastructure (Lewis et al. 2011) or scaling of the user base (Huang et al. 2017) – there is a lack of operationalization on ICT-enabled SI and scaling of HCSSs involving personal interaction.

2.2.3 Business Model Design

A BM is a "simplified and aggregated representation of the relevant activities of a company. It describes how marketable information, products and/or services are generated by means of a company's value-added component" (Wirtz et al. 2016, p. 41). This is useful for customers and service designers to understand the value of service systems, as both have limited background knowledge (Noh et al. 2016). In practice, however, only a few models are used to define these relationships, such as the BM canvas (Osterwalder and Pigneur 2010) or the BM navigator (Gassmann et al. 2014). All of these approaches have different components representing the functioning of the BM (Wirtz et al. 2016). A fundamental component of a BM is the value proposition (Maglio and Spohrer 2013; Osterwalder et al. 2015; Wirtz et al. 2016). The value proposition "describes the benefits customers can expect from products and services" (Osterwalder et al. 2015, p. 6).

The objective of BM design is to expose business opportunities by defining a value for the participants involved in the service system (Zott and Amit 2010). The customer value proposition that "describes the benefits customers can expect from products and services" reflects this purpose (Osterwalder et al. 2015, p. 6). Thus, it shows how a client's problem is solved (Teece 2010). This approach is related to how a service is designed and can therefore not be considered separately (Osterwalder and Pigneur 2010). Value proposition design is about "applying tools to the messy search for value propositions that customers want and then keeping them aligned with what customers

want in post search" (Osterwalder et al. 2015, p. XIII). It focuses on the problem-solution fit, the product-market fit, and the BM fit. An alignment between the value proposition of the BM and the service system does not happen (Chandler and Lusch 2015). BM implementation describes the process "from the informal first idea to a process of trial and error shaping its final design, or a continuous process of modification, where customers, technology, business system infrastructure and economics and profitability are all rethought" (Sabatier et al. 2010, p. 434). Although this is what everyone has to do, BM implementation or execution is a widely neglected issue (Hacklin and Wallnöfer 2012; Osterwalder et al. 2005). A BM refers mostly to a particular product or service with an associated value to the customer (Osterwalder et al. 2015). This value to the customer is the basis for the financial return of the product or service (Teece 2010). BM design is a critical task for managers and represents a challenge when established BMs are reconsidered and revised (Zott and Amit 2010).

The result of BM design is a set of relevant and individual activities that represent the positioning of the service provider to customers and competitors. The process of the design is similar in many cases, although there is no uniform approach (Ebel et al. 2016). What is challenging to BM design is that, contrary to partial optimization, system-level design is to be considered (Zott and Amit 2010). A BM that only focuses on value creation or delivery without simultaneously considering revenue streams from that value will likely be economically unsustainable (Chatterjee 2013). Additionally, when reconsidering existing BMs, there are forces of inertia and resistance to change that represent a challenge (Zott and Amit 2010).

The activities in BM design are supported by different concepts. These concepts represent interfaces to BM design (Wirtz et al. 2016). They help in the development and commercialization of service systems and their corresponding BMs. Table 4 lists the concepts including their objectives and the connection they have with BM design.

Concept	Objective	Interfaces
Customer Development (Blank and Dorf 2012)	Align product development with customer needs and market	Service ideation, revenue model
Lean Startup Approach (Ries 2011)	Service development with shortened development cycles	Service development and implementation
Service Design (Zomerdijk and Voss 2010)	Design service according to the needs of customers or participants	Service ideation and development
Service Innovation (Barrett et al. 2015)	Reconfiguration to increase the value for the involved actors	Service ideation and development
Value Proposition Design (Osterwalder et al. 2015)	Define the functionality of services and customer needs	Service ideation, development, and visualization

Table 4: Concepts Related to Business Model Design

Source: Own Illustration

3 METHODOLOGICAL BACKGROUND[3]

This section gives a high-level overview of the methodology. The research presented was embedded in a larger three-year research that aimed at developing and introducing service platforms based on existing offline services. The research contained a technical part including the development and testing of the software as ICT components and a business part including the design and implementation of the services and the corresponding BMs. The project includes an explorative phase in which the problem and solution space are clarified and an implementation phase in which design knowledge is developed, tested, and formalized. Part of the problem of the service providers is the situation described in the introduction that systematic knowledge for designing the service business is missing to support ICT-enabled SI. A methodology was chosen that allows this systematic knowledge to be built up. Accordingly, this dissertation is based on the DSR approach. Based on this DSR approach, qualitative research methods support the development of the knowledge base, the development, and evaluation of design knowledge. The approaches used are briefly explained.

3.1 Design Science Research

For the development of a service business design for HCSSs, the dissertation includes a DSR approach (Hevner et al. 2004). The research approach is based on the guidelines for DSR provided by Hevner et al. (2004) and Hevner (2007). The focus in DSR is on creating and evaluating a useful artifact that enables organizations to address important questions (Gregor and Hevner 2013). The objective of this dissertation is to develop systematic design knowledge for service business design enabling the benefits of ICT-enabled SI in human-centered service systems. In specific, the focus is on developing and evaluating artifacts such as the service business design that have to show utility, quality, and efficacy to meet the customer and business requirements (Venable et al. 2016). The design artifact is an interplay of technology, information, and social components (Lee et al. 2015).

The DSR approach (Figure 3), in which this research is embedded, consists of three main activities that include the design, relevance, and rigor cycle (Hevner 2007). The relevance cycle enables direct feedback from the research setting and the environment. The rigor cycle offers the possibility to incorporate previous findings from research and

[3] Parts of this chapter have been published in an earlier version in different conference proceedings and research journals. For details please refer to the Overview of Publications (section 1.4).

development. The design cycle offers the possibility for an iterative development of the artifact in the build and evaluate phases. All three cycles must be passed to ensure the usefulness of the result.

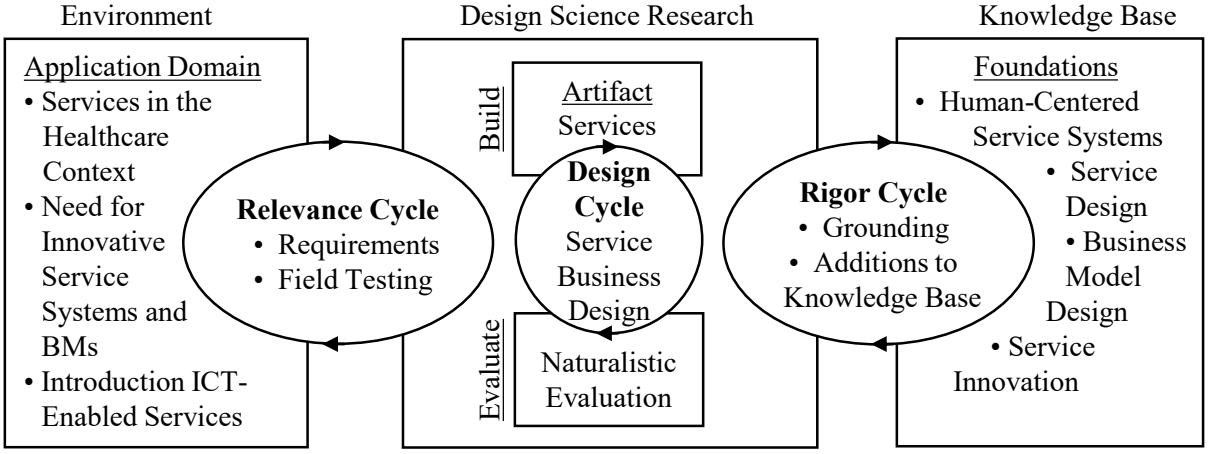

Figure 3: Design Science Research Cycles
Source: Adapted from Hevner (2007)

The relevance cycle tackles a specific problem and identifies potentials. Within the relevance cycle, the contextual environment of the research project is connected to the design science activities. In this part of the research, the environment of the presented research consists of a larger research project that aims at the development and introduction of matchmaking services in the healthcare context. The research project consists of a technical part including the development and testing of the service platforms and a business part including the design and implementation of the service systems and BMs. The service providers involved have a strong need to innovate their services to respond to changing market conditions. The service design and BM design should be adapted accordingly. The relevance cycle offers the opportunity to identify requirements for a possible service business design as well as to test this possible solution.

The rigor cycle connects the DSR activities with the knowledge base of scientific foundations, experiences, and expertise. This involves a systematic review of existing literature and an assessment of how the problem has been dealt with so far. The rigor cycle ensures that the solution developed represents an innovation that improves previous approaches and problem solutions. This dissertation uses the concepts and theories in HCSSs, SI, service design, and BM design that are presented in the theoretical background section as a knowledge base for the design and evaluation. The research findings in the DSR approach return directly back into the knowledge base and expand it. This will be explained in the theoretical contribution (section 9).

The design cycle is the core of the DSR approach. In this cycle, the artifact is built and evaluated. In the research project, services and BMs are developed as described. In creating these services, a systematic approach to the service business design can be developed that is tested and improved in the naturalistic setting (Venable et al. 2016). The artifact is designed in iterations that allow feedback and refinement. The input for this feedback is coming from the relevance cycle and the rigor cycle. On the one hand, the existing solutions shown in the relevance cycle offer one or more approaches and starting points for solving the problem, and on the other hand, the requirements of the service providers in the rigor cycle offer a possibility of comparison with the desired status.

3.2 Qualitative Research

In addition, different qualitative methods are used to do justice to the VUCA context in which the design of the service business of HCSSs takes place. These qualitative approaches help to understand a phenomenon or actions in their context (Miles et al. 2014). Thus, the qualitative approaches can contribute to verify theories and classify the acquired knowledge. In the DSR approach, qualitative methods can be used for understanding a problem and for evaluation of the designed artifact (Hevner et al. 2004). The qualitative approaches are a way to understand reality and action and thus also the real-world problem. This understanding of the problem is mainly clarified in the relevance cycle. Furthermore, the qualitative approaches offer an opportunity to use the artifact and design knowledge in the real world and thus to evaluate the change. This understanding of the changes is mainly clarified in the design cycle because it is the core of the development and evaluation scheme. This scheme enables an evaluation of utility, quality, and efficacy. A summary of the approaches used in this dissertation is given in Table 5. The application of the qualitative methods in the design cycles is mentioned in a short introduction.

The *SLR* aims at the systematic analysis of the existing theoretical knowledge. The approach is based on the contributions of Webster and Watson (2002) and vom Brocke et al. (2009, 2015). They examined existing literature reviews to develop an approach for conducting literature reviews more systematically. Based on their findings, a literature review contains the steps of (I) defining the scope of the SLR, (II) specifying the covered topics, (III) searching for relevant literature, (IV) synthesizing the content, and (V) deriving a research agenda.

In-depth case study research identifies and describes the practices used in different domains. This requires an in-depth analysis and their context (Schatzki 2001). Practices

are “embodied, materially mediated arrays of human activity centrally organized around shared practical understanding” (Schatzki 2001, p. 11). Its inherent “arrays of human activity” as well as their corresponding context can help to inform theory and practice (Feldman and Orlikowski 2011; Nicolini 2009).

Canonical action research solves problems through the cooperation of theory and practice. The method combines the generation of scientific knowledge with researcher intervention to solve immediate real-world problems in a formalized form (Baskerville and Myers 2004; Davison et al. 2004). As action research runs in iterations, the cycles of diagnosing, action planning, action taking, evaluating, and specifying learnings are repeated until the problem is solved (Baskerville and Wood-Harper 1998).

Qualitative data analysis aims at revealing data structures and relationships. This approach is performed in iterations, so that data structures, concepts, and themes become more precise in their context (Gioia et al. 2013; Miles et al. 2014). This can include deductive or inductive forms. A first iteration identifies the concepts under consideration. The second iteration details the themes.

Method	Objective	Main References	Use in the Dissertation
Systematic Literature Review	Analysis of the existing theoretical knowledge	vom Brocke et al. (2009, 2015), Webster and Watson (2002)	Section 4
In-depth Case Study Research	Identify and describe the practices in the real world	Feldman and Orlikowski (2011), Nicolini (2009)	Sections 5 and 7
Canonical Action Research	Solve problems by iterating theory and practice	Baskerville and Myers (2004), Davison et al. (2004)	Section 6
Qualitative Data Analysis	Reveal data structures and relationships	Miles et al. (2014), Gioia et al. (2013)	Sections 4, 5, and 6

Table 5: Summary of the Qualitative Methods
Source: Own Illustration

4 SUMMARIZING THE STATE OF RESEARCH[4]

This chapter addresses the fundamental question about the state of research in the research area of ICT-enabled SI. The chapter presents the result of the SLR in the research area that includes an integrated and representative overview of ICT-enabled SI in HCSSs and provides opportunities for research. In this chapter, section 4.1 specifies the need for systematic research in the research area before section 4.2 describes the actual review process, providing insights into the method used for this SLR. The section 4.3 contains the findings on a descriptive and thematic level. Based on the discussion of the findings, in section 4.4 a research agenda is derived including topics for future research. Section 4.5 addresses limitations, and the last section 4.6 provides an overall conclusion of the chapter.

4.1 Motivation

Both research and business practices recognized the potential of ICT-enabled SI in HCSSs. In research, the service-dominant logic puts service as the fundamental basis of exchange and proposes value as a co-creation of the interaction between multiple actors (Vargo and Lusch 2004, 2016). Innovating within complex service systems and value networks is regarded as one of the top research priorities in service research (Ostrom et al. 2015). With ICT as a facilitator and initiator of SI and value co-creation, this topic becomes relevant for service and IS research because it links human interaction with the technology in a service environment (Lusch and Nambisan 2015; Rai and Sambamurthy 2006; Yoo et al. 2012). In business practice, especially innovative companies observe opportunities to improve and support human-based processes in VUCA contexts. Apple Inc. (2020) presents a successful example for this. In a learning environment they encourage teachers to use their products to enhance the learning experience for students. Although the focus of the service system is still on education, ICT improves the teaching abilities and the learning experience for the students and thus improves the value of the service. Previous findings on ICT-enabled SI in HCSSs are not presented systematically. Given the significance of the topic, further research is desirable (Maglio et al. 2015; Sheehan 2006). Therefore, a systematic summary of the literature is required that is not available yet.

[4] This chapter have been published in an earlier version in the Proceedings of the 37th International Conference on Information Systems (2016, pp. 5478–5495). For details please refer to the Overview of Publications (section 1.4).

4.2 Research Method

4.2.1 Data Collection

The purpose of this SLR is to present an integrated and representative overview of the literature on ICT-enabled SI in HCSSs and to provide opportunities for future research. Therefore, the method of Webster and Watson (2002) and vom Brocke et al. (2009, 2015) were applied. The scope of this review focuses on data collection and analysis (Cooper 1988; Jennex 2015). The focus in the data collection is reflected in the inclusion criteria and selected journals. The analysis includes a descriptive as well as scoping analysis (Paré et al. 2015).

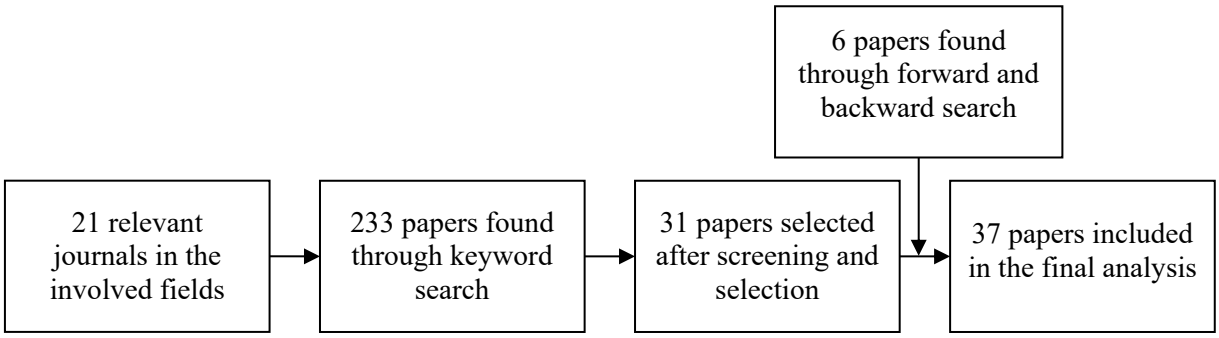

Figure 4: Literature Search Process in the Systematic Literature Review
Source: Own Illustration

The search process for this SLR contained four steps before including the papers in the analysis. The process is depicted in Figure 4. The literature on ICT-enabled SI and HCSSs is multidisciplinary (Huang and Rust 2013; Maglio et al. 2015). Therefore, following Webster and Watson (2002), this review started with literature from top journals in the research areas of management science, BISE, service research, and innovation management. Suitable journals that provide an overview of high-quality and relevant research in the research areas were selected using the objective Thomson Reuters Journal Citation Report and the subjective German VHB-JOURQUAL 3 ranking. Each journal was searched in using the search parameters ("information technology" OR "information and communications technology" OR digitization) AND innovation AND ("service system" OR "service systems"). The search parameters were chosen as they represent the combination of ICT-enabled innovation in service systems. The search parameters cover both singular and plural and are based on the terms used regarding the related research area within the theoretical background. Because the various databases have different formats, adaptations to the specific search strings were made. 233 papers were found through the keyword search (“Hits” in Table 7). The sources were chosen depending on the number of hits, preferring a larger number of

papers (cross-journal databases vs. publishers' databases). In a screening and selection step, the papers were examined regarding their titles and abstracts based on three inclusion criteria. These criteria included:

- a research focus on ICT-enabled SI,
- a research background in the research area of HCSSs, and
- a data collection in the research papers.

31 papers matched these criteria ("Included" in Table 7). Backward and forward searches were performed to identify more relevant literature (Webster and Watson 2002). For the forward search, the Thomson Reuters Web of Science research platform was used. The same inclusion criteria and quality standards were applied. In total, 37 papers were included in the final analysis ("Included" plus "Forward/Backward" in Table 7). The results include papers published before 2016.

The analysis of this SLR is based on a systematic information extraction and mapping of the research objectives to an analytical framework. The data extraction for each contribution included the eight different categories of

- full reference,
- research context,
- studied SI,
- main research objective,
- main research findings,
- theoretical foundation,
- research methods used, and
- proposed future research

4.2.2 Data Analysis

For the analysis, a framework integrating two dimensions was introduced. The first dimension depicts a SI management process that includes four phases. This process builds on work regarding the system development life cycle that is included in ICT-enabled change and was applied to service systems (Alter 2008). The management process describes the phases before, during, and after an ICT-enabled SI. The different process phases contain activities that build on each other. The initial phase is about understanding the innovation process and its influencing factors. Based on this knowledge the idea of the SI is questioned and the decision is made for the implementation. The second phase includes the development of the ICT-enabled service system and thus the core of the SI. In the end, a running service system should offer

value to the beneficiary. The activities after the ICT-enabled SI are divided into two phases. The third phase includes aspects that relate to the operation of the service system. The actual value co-creation is started, and possible adaptations are implemented. The goal of the phase is to reach a state of stable operations. The final phase includes the value capture for the service provider. In this phase, the value co-creation is established and the service provider can take an assessment of the ICT-enabled SI. Table 6 depicts a summary of the phases and their associated descriptions.

Phase	Description
Understanding	Idea to Decision – Understanding what needs to be considered for and what is included in an ICT-enabled service innovation.
Designing & Implementing	Decision to Service System – Execution of the service innovation including the building or acquisition of the ICT and the most appropriate service system configuration.
Operating & Adapting	Service System to Usage – Sustainably operate the service system with the ICT-enabled service innovation and without problems associated with technology and new processes.
Value capture	Usage to Value Increase – Systematically derive benefits from the ICT-enabled service innovation. This includes the measuring of the performance.

Table 6: Analysis Framework for the Systematic Literature Review
Source: Own Illustration

The second dimension of the analytical framework is derived from the constituting parts of the service system definition (Maglio et al. 2015), meaning people, information, organizations, and technologies. Thus, both dimensions combined include the SI process for all parts of the service system. Due to the used definition of SI, this composition enables an assessment of the different areas of the service system and SI. The actual thematic analysis consists of mapping the main research objectives and research findings of the found papers to the analytical framework.

In three phases of the research process quality assessments were used to ensure complete and relevant results. Three senior researchers provided feedback on the steps. These researchers come from the research disciplines involved in the research process. First, the selection of journals was discussed. Based on their feedback, three journals were included and eight were excluded. Second, the search parameters were discussed. Based on the feedback, the assessment whether a paper includes ICT-enabled SI and HCSSs was performed in an extra step instead of being included in the search parameters. Third, the resulting assignments to the categories based on the objective of the papers were discussed. The feedback helped to define the main categories and assign the included

papers. Thus, it allows verifying the found research gaps (Müller-Bloch and Kranz 2015).

4.3 Findings

4.3.1 Descriptive Findings

On the basis of the keyword, backward, and forward search, a total number of 37 papers was found in the different journals that matched the inclusion criteria. This includes the analyzed disciplines, the associated journals including the database source, the number of hits within the keyword search of the journals, the number of papers selected on the basis of the inclusion criteria, and the number of papers added based on the forward and backward search. Table 7 shows the result of the SLR process.

Discipline	Journal	Source/ Database	Hits	Included	Forward/ Backward	Overall
Management Science	Academy of Management Journal	Academy of Management	1	0		0
	Journal of Management	SAGE	1	0		0
	Management Science	INFORMS	3	1	1	2
Business & Information Systems Engineering	European Journal of Information Systems	ProQuest	13	8		8
	Information Systems Journal	Wiley	11	3		3
	Information Systems Research	ProQuest	4	0		0
	Journal of the Association for Information Systems	INFORMS / ProQuest	9	0		0
	Journal of Information Technology	ProQuest	9	0		0
	Journal of Management Information Systems	Taylor & Francis	12	2		2
	Journal of Strategic Information Systems	Science Direct	6	0		0
	MIS Quarterly	AIS eLibrary	9	2		2
	Electronic Markets	Taylor & Francis			2	2
	International Journal of Information Management	Science Direct			1	1
Service Science	Journal of Service Research	SAGE	30	5		5
	Journal of Service Management	Emerald	22	3		3

	Journal of Retailing	Science Direct	5	1		1
	Manufacturing & Service Operations Management	ProQuest	4	1	1	2
	Service Science	INFORMS	35	2		2
	Journal of the Academy of Marketing Science	ProQuest			1	1
Innovation Management	Industry and Innovation	Taylor & Francis	2	0		0
	Journal of Product Innovation Management	Wiley	17	0		0
	International Journal of Innovation Management	World Scientific	4	1		1
	Research Policy	Science Direct	11	0		0
	Technovation	Science Direct	25	2		2
Total			**233**	**31**	**6**	**0**

Table 7: Overview of the Literature Review Results
Source: Own Illustration

The results show a concentrated distribution. It is worth remarking that the papers were mainly from journals of the research areas of service research and BISE. Only two of the contributions were included from the research area of management science and three from that of innovation management. With eight contributions, the European Journal of Information Systems was the journal with the highest number of papers in the analysis. The number of papers about ICT-enabled SI in HCSSs has increased in recent years. However, a clear trend cannot be confirmed. Figure 5 shows a bar chart with the number of publications for each year in which papers were found. The first contributions published in the years 1999 to 2003 are rather explorative than specific. The contributions by Broadbent et al. (1999), Uchupalanan (2000), and Bannister (2001) included empirical research in the form of case studies. The first quantitative study is the contribution of Levenburg and Klein (2006).

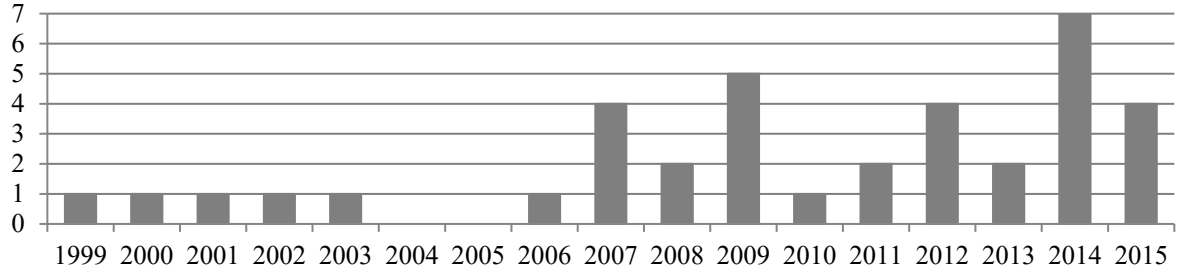

Figure 5: Publication Distribution of the Literature in Review
Source: Own Illustration

The examined contributions included empirical data from various application contexts and data sources. Table 8 shows the number of publications regarding the different research contexts. Healthcare is the most popular research context in the sample. In this industry, the service systems are based on the interaction between providers and patients (Bhargava and Mishra 2014; Morgre et al. 2009; Srivastava and Shainesh 2015). When considering the used research methods (Table 9), it becomes clear that different research methods are used to examine ICT-related SI in HCSSs. Case study research was mostly used research method in the studied papers. Authors of case studies justify their explorative approach with the complexity of service systems and the little knowledge about the research area of service systems. However, the results show that it is possible to examine specific aspects with quantitative methods.

Industry	**Found Papers**
Healthcare	11
Retail	8
Multiple	4
Banking	4
Education	3
Government	4
Consulting	1
Hospitality	1
Industry Neutral	1
Total	**37**

Table 8: Research Context of the Literature in Review
Source: Own Illustration

The found literature covers different domains with diverse levels of theoretical background knowledge. On the one hand, many of the papers relate to previous research without using specific and established theories. Examples of this approach are theoretical backgrounds on SI (Yang and Hsiao 2009), new service development (Lin and Hsieh 2014; Wallin et al. 2015), or the value co-creation (Komulainen et al. 2007; Villarroel Ordenes et al. 2014). This approach was chosen in 15 of the 37 papers. On the other hand, complex theories were used when subsections of a problem had been studied. With regards to the theories, the theory of acceptance and use of technology or components thereof (technology acceptance model, theory of reasoned action) is the one most commonly used. The theories that include factors that have an impact on the usage intention and behavior were used in ten papers. Other theories used more than once are the task-technology fit theory (3 times) and the customer contact theory (2 times).

Research Method	Found Papers
Case Study Research	13 (6 Single Case Studies, 7 Multiple Case Studies)
Mixed Methods Research	6
Survey Research	10 (6 Cross-Sectional Surveys, 4 Longitudinal Surveys)
Experimental Research	3 (1 Lab Experiment, 1 Field Experiment, 1 Online Experiment)
Archival Research	2
Ethnography Research	1
Design Science Research	1
Grounded Theory	1
Total	**37**

Table 9: Research Methods of the Literature in Review
Source: Own Illustration

4.3.2 Thematic Findings

The thematic analysis resulted in mapping the papers to the four phases of the management process and the components of the service systems definition. The individual contributions were mapped to an analytical framework due to their research objectives that are given in the paper abstract or introduction. For clarity, the results are presented by the management process and discussed regarding the individual phases of the process and the components of the service system. If the papers found discussed more than one research problem or had several findings, they can occur more than once in the discussion. The results for each of the process phases are shown in Tables 10 to 13.

The first phase of the proposed management process is the initiation of ICT-related SI in HCSSs. The papers included regarding this phase answer the question of what should be considered for ICT-enabled SI (Table 10). Based on the number of papers, this is the most popular topic in research. Also, regarding content, it is the most comprehensive phase.

People	Burke (2002), Cocosila (2013), Pramatari and Theotokis (2009), Smith et al. (2014), Wallin et al. (2015), Wünderlich et al. (2012)
Information	Jahng et al. (2007), Essén (2009)
Organizations	Bigdeli et al. (2013), Tallon (2010), Uchupalanan (2000)
Technology	Broadbent et al. (1999), Peng et al. (2014), Komulainen et al. (2007)

Table 10: Literature about the Understanding of Service Innovation
Source: Own Illustration

Focusing on the individuals, the authors analyzed the impact of attitudes, beliefs, personality traits, and perceptions. Thereby, the papers include different aspects that

have to be considered for ICT-related SI. The beneficiaries of the ICT enablement are the research objects. Acceptance of the ICT is the main focus that is examined. For example, Cocosila (2013) examined if the attitude of beneficiaries toward the activity support or influences the acceptance of ICT in HCSSs. She showed that there is only a small positive influence on the behavioral intention associated with using the ICT-enabled service system. Wünderlich et al. (2013) examined the attitudes toward and the use of ICT-enabled service systems while identifying a set of acceptance and usage barriers and drivers. They found that the beneficiaries' beliefs about the control over, the trustworthiness of, and collaboration with other organizations in HCSSs are significant influencing factors. Smith et al. (2014) analyzed factors that enable and impede the utilization of radio-frequency identification (RFID)-enabled systems. They found that the utilization is affected by the perceived usefulness and the privacy concerns of the users. In order to include the system level, Pramatari and Theotokis (2009) examined the different levels of acceptance for an integrated service system including ICT. Based on an example of RFID use, they showed that personality traits such as technology anxiety and privacy concerns affect the attitude toward the use of such systems on a technology and system level. Considering other significant factors on the individual level, Wallin et al. (2015) pointed out the importance of analyzing the contextual value for a variety of relevant stakeholders and of identifying the key persons. Burke (2002) investigated aspects of experience that are significant for beneficiaries of the ICT-enabled shopping system. He emphasized that the applications and their embedding in the service system should be generated based on the unique requirements of customer segments and product categories to ensure satisfaction.

Two contributions promote the understanding of the interaction and show the shared information in the service system. From a general perspective, Essén (2009) wanted to understand if the innovation process in HCSSs is predictable and can be controlled. She found that such innovations are nonlinear and emergent processes that can reorganize the information flow in the organization. Jahng et al. (2007) analyzed consumers' interactions on an electronic commerce platform with sold products and sales representatives. They found that the shared information of ICT-related SI is higher if the HCSSs are highly complex. Based on the assumption that interaction means value co-creation in HCSSs, these findings are advantageous.

At the organizational level, the authors in the understanding of SI showed how ICT-related SI influences their service business externally and internally. The examined factors help to understand SIs. They are influenced by new technological resources, institutional constraints, feedback, and repurposing of available resources. Because the

innovation process is greatly influenced externally, Uchupalanan (2000) wanted to explain how the characteristics of market competition affect the innovation process. He examined the relationships between competitive strategies and ICT-related innovations in financial service and found that they affect each other and depend on the context. Providing an example for the dependency, Tallon (2010) showed that there are size-related differences. ICT-related SI in HCSSs cannot be successfully implemented without knowing the influencing variables. The extent to which ICT and business strategy match can influence the outcome. Smaller companies should follow other strategies than large companies. Returning to a system perspective, Bigdeli et al. (2013) showed that interaction between government organizations is influenced by the combination of environmental, organizational, business process, and technological factors when using an ICT-enabled SI. Their intention was to show decision makers the importance of these influential factors.

Examining the mechanisms of technology, some authors focused on its role regarding SI. Broadbent et al. (1999) researched the links between firm-wide IT infrastructure and business process change. They found that the IT infrastructure capability has an impact on the speed and nature of process change and thus on innovation adoption. Additionally, Peng et al. (2014) focused in their paper on the aspect of technology diffusion. They proposed a framework that explains the adoption of ICT-related innovation and the influencing factors. They found that knowledge flow plays a key role in fostering technology diffusion in the first years. On the other hand, there are factors in the company that influences the technology diffusion. Komulainen et al. (2007) showed that the perception of value differs for companies according to the willingness and ability to use the ICT-related SI. Therefore, they advised developers and facilitators of ICT-related SI to study and know the different beneficiaries they want to target.

The second phase of the management process is the designing and implementing of the ICT-related SI in HCSSs. The papers included regarding this phase answer the question of what the most appropriate configuration for the service system is (Table 11). No papers could be assigned to the dimensions people and shared information.

People	
Information	
Organizations	Lin and Hsieh (2014), Pinho et al. (2014), H.-L. Yang and Hsiao (2009)
Technology	Lahiri and Seidmann (2012), Levenburg and Klein (2006), Mosse and Whitley (2009), Skålén et al. (2015), Srivastava and Shainesh (2015), Theotokis et al. (2008), Y. Yang et al. (2011)

Table 11: Literature about the Design and Implementation of Service Innovation
Source: Own Illustration

In designing ICT-related service systems, the authors regard the design of the ICT as the most significant sub-category with respect to the number of contributions. The category includes papers that provide assistance regarding the compilation and level of ICT in the service system and at the different phases of the implementation. In their analysis of existing ICT-related service systems, Levenburg and Klein (2006) recognized an oversupply of ICT for the users. They researched how companies can select ICT for a SI that improves the financial success of the innovation. They found that understanding the beneficiaries' needs is central to successfully design a SI. Based on their findings regarding the beneficiaries' needs, they established guidelines for digitized service co-creation and presented a combination of best practices with proposals for the configuration. Y. Yang et al. (2011) researched which factors have to be considered in the designing of systems to maximize the influence of, benefits from, and user responses to the ICT-enabled service system. They found that the satisfaction with ICT-enabled SI depends on the system quality and system usefulness, so they recommended to focus on these aspects. With the same intention of maximizing the output of ICT-related SI through design, Theotokis et al. (2008) examined how much technology different service systems require. Based on the dimensions of technology readiness, they proposed a classification regarding the level of customer-technology interaction in the service system. Based on much of this knowledge, Lahiri and Seidmann (2012) examined in which phase the information gathering in the HCSS makes the most sense to design an efficient ICT artifact. They found that it improves the turnaround time in separating information gathering and usage and relocating the task upstream in the workflow. Mosse and Withley (2009) focused on the adoption of website benchmarking techniques to design ICT artifacts. They found that the development of a classification regarding the service system and an evaluation tool is more important than looking at competitors. They concluded that innovators reflect on the ways in which ICT-enabled innovation is changing the HCSS. Skålén et al. (2015) showed an example in their case study of how ICT tools can serve as a facilitator for SI. They proposed a service design using interdependent ICT tools. In advanced stages of the implementation, Srivastava

and Shainesh (2015) wanted to show how ICT enables growth in service systems. They found that there are enablers (obsessive customer empathy, belief in the transformational power of ICT, continuous recursive learning, and efficient network orchestration) that support the process of adoption.

For organizations, one of the most significant aspects to plan in designing new ICT-related service systems is the coordination with other organizations. Pinho et al. (2014) studied value co-creation from multiple actors' perspectives and found that for coordination, the interactions in nonlinear relationships are essential. Their study emphasizes the need for designing the co-creation among different actors in the network. Lin and Hsieh (2014) analyzed new service developments in complex service systems. In addition to the identification of clear user needs and the involvement of a developed ICT in the innovation process, they found that sharing information across organizational boundaries is essential for the design of the service system. Also, regarding the new service development, H.-L. Yang and Hsiao (2009) showed mechanisms of different development phases. They showed that ideas, requirements, and specifications of the service system stimulate the development of ICT-enabled service systems in organizations

The third phase of the process is the managing of the ICT-related SI in HCSSs. The papers included regarding this phase answer the question of how to operate and change the service system (Table 12). No papers could be assigned to the dimension people.

People	
Information	Breidbach et al. (2012), Tan and Pan (2003), Villarroeol Ordenes et al. (2014), Padgett and Mulvey (2007)
Organizations	Flynn and Du (2011), Padgett and Mulvey (2007), Skålén et al. (2015)
Technology	Smith et al. (2014)

Table 12: Literature about the Operation and Change of Service Innovation
Source: Own Illustration

Managing ICT-enabled service systems is about knowing operating principles and adapting the service system to changing beneficiary needs. Working with an implemented service system, Smith et al. (2014) recognized that the usage of ICT-enabled SI involves more than just providing the technology. They examined relevant factors for the user acceptance of the technology (here: RFID). To improve the ICT usage, they suggested providing customers with a clear message about the benefits of using ICT.

Focusing on the operation of the service system, interaction is significant when the ICT is relatively new in the service segment (Padgett and Mulvey 2007). Tan and Pan (2003) provided an example of how a governmental organization can adapt to the dynamics involved in ICT-enabled SI. They showed how customer relations in an organization-stakeholder relationship could work. From this, they derived lessons learned about how to change customer relationships and offer an improved interaction. Following this topic, Villarroel Ordenes et al. (2014) examined the rising complexity of feedback management. They recognized that the ability to use customer interactions is related to successful co-creation processes in a service system. Thus, they proposed a linguistics-based tool that allows the analysis and improvement of feedback to customers. Contradicting the claim of managing interaction with ICT, with their findings, Breidbach et al. (2013) proposed a system that is based on human interaction. They found that ICT alone does not influence human behavior, goals, or motivations regarding the value co-creation process. They regarded managing the social connectivity between the participants of a service system as a prerequisite for a successful ICT-enabled service system.

Flynn and Du (2011) examined a related topic on an organizational level when they analyzed the legitimation process to gain stakeholder support for an ICT-enabled SI project. They found that monitoring and evaluating is a dynamic process that links planned interaction and an action for legitimation. Related to Smith et al. (2014), they suggested to develop an appropriate image of the system for the stakeholders and to show the progress of the development. When the service system is running, the organization finds itself in a situation where it has to differentiate itself from other competitors. Padgett and Mulvey (2007) analyzed how firms integrate ICT-related SI into existing service systems and align themselves in comparison to their competitors. They proposed a positioning via service interaction, customer values, or linking the technology to customer values, always in relation to the customers. Skålén et al. (2015) showed another perspective. They examined the rise of a complex ICT-related service system and proposed actors, actions, roles, and operating principles for an unstructured process. Thus, they provided a best practice example for managing the involved organizations where uncertainty prevails.

The fourth phase of the management process is the measuring of the ICT-related SI in HCSSs. The papers included regarding this phase answer the question of how to prove the impact of ICT-enabled SI Table 13. No papers could be assigned to the dimension organization.

People	Ahearne et al. (2008), Bhargava and Mishra (2014), Xue et al. (2007)
Information	Villarroel Ordenes (2014)
Organizations	
Technology	Bannister (2001), Piccoli and Lui (2014), Resatsch et al. (2008), Torkzadeh et al. (2011)

Table 13: Literature about the Value Capture in Service Innovation
Source: Own Illustration

The evidence of the impact of an ICT-enabled SI on the individual level is essential for companies. Ahearne et al. (2008) used a salesforce example from the pharmaceutical industry to look into the mechanisms by which such an ICT-enabled SI can support employees to achieve their performance goals. Their findings clarify that ICT can have an impact on the key objectives and that this should be considered for the measurement. Similarly, Bhargava and Mishra (2014) examined the impact of an ICT-related SI on physician productivity. With their approach, they first analyzed the specifics of the service system, then being able to make an opinion about the productivity curve. Their findings draw attention to the influence of learning effects on the falsification of the results in the introductory phase. The paper also deals with the fact that users expect a productivity loss because of the ICT-related SI. The procedure explained in the paper can offer a template to refute this presumption. Based on the co-creation in the service system, the customers are a critical variable to be measured. Xue et al. (2007) discussed the measurement of customer efficiency in self-service channels. They showed that the measurement requires identifying the influencing factors for the customer. Furthermore, they pointed out that the relationship between co-production and firm performance is an important one.

Likewise, the effectiveness of ICT components in SI have to be proven. This is the case in public administration. Bannister (2001) examined a service system with an unintegrated ICT. The problem was mainly to justify the value of the ICT introduction in the service system. Facing limited resources in the public sector, he proposed a new approach based on the concept of business objects to provide evidence for value creation through an ICT-enabled SI. In the private sector, it is especially important to examine the differences between the various competitors, as it was also examined by Padgett and Mulvey (2007). Piccoli and Lui (2014) analyzed the impact of ICT on the sustained competitive performance of the service system. They found that no general statements could be made regarding this connection but found an impact of complementary resources on the ICT performance. Based on previous findings, Torkzadeh et al. (2011) studied the relationship between technology-enabled job learning and technology

outcomes. They conceptualized technology outcomes with relevant variables for their context and thus demonstrated an example of a reliable, valid, and easy way to use the measurement. Also, the question of how the measurement takes place was examined. Resatsch et al. (2008) evaluated an ICT prototype in a retail context and found an approach to evaluate user acceptance. They proposed a mixed evaluation for that context.

As the only publication found, Villarroel Ordenes et al. (2014) also focused on value capture of shared information and, in particular, interactive service experiences. They proposed a framework to assess the impact of interactive service processes on customer experiences. To measure the interaction, they focus on a process rather than an output perspective.

4.4 Discussion

The results show a diverse research area of topics and growing interest in ICT-enabled SI in the research context of HCSSs. The understanding of the subject overall and in detail is most frequently discussed, whereas the value capture was the least researched. The thematic analysis shows that the numerical distribution reflects the body of knowledge. There are more insights regarding the beginning of the management process than the end.

The findings are discussed based on the phases of the SI management process. This is possible as both, quantitative and qualitative assessments of the papers are available. Table 14 provides a summary of the progress in the research areas of research. Harvey balls indicate how developed a research area is regarding number and content of the contributions. Research areas, where no research had been found, were classified as very low. Research areas in which only a few items were found or the contributions represent only a first attempt to research were classified as low. Research areas with some contributions or fundamental findings were classified as moderate. Research areas with several contributions and fundamental findings were classified as high. Research areas that have already been fully covered (very high) were not found. Regarding the descriptive and thematic findings, this assessment provides the opportunity to assume about the need for further research. This structure follow the framework of Müller-Bloch and Kranz (2015). In each thematic discussion, research gaps are localized and characterized. Practitioners get a structured overview of existing knowledge in the research area of ICT-enabled SI in HCSSs.

	People	Information	Organizations	Technology
Understanding	◕	◔	◑	◔
Designing & Implementing	○	○	◑	◕
Operating & Changing	○	◑	◑	◔
Value Capture	◑	◔	○	◑

○ Very Low ◔ Low ◑ Moderate ◕ High ● Very High

Table 14: Research Progress in ICT-Enabled Service Innovation
Source: Own Illustration

The papers of the understanding phase provide insights into basic considerations before implementing the ICT-enabled SI. It appears that much knowledge about influencing factors regarding the individual acceptance and the usage of ICT-related SI exists. This is reflected in complex research models (Cocosila 2013; Pramatari and Theotokis 2009; Smith et al. 2014). However, these contributions can only look at small parts of the research area. The context determines much of the current knowledge. Therefore, they have a limited validity in a diverse research area such as HCSSs. Understanding the mechanisms related to ICT and interactions in HCSSs and doing so at a higher level appears to be rather limited. Essén (2009) attempted to illustrate the innovation process and found many influence factors. Again, the diversity of HCSSs plays a role. Overall, it could be shown that the understanding phase does not include much successive research. With their various contributions, the authors are trying to put the research phenomenon of ICT-related SI into a theoretical framework. Further research needs are evident regarding the points of:

- **Understanding the innovation processes**. There are unclear mechanisms in all considered sub-research areas that affect the nonlinear innovation process (Essén 2009). Clarity about the innovation process could help all actors in the service system structure their actions. It could be a starting point for the designing and implementation during the next phase. The first link to research could be an analysis of the interaction between organizations in the service system. Researchers could examine the origin of the ideas for ICT-enabled SI. The next step could be the identification of different innovation processes to recognize patterns. This should be analyzed in different contexts and usage perspectives to make general statements. RQs could be: What steps are included in the SI process? Are there domain-specific differences in the SI process? Which factors can influence the success or failure of the SI process? How does other factors like capabilities, change, and engagement influence the SI process?

- **Understanding the ICT and interaction perspective**. Previous contributions do not allow general statements understanding of ICT and interaction perspective. This is mainly based on the mixed value contributions of the components in service systems. Research on the mechanisms of ICT and shared information could enable a more effective design and management. A starting point would be to examine the contributions of the individual parts of the service system, similar to the research of Breidbach et al. (2013) who showed the differences of the contributions between people, interaction, and ICT. Smith et al. (2014) recognized this research gap. RQs could be: How does ICT influence the SI process? How does interaction influence the SI process? What value contribution do the individual components of the service delivery system provide for the SI?

The contributions regarding the designing and implementing phase provide insights into possible configurations of the service systems. In this topic, the ICT design is the focus of the discussion, which it is focus of specific papers (Breidbach and Maglio 2015). The level of ICT and the assistance of the value creation in service systems appear to be significant factors for the value creation. Furthermore, value creation seems to be the decisive factor regarding the design of the service system. The findings and the contributions of Skålén et al.(2015) are the first insight. The individual beneficiary has thus far not been considered in research. The same applies to the design of shared information in the service system. Existing findings show that designing the coordination of organizations is complex (Pinho et al. 2014). Overall, there are only a few general design guidelines. Further research needs are evident regarding the points of:

- **Designing the service system on the basis of value creation**. The findings of Levenburg and Klein (2006) and Theotokis et al. (2008) show the need for decision-making on the basis of user needs. When considering the whole service system, the user needs probably fall short. As a first step, investigating the contributions of ICT in a service system would generate a general design guideline. Based on this, having design guidelines for the entire service system would certainly be helpful, which ensures completeness with respect to the entire service system and take the value creation into account. RQs could be: How to design the interfaces of service systems and SI? How to design the interfaces of service systems and corresponding concepts in SI? How to include the beneficiary in SI to increase value creation? Which guidelines or rules should be respected in the design of the SI? How to optimize value creation in SI?

- **Designing roles and interaction in HCSSs**. In addition to the role of the ICT in a service system, the contribution of Breidbach et al. (2013) showed the importance of human interaction in HCSSs. This is a topic that has not been researched regarding the design of HCSSs. A first approach would be to summarize existing approaches of other research areas. Furthermore, it is necessary to find out what differentiates roles and interaction in HCSSs. Based on the findings, the design could take place. Pinho et al. (2014) recognized this research gap as they regard interaction as a function for the coordination of the involved organizations. RQs could be: How to design human interaction in ICT-enabled service system? What differentiates roles and interaction in ICT-enabled HCSSs? What roles are important in ICT-enabled HCSSs? How to leverage interaction in the design of ICT-enabled HCSSs?

In the analyzed literature, the operating and changing phase provided insights into management and adaptation practices. Ideally, these papers contain guidelines, which can be easily adopted by managers within the running service system. However, there are not many of those contributions. It seems that findings regarding the understanding and designing phase have not been implemented in service systems. Thus, they cannot provide advice regarding the management of ICT-enabled SI. A variety of papers of the operating phase examined the phase that follows shortly after the implementation of the SI (e.g., Flynn and Du (2011) or Padgett and Mulvey (2007)), which could be an indication of an underdeveloped design. Moreover, it is noteworthy that personal connections and information between individuals play a role in addition to the technology (Breidbach et al. 2013; Smith et al. 2014). Further research needs are evident regarding the points of:

- **Managing people in the service system**. Individuals co-create value in service systems (Vargo and Lusch 2016). If these individuals can be encouraged to become more integrated into ICT-enabled SI processes, value creation can be enabled. The starting point would be to have guidelines about how to involve employees or third parties such as volunteers in the ICT-enabled service systems. In this topic, ideas from operations research could be helpful such as the customer contact theory (Chase 1981). Additionally, an alignment with value creation and the productivity of the service system should be ensured. RQs could be: How to integrate beneficiaries in ICT-enabled service systems? How to increase human-based value creation in ICT-enabled service systems? How to align value creation and productivity in ICT-enabled HCSSs?

- **Managing dynamics of the service system**. After the initial implementation and set-up, the service system should create value for the beneficiaries. It is necessary to adapt the service system to the changing needs of the beneficiaries to ensure this value creation. Essén (2009) showed an example of how this can be implemented in practice. Further research is needed to capture the changing needs and to implement them in the service system. A template for this could be the work of Lin and Hsieh (2014), who considered these dynamics regarding new service development. RQs could be: How to operationalize SI in ICT-enabled service systems? What management is needed in the shakedown phase of ICT-enabled SI? What changes are needed in SI to enable value creation in the service system?

The papers of the measuring phase provide insights into how the effectiveness can be examined. All contributions define the metrics matching their contexts. The literature recognized that the output of the service system does not solely depend on the employees but also on the customers (Xue et al. 2007); and this does not only need to be measured within the company but can be compared with competitors (Piccoli and Lui 2014). There are influencing factors such as the learning curve of users (Bhargava and Mishra 2014) that some of the authors took into account and others did not. It can be assumed that the exclusion is a simplification of the reality. Torkzadeh et al. (2011) are the only ones who thought about the effectiveness of their introduced metrics. Research needs are evident regarding the points of:

- **Measuring interaction in the service system**. The focus of many of the contributions is the measurement of the output variables. In this topic, the interaction and the value co-creation are difficult to measure. As service is a process (Vargo and Lusch 2004), it is necessary to examine the contribution of HCSSs in a new way. The perspective of Villarroeol Ordenes et al. (2014) recognized this research gap. Based on this, a complete measurement and control system for ICT-enabled SI in HCSSs could be developed. RQs could be: What do influence interaction in ICT-enabled HCSSs? How to implement value capture from interaction in ICT-enabled HCSSs? How to measure value co-creation in HCSSs?
- **Measuring the contribution of organizations**. Organizations are basic constituents of a service system. A service system can create value when multiple organizations work together by performing coordinated activities. If a service system is to be optimized, it is necessary to know which contributions the individual organization adds for the value creation. Research in this area could

reveal mechanisms, reduce coordination efforts, and capture the value co-creation of the entire service system. RQs could be: How to measure value contribution of participants in the service system? What coordination tools can be leveraged in ICT-enabled HCSSs? How to optimize coordination in the service system?

4.5 Limitations

As in any SLR, this review faces limitations. These are the restricted scope of the SLR, the selection of the included papers, and the extraction of the contained information.

The scope of the SLR is restricted and not exhaustive. The limitation to top journals allows to highlight the state of the art in established and high-quality research. To counteract this limitation, new and diverse research was included in the theoretical background. The limitation to papers with a focus on service systems serves the purpose of the selection of HCSSs that go beyond the service between companies and customers.

The selection of the included literature is influenced by interpretation. The sources of the journals are specified in Table 7 to validate the results. The selection of the included literature was not standardized. It was based on the selection criteria but assessed. Because the review process included the selection of the found papers based on their title and abstract, the used information was limited. Both facts, the interpretive results of the databases and the selection, were minimized by including a larger number of doubtful contributions.

Similar to the selection of the journals, validity and objectivity of the findings might be challenged by extraction of the included information. To achieve optimal results, the review included categories for the data extraction and the analytical framework. The results were discussed with independent senior researchers.

4.6 Summary of the Chapter

The SLR presented an integrated and representative overview of the literature on ICT-enabled SI in HCSSs and highlighted opportunities for future research. The conducted SLR could identify 37 individual research papers that show ICT as an enabler of SI in HCSSs. As one of the outputs it was possible to develop an analytical framework for the assessment of the found literature. Applying the analytical framework allowed to show that existing contributions focus on a few topics such as the understanding of individual attitudes, beliefs, personality traits, and perceptions, and the designing of ICT artifacts in service systems. Regarding other topics, there are no or little papers that provide opportunities for future research. The review shows that the research background and

the research methods used in the papers are diverse, representing a large research area with a varying degree of knowledge. In the discussion, eight emerging research opportunities were named:

- Understanding the innovation processes
- Understanding the ICT and interaction perspective
- Designing the service system on the basis of value creation
- Designing roles and interaction in HCSSs
- Managing people in the service system
- Managing dynamics of the service system
- Measuring interaction in the service system
- Measuring the contribution of organizations

Overall, this SLR contributes to the existing literature in promoting further understanding of ICT-enabled SI in HCSSs of researchers and practitioners, in providing an analytical framework for ICT-enabled SI, and by highlighting research gaps.

5 ANALYZING SERVICE INNOVATION PRACTICES[5]

This chapter addresses the second RQ, which is concerned with what constitutes the design of HCSSs in ICT-enabled SI. The focus of this chapter is on analyzing SI practices that are used in the design of the service business. In this chapter, section 5.1 specifies the services in focus. Afterwards, the research method in which the parts build on each other – including the practice-based approach, the case-based data collection, as well as the interpretive and in-depth analysis – is explained in section 5.2 to ensure the traceability of the findings. The subsequent presentation of the findings in section 5.3 includes insights into three scaling practices and the SI process. Finally, the discussion and the conclusion (section 5.4) indicate the value of the rich descriptions, provide implications for research and practice, as well as explain the chapter's limitations and related avenues for future research.

5.1 Motivation

The demand for services with high customer interaction is increasing (Buell 2018; Glushko and Nomorosa 2012). In fact, 85% of companies predict higher levels of complexity in the interaction with customers in the upcoming years (Deloitte 2017). This focus on personal interaction is central to CIS that rely on personalization, competence, and trustworthiness of employees (Patrício et al. 2008). Examples of such services exist in healthcare, education, and social services; most of them improve human well-being and therefore, are socially desirable (Breidbach et al. 2016). The characteristics of CIS – being labor-intensive with high personal interaction and individual service delivery (Jaakkola et al. 2017) – imply a resource intensity that constitutes a decisive factor when it comes to adapting service capacity that is relevant whether in reduction or in growth. As CIS are restricted in resources (Chase 1981), service providers have to find new ways to innovate their services (Barras 1986). In that regard, service scaling is a possible operationalization of SI which refers to the ability of service providers to adapt service capacity (Di Pietro et al. 2018) and is particularly useful given the aforementioned resource intensity and resource restriction of CIS. This service scaling is often enabled by ICT (Lewis et al. 2011).

Unfortunately, most providers of CIS do not have specific knowledge of service scaling or ICT-enabled SI because the "[service] innovation process is still deeply rooted in a

[5] This chapter have been published in an earlier version in the Journal of Service Management (2019, DOI 10.1108/JOSM-12-2017-0349). For details please refer to the Overview of Publications (section 1.4).

non-digital past" (Troilo et al. 2017, p. 617). Consequently, the details of how to implement and realize ICT-enabled SI remain unclear (Nambisan et al. 2017). Furthermore, to date, the design mechanisms of service scaling have been analyzed and presented only in an abstract form (Huang et al. 2017) and are specific to the type of service (Jaakkola et al. 2017). In the scaling of CIS with ICT components, personal interaction – the core of CIS – needs to be reconfigured to enhance the service (Huang et al. 2017). This reconfiguration for a changed capacity may include the adaptation of current value creation for the customer and the value capture logic for the service provider (Jin Zhang et al. 2015; Täuscher and Abdelkafi 2018). The service scaling is carried out in activities that are part of SI practices (Droege et al. 2009; den Hertog et al. 2010; Skålén, Gummerus, et al. 2015). An example of such innovation practice is the recombination of resources (Beverungen et al. 2018). However, researchers currently lack a deep understanding of the interrelationship between SI and scaling (Jin Zhang et al. 2015), which is crucial for service scalability.

Despite the high relevance of CIS, still little understanding is available in literature of SI and the practice of how to attain service scalability. Therefore, this chapter aims to identify and describe practices used in service scaling for supporting ICT-enabled SI.

5.2 Research Method

The objective of this chapter is to identify and describe the practices used in scaling CIS and thereby, support service providers in ICT-enabled SI. This requires an in-depth analysis of the scaling activities and their context (Schatzki 2001). To do so, this chapter draws on a practice lens that is mainly used in social sciences and sociology (Feldman and Orlikowski 2011). However, the practice approach is not unified (Feldman and Orlikowski 2011; Nicolini 2009), but practices can be understood as "embodied, materially mediated arrays of human activity centrally organized around shared practical understanding" (Schatzki 2001, p. 11). Therefore, this understanding is used as a working definition of practices. Its inherent "arrays of human activity" as well as their corresponding context can help to inform theory and practice (Feldman and Orlikowski 2011). The analysis of the activities for scaling CIS can reveal patterns and relationships across the actions (Nicolini 2009). To gain these insights, a practice-based lens is chosen. These insights allow for the identification, description, and improved understanding of specific SI practices. However, the understanding of SI practices is still in the early stages of development (Skålén, Gummerus, et al. 2015; Vargo and Lusch 2016). The identification and description of specific SI practices – in this chapter

for scaling of CIS – can contribute to an improved understanding of SI (Witell et al. 2016).

5.2.1 Case Selection

Given that the objective of this chapter is to distil rich insights about SI practices, a qualitative research design is appropriate. A case-based setting with an interpretive and in-depth analysis (Walsham 1995, 2006) is used. The unit of analysis is one CIS and its ICT-enabled scaling; this unit of analysis has been used before to understand SI (Russo-Spena and Mele 2012) as well as the introduction of ICT (Orlikowski 2000). To ensure the generalizability of this chapter's findings, case selection was based on the formative characteristic of CIS (the degree of contact intensity) as a basis for comparability and the possibility of scaling and scalability (the degree of technology in the service).

The *degree of contact intensity* describes the extent of personal interaction in the service which can be an indicator of the individualization of the service delivery (Jaakkola et al. 2017). To achieve comparability of the findings, this chapter uses three CIS with a high degree of contact intensity:

- *Case A* is a home care service in Northern Germany that provides professional nursing to elderly people who cannot cope with everyday life. The high contact intensity of the service is reflected in the personal attention of a care worker towards a person in need of help. Thus, the service is based on intensive assistance and an entirely offline service delivery.
- *Case B* is a mobility service in Southern Germany that organizes drivers for everyday trips of elderly people. The high contact intensity of the service is reflected in the trips made by drivers for citizens in need of transport. The processes of coordination include personal matchmaking between 3800 potential customers and drivers.
- *Case C* is a matchmaking service for volunteers in Switzerland that places volunteers for everyday jobs with voluntary organizations. The matchmaking process – in which volunteers are placed in over 3000 associations/NGOs – reflects the high contact intensity of the service. Volunteers prefer telephone consultation because of the uncertainties in the matchmaking process.

In contrast, the *degree of technology* reflects the level of ICT-enabled service provisioning and is an indicator of the scalability of the service (Lewis et al. 2011). The objective for each service provider was to scale the capacity of the service with limited resources via the implementation of a service platform that can "create value by facilitating interactions between external producers and consumers" (van Alstyne et al. 2016, p. 57). To contrast the service scaling practices and generalize the findings on

CIS, the cases had different starting points and objectives varying in the degree of technology:

- *Case A (low degree of technology)* involves an offline service with no specific technology used. The intended service scaling should enable greater concentration of the nursing on the person seeking help by replacing individual service parts with automated.
- In *Case B (medium degree of technology),* telephone consultations are used to make the mobility service available to other citizens of the small town. The service scaling via the platform should provide an online process replacing a large part of the coordination tasks.
- In *Case C (high degree of technology),* the customers have the possibility to contact the voluntary organizations via the website or telephone. The service scaling includes more standardized and more simple processes that should require less personal consultation and less manual control by the employees for initiation, arrangement, and coordination.

5.2.2 Data Collection

The three cases are built on a rich set of data over a three-year period (11/2014 – 11/2017). In this period, all CIS were revised in the context of projects that covered the implementation of service platforms. The projects consisted of two parts: a technical part comprising the development and testing of a service platform; and a business part comprising the service provider-individual design of the service concept and implementation of the service processes. This data set was extended over time to allow for further analysis. Further information extended the information in the analysis. The data collection contained data from (1) workshops with participant observation, (2) interviews with analysis of memos and notes, (3) project documents with document analysis, and (4) the development level of the ICT components. Table 15 provides details of the data collected and how the data were used in analysis.

Data Collection Method	Details	Use in the analysis	Example Data
Workshops with participant observation	Overall 13 internal workshops: • February 2015: Joint kick-off to define the project objectives • August 2015: Joint Workshop to consolidate business analysis • January 2016: Joint Workshop to modify service settings • January 2016: 3 Workshops in the different cases for initial requirements analysis • June 2016: Workshop to consolidate process modifications • November 2016: Workshop to redefine the ICT components • June 2017: First workshop regarding an analysis of service modifications • June 2017: 3 User workshops for training and feedback in the different cases • October 2017: Second workshop regarding an analysis of service modifications	Capture detailed information about service scaling activities in the workshops. Collect information about planning of the scaling activities.	The workshop for consolidating the process modifications (June 2016) included the module definition in the analyzed service processes. The possible cuts of the service processes were discussed within the teams and then shared with the other projects. The planning included the process mapping and the result the possible implementation for the ICT components.
Interviews with analysis of memos and notes	Overall 32 interviews: • November 2014: 3 interviews with project leads regarding the project understanding • February 2015: 5 interviews with team members regarding the individual objectives • January 2015: 2 interviews with test managers in cases B and C regarding their user involvement plan • June 2016: 6 interviews with project members of all cases regarding the upcoming process requirements and implemented modifications in the processes • November 2016: 7 interviews with team members regarding the field testing • June 2017: 3 interviews with tech leads about the platform modifications • Nov 2017: 6 interviews with project leads about the achievements in case and project	Capture team members interpretations of the scaling activities in the workshops and the context of the project setting.	In the interviews about the upcoming process requirements (June 2016) focused on the interfaces that were helpful for the requirement analysis. The opinion on the outcome of the workshop was discussed as well as the further development of the cases.

Project documents with document analysis	Overall 14 documents: • August 2015: Consolidated evaluation framework for service processes • June 2016: 3 draft specifications of service modules, requirements, service concepts • October 2017: 2 Evaluation reports and the overall system architecture • November 2017: 5 descriptions of services, processes, and business models in the different cases as well 3 descriptions of project processes and infrastructure	Capture additional reflections communicated to external stakeholders.	The draft specification of the services (June 2016) was the written summary of the module definition, which served as a template for the final decision on the ICT components.
Development level of the ICT components	Development level of the ICT components in the three CISs • June 2016: Mock-ups of the applications • Nov 2017: Market-ready platforms	Collect additional information on the ICT components.	Based on the initial requirements, mock-ups of the services (June 2016) were created, which were adapted in the development.

Table 15: Data Collection in Analyzing Service Innovation Practices
Source: Own Illustration

Primary case data were collected in 13 project workshops via participant observations (Glaser and Strauss 1999). The main purpose of this data collection was to directly capture the activities in scaling CIS. The participants in the workshops were the three project teams in the three different cases with the project leads and overall 14 project team members with industry expertise. These workshops were held during the project time to coordinate the SI activities and to make decisions regarding scaling of individual services. Workshop discussion topics covered definition of the objectives, consolidation of the analyses, requirements analyses for the services, definition of ICT components, modification of services and service concept, as well as training on, analysis of, and feedback to the services. It was possible to attend these workshops as involved researcher (Walsham 1995) and capture detailed information about activities of the individual project teams (Feldman and Orlikowski 2011; Nicolini 2009) for scaling the services. Additionally, the activities in the workshops provided data that included the planning of the next steps. The observations were captured in detailed notes about the activities and enhanced with information from the workshop documentation.

The workshop data was triangulated (Gibbert et al. 2008) by informal interviews, project documents, and the level of development on the platforms. Overall, 32 interviews took place with project leads and team members before and after the workshops. Although

interviews have their limitations in the study of practice, the purpose of gathering these data for analysis was to capture the interpretations of the project team regarding the activities in the workshops and the context of the project setting. Therefore, the focus of the interviews concentrated on their understanding of the project, their individual objectives, user involvement, requirements and modifications to the services, evaluation of scaling, and the project achievements. Additional information determined the number of interviews for theoretical saturation (Glaser and Strauss 1999). The findings and statements from the interviews were documented using memos and field notes. Moreover, 15 project documents provided insights to the understanding of the project members regarding the progress and the results of scaling. These documents were helpful for understanding the results regarding the service concepts, the processes, the ICT components, and the business logic. The main purpose was to reflect on prior information that was communicated to external stakeholders. The rich insights from the three sources (workshops, interviews, and documents) have been reflected in the level of development of the ICT components and the CIS, which were presented in the form of mock-ups and market-ready platforms.

5.2.3 Data Analysis

The objective of the data analysis was the specification of service scaling practices and their interrelationships. Following methods of qualitative data analysis (Gioia et al. 2013; Miles et al. 2014), a two-stage approach was used: first stage, identification of service scaling practices; and second stage, detailing of the service scaling practices.

In the first stage, the analysis of the workshops and interviews enabled identification of the SI practices within the cases. Methods like service blueprinting (Bitner et al. 2008) or BM design (Osterwalder and Pigneur 2010) and decisions for service scaling were part of the activities. The explanations in the interviews provided more detailed insights on the context of the scaling activities such as the objective to use of a service blueprint. Descriptive coding of activities allowed structuring and filtering of the collected data into nine first-order concepts; see Figure 6. The concepts were labeled either by the workshop activities or the activities included in the documentation. The descriptions from the interviews enabled the filtering of the activities regarding service scaling. This included a search for alternative influencing factors and resulted in condensation of the concepts to the completed set of activities in scaling CIS. An aggregation of these concepts into meaningful thematic blocks structured this collection of activities. This structuring resulted in nine coded second-order themes: value definition, service specification, module definition, business modelling, process modelling, ICT

component development, customer acceptance testing, field testing, and value review (see Figure 6). The themes were named by containing first-order concepts or were specifically mentioned by the interviewees.

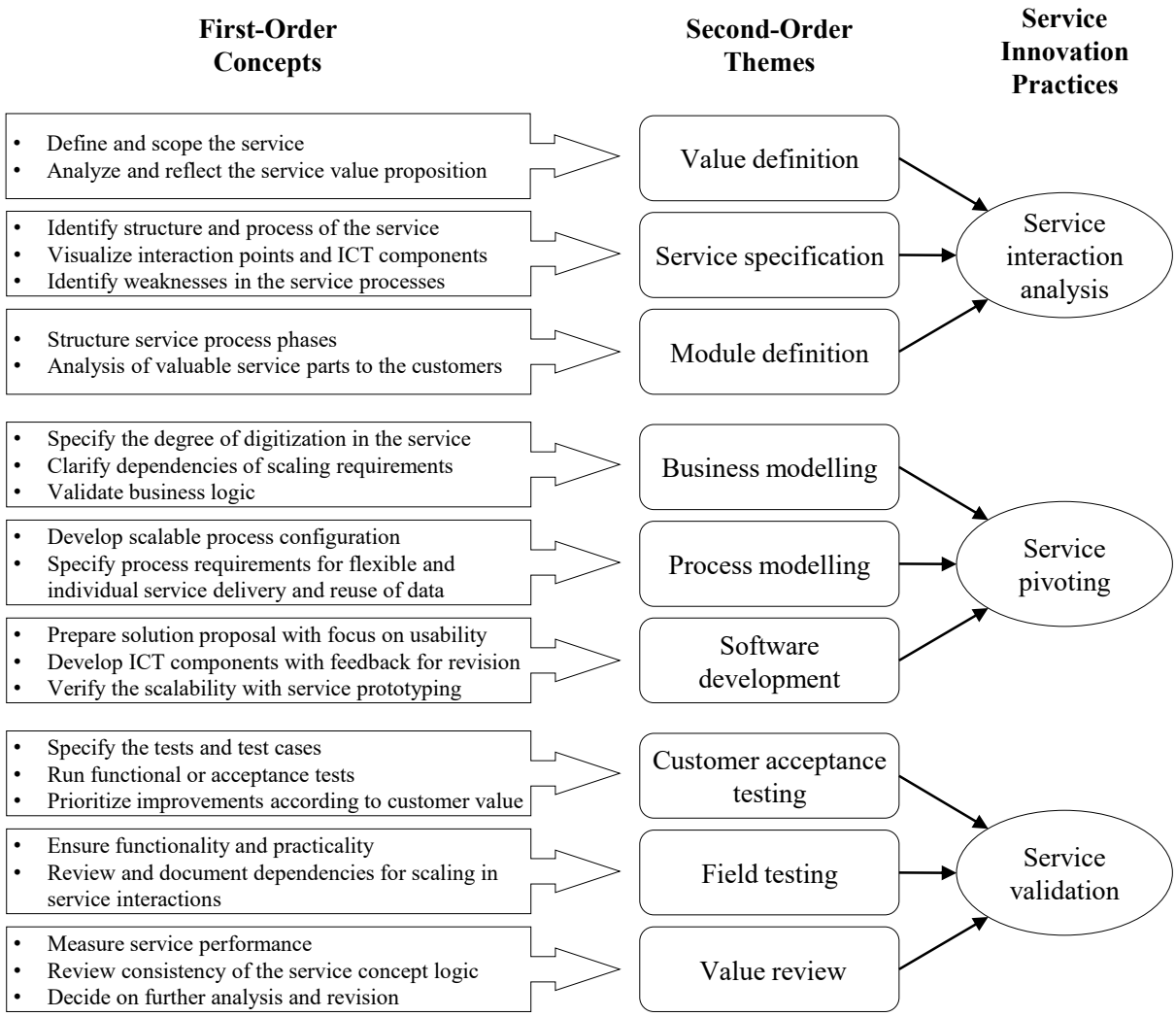

Figure 6: Data Structure in Analyzing Service Innovation Practices
Source: Own Illustration

In the second stage, cross-case synthesis (Miles et al. 2014) revealed data similarities and differences in the three cases. A repeated alternation of perspectives between individual cases and the entire set of cases enabled the interpretation of the activities (Nicolini 2009). These evidence-based activities were validated based on findings in related literature on SI. The cross-referencing of the different cases with the project documents and the level of development in the ICT-enabled service allowed the analysis of causal relationship of the activities. Within the three cases, three repeating practices were identified: service interaction analysis (i.e., analysis of the defining parts of the CIS), service pivoting (i.e., adaptation of service concepts and processes), and service validation (i.e., testing and review of the improvement). A summary of this data

structure as a first intermediate result is depicted in Figure 6. In accordance with the data-analysis objective, the overall output of the synthesis is the description of the practices (Reckwitz 2002). Statements based on interview notes and documentation provided evidence of these findings. Moreover, the level of development in the ICT-enabled service revealed the functionality behind the intended scaling. To summarize the practices and create more detailed descriptions of the concepts of service scaling, the final insights were organized in the form of research propositions to enable model development.

5.3 Findings

The SI projects and the scaling of the CIS in the included cases were successful as they simplified the service processes and reduced the employees' workload. However, a project lead described the results as follows:

> "Thanks to the service platform, we have a more automated service. We can prove this with our performance indicators that show a higher volume of transactions. However, we still work with people that talk to each other. That's a good thing because this is the core of what we do, but it's not a fully automated process." (Project lead, Case A)

Thus, the result with the most comprehensive consequences in the cases is that the scalability of CIS is limited. This limitation is because of the peoples' involvement in the process. The characteristics of CIS and particularly the personal interaction as a source of value creation for the customers impede full scalability of these services. The service providers overcame this limitation with a focus on the personal interactions of the services and activities for improved scaling of these interactions. The following examples and excerpts from the interviews and project documents explain the individual activities of the three identified SI practices: service interaction analysis, service pivoting, and service validation.

5.3.1 Service Interaction Analysis

At the beginning of the projects, the project teams focused on the identification and analysis of existing structures in service interactions and on learning about the need for improvement in scaling. The review of existing structures occurred in workshop settings and included discussions about customer value, customer experience, and customer process. When it was determined in other practices for service scaling that value and processes of the service are not yet clear for revision or the customer, a new interaction analysis was carried out. Thus, the other practices constitute a feedback mechanism for

the findings of the service interaction analysis. The practice of service interaction analysis was found to involve three activities: value definition, process visualization, and module definition. Furthermore, insights into the practice of service interaction analysis led to a proposition regarding the practice and scaling CIS.

Value definition. The first activity in the workshop sessions included the definition of the offered services by identifying their process starts and ends. The value proposition to customers was analyzed using a value proposition canvas (Osterwalder et al. 2015) to focus on customers. Lead users that are "users whose present strong needs will become general in a marketplace" (von Hippel 1986, p. 791) reflected on value propositions and their reflections were used to validate the assumptions of the project teams. This reflection resulted in a current service concept that reflected the fundamental value of the service to the customer and the service provider. One of the participants of the workshop explained the impact of the initial service analysis:

> "In the analysis [of the service], it is critical for us to have regular feedback from important users. In the beginning, they can provide us valuable input and we can adjust the service very quickly and before investing too much." (Project lead, case B)

Service specification. The specification of the services was implemented in the workshop activities by the visualization of the service delivery and interaction points with the customers. The workshop discussions centred on the process steps and the value of the interactions including the existing ICT components. Service blueprinting (Bitner et al. 2008) as a tool for process visualization allowed in-depth discussion of the processes and existing ICT components in this process. This resulted in identifying possible impediments in the process and the variability in capacity:

> "First, we have to find out where the service and processes have weaknesses, where the bottleneck is, before we could start thinking about the service platform. This most often concerns personal interactions in the service." (Project team member, case C)

The service processes and the service blueprint had different characteristics and forms. For example, in cases B and C, a process description was created, whereas in case A only a basic concept was described because formal processes were not specified before.

Module definition. After the definition of the existing services and processes, the project team focused on possibilities for modularising the service delivery within the process structures. The services were divided into logical parts that generate value on their own, e.g., the initiation of a matchmaking process in case C. The different modules of the services were chronologically structured to provide starting points for further

discussion. This structuring enabled the identification of valuable service modules including interaction with the customers. The modules were perceived as helpful by the project teams with their defined interfaces and dedicated customer value, customer process, and customer experience enabled easier reconfiguration. The team members ranked the modules where service scaling was useful based on their probability to promote or prevent scaling, which in turn were discussed in the projects with the lead users. Those involved perceived the need for action in interaction as a "take away message" (Project lead, case C). Findings and output for the project team from this activity are potential fields of action in the service scaling:

> "The main objectives were to identify information deficits, end user needs, […], analyze the shortcomings […], and define the processes […]. The deliverable is an input for the detailed requirements for the system architecture and development of a [service] platform." (Draft service specification)

The insights into the identification and analysis of existing structures led to the following proposition for service interaction analysis as part of scaling CIS:

Proposition 1: *The scaling of contact-intensive services involves the definition and analysis of service value, processes, and structures to identify the interactions that promote or prevent scaling.*

5.3.2 Service Pivoting

In the workshops to redefine the ICT components, the teams planned the SI with the revision of the service concept and processes with ICT components and started the implementation of ICT-enabled services. The objective of the workshops was to conceptualize scaling in the service concept and service processes. The term service pivoting is based on the revision of startups (Ries 2011) and was mentioned by the project lead in case C. Service pivoting aims at the revision of the service – including ICT components – to improve the service capacity and scalability. As a result of this service pivoting, the revised service concept is implemented in an ICT-enabled service that offers the intended service scaling. The workshops revealed three activities of the service pivoting practice: business modeling, process modeling, and software development. Furthermore, insights gleaned from this led to a proposition regarding the service pivoting practice and scaling CIS.

Business modelling. The revision of the service concept required the definition of the scope of scaling and degree of digitization in the service. A critical discussion in the workshops concerned the revision of the service concept, specifically the question of

how the scaling can be implemented. For example, in case B, the focus was on coordination of a driving service because it had the highest potential for scaling. The building blocks of the BM canvas (Osterwalder and Pigneur 2010) served as starting points for the discussion of the dependencies in the service processes and modules. The integration of ICT components into the existing service parts was verified in each building block and the overall logic of the service was validated. In case A, this discussion and user feedback led to the extension of the service with components for communicating a clear value proposition, usability, and activation. The project leads ensured that service scaling was the focus of the activities. The validation of the business logic forced a revision to the developed ideas. The feedback from the customers and service employees led to a clear vision and requirements:

> "Involving our end users in the process of designing a usable online platform helped us to understand their issues and requirements […]. We could discover their way of thinking and how our product could make it work better for them." (End user framework report)

Process modelling. Process configurations were developed and were iteratively improved based on feedback from customers and service employees. Automation with ICT components was planned where personal interaction was not necessary or desirable. A "satisficing" solution for the service provider consisted of an intelligent interplay of personal interaction and ICT components. In the discussion, a decisive argument for a combination of ICT and non-ICT components in case B was that its customers could use the ICT components – such as the booking of drives – without help. It was essential for the service providers that the core of the service remained stable:

> "The [service] platform is considered as a working tool for better organization of [the service], documentation of processes and coordination […] leading to higher efficiency (reduced costs) and possibly reduced workload." (Final service specification)

As a result, the process requirements for scaling of CIS were three-fold: flexibility in the service delivery, decision-making authority of service employees, and use of existing data. First, the analysis revealed interactions with customers that did not add value to the flexibility of the service delivery. The requirements for automated processes allowed an individual service delivery. Second, regarding decision-making authority, the process analysis made the rigid processes evident. The requirements allowed service employees to manage the problem-solving in the service delivery and evaluate the results for new

customer needs. Third, regarding using existing data, the feedback from customers regarding the ICT components implied that further data collection was considered ineffective. Therefore, the requirements included the need that existing data were used and standardized.

Software development. The individual ICT components for the service modules were developed according to the requirements of business and process modelling. For this purpose, a solution architecture was developed that technically translated the requirements into functionality. This architecture was discussed within an expanded project team with development expertise for ICT components. The focus of the discussion was on the usability of this solution architecture for the customers and the service personnel. During the actual development of the ICT components, the service prototypes were discussed with the lead users to assess whether all requirements had been included. Thereby, the implementation of documented requirements was extended with the feedback. Additionally, this development of the individual ICT components was implemented with service prototyping to quickly test key functionality of the services. In this service prototyping, the requirements and developments were constantly questioned and refined. The focus of the project team at the end of the first developments was a verification of the intended scaling of the service. The project team members mentioned that this practice exceeded the activities in the workshops and included iterative development and requirements refinement of ICT components:

> "Various points of contact with end users such as interviews provide insights in their wishes and further requirements […]. The piloting provides means to the development and provides feedback to the same. The comments by the users provide valuable input for a [software] development." (Evaluation report)

The insights about the revision of the service concept and processes led to the following proposition for service pivoting as part of scaling CIS:

Proposition 2: *The scaling of contact-intensive services involves the iterative specification, implementation, and refinement of the service regarding its business logic, its underlying processes, and software components.*

5.3.3 Service Validation

The service providers introduced the services to the market and tested the ICT-enabled service with real customers. The ICT components and services were at an advanced development stage and were described as a "minimum viable service" (Ojasalo and Ojasalo 2018). The objective of the tests was the gathering of customer feedback

regarding the implemented requirements, the functionality and usability of the ICT-enabled services, and the verification of the scalability. The outcomes were opportunities for revision that enable the validation of objectives. In summary, the service validation aimed at testing and refining the market-ready service's performance and customer acceptance. The activities of the service validation practice included customer acceptance testing, field testing, and value review. Furthermore, detailed study of these activities resulted in a proposition.

Customer acceptance testing. The focus of the workshops was on the validation of the scaling within a specific context. In the interviews, the project team was rather critical concerning the customers' acceptance of the ICT components. Therefore, the planning of the acceptance tests included the specification of the test purpose and test scenarios. The tests' purpose comprised the ability of ICT components to contribute to scaling in the service processes. The test scenarios were applications of scaled services. After this specification of the test scenarios, functionality tests for the ICT components took place. Afterwards, the acceptance tests were started. Fundamental topics regarding usability were raised by the customers during the walkthroughs of the processes that included changes in services and ICT components. These topics were structured and prioritized according to their importance for creating customer value. For example, in case A, privacy concerns regarding the online platform came up. The focus on the application enabled the functionality and usability testing in the service process:

> "The overall idea [of testing] was to start the platform with specific services for the end users and the end-user organizations. This approach quickly reveals the specific needs of the end user." (Draft business plan)

Field testing. The acceptance tests resulted in a ready-to-market ICT-enabled service. The services were tested in two rounds of field tests for each of the three cases. The first round aimed at ensuring that the functionality and practicality for customers and employees supported daily business. The project team reported that the testing resulted in feedback that improved the quality of the service. This feedback included improvement suggestions to the user interface and the lead time of services. The project team continued to test the scaling of the service in the second round in a revised form. This time, the users were trained intensive in dealing with ICT components. The results of the cases revealed that the revision of the CIS depended on the interaction of ICT and non-ICT components. The combination of personal interaction and ICT components interacted in such a way that scaling did not disrupt the processes but rather allowed employees more personal interaction. The interactions were thoroughly reviewed and

emerging improvements were documented for further development. In these improvements, the real customer processes served as orientation:

> "The business logic [of the service platform] was well-tested and improved to meet the highest market standards. The time […] was devoted to refining the already tested solutions." (Testing report)

Value review. The decisive factor for further actions was whether more customers can be or have been served while providing the same service quality. Therefore, the activities within the project team focused primarily on measuring service performance. The result of the field tests was the proof-of-concept for the service scaling improvement. The three cases included an improved flow of customers through the processes. In Case A, the first-time introduction of ICT components revealed the greatest effects on customer involvement. Other than service performance, the project team focused on the logic of the service concept. This includes the integration of the ICT components and the modular design in the value creation for the customer. The project team reported that the value logic of the CIS adapted slowly because of the familiar personal interaction. Therefore, in the mobility service (case B), both service processes – old and new – ran in parallel during the transition period. When scalability and consistency of the CIS could be verfied, the development and revision of the CIS was started again as soon as the service demand reached a critical level. The validation could lead to a rejection of the ICT-enabled service, which resulted in a further revision in the service pivoting or further analysis via the service interaction analysis:

> "The [services] went through a couple of interesting developments within the course of the project. Starting from a very vast offer of services on the platform, [a specific service] was soon recognized to be the most interesting service to focus on" (Final project report)

The insights about introduction of the services to the market led to the following proposition for service validation as part of scaling CIS:

Proposition 3*: The scaling of contact-intensive services involves the testing and evaluation of functionality, acceptance, usability, and practicality of the market-ready service.*

5.3.4 Model Development

The identified practices for service scaling are service interaction analysis, service pivoting, and service validation. These practices enabled the service providers to revise

their CIS to increase scalability. The increase in scalability is manifested by the flexible adaptation of service resources:

> "[The services] provide [the users] with easy-to-use ICT-supported solutions. In doing so, the [service platform] project increases transparency of demands and offerings, allowing for flexible and self-determined participation." (Evaluation report)

The practice of service interaction analysis was the entry point to service scaling. In this practice, service providers clarified which parts of the service are high in personal interaction and thereby, which parts promote and prevent service scaling. Furthermore, the practice includes identifying which modules of the service can be supported with ICT while ensuring the same or an even higher customer value.

The service pivoting practice improved the service capacity by adapting the service concept, the processes, and structure of the service. The focus of the improvement was in the ICT-enabled service as being a materialization of the SI. The adjustments were based on customer value creation possibilities of the resource reconfiguration. The coordination occurred in the interfaces between personal interaction and ICT.

When the service adjustment was ready for the market, the service provider and the customer tested it via the practice of service validation. This practice includes verifying whether the service is more efficient than before and making modifications to ensure that it is. The activities in the workshops illustrated, however, that service scaling is centered around increasing value for customers and service providers. Feedback and iteration in the individual activities of the service scaling practices and the return to the previous activities are an integral part of the procedure:

> "Applying an agile approach and involving the user on a regular basis as well as automated deployment and testing allowed to deliver and improve an integrated solution step by step." (Final project report)

These insights led to the following proposition regarding the interrelationship of practices in the scaling of CIS:

Proposition 4: *The scaling of contact-intensive service involves a cyclic and iterative process of practices that aim at responding flexibly to changing demand and improving value for the users and service providers.*

Figure 7 summarizes this relationship between the three practices and the nine activities, depicting the cyclic innovation logic in a service scaling concept.

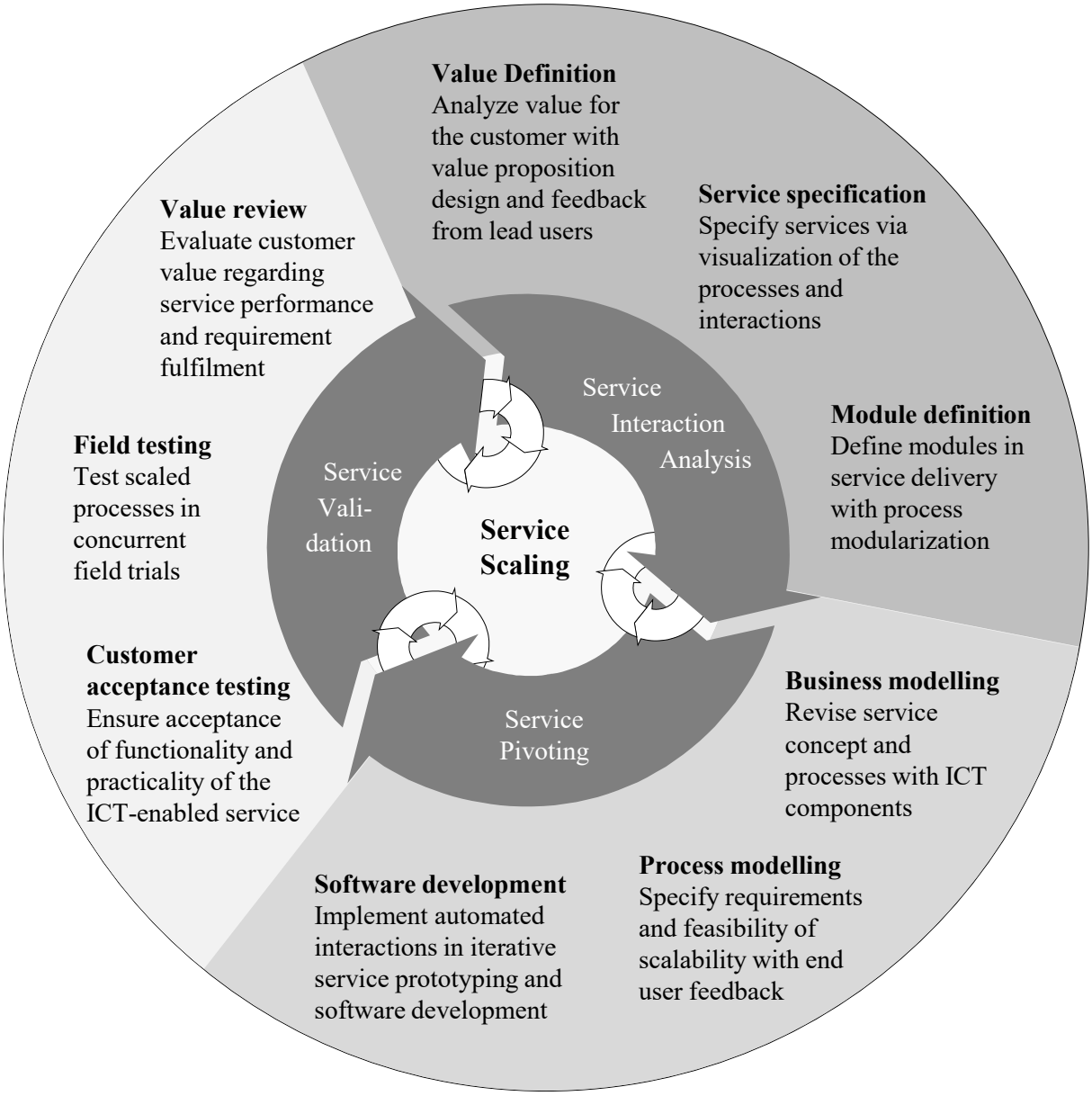

Figure 7: Service Scaling Model including Practices and Activities
Source: Own Illustration

5.4 Discussion

5.4.1 Theoretical Contribution

This chapter identifies and describes the three practices for scaling CIS: service interaction analysis, service pivoting, and service validation. In contrast to existing research, these practices provide details of the SI process that have hitherto been considered only on a meta level. The practices cover a cyclic and iterative process including the following (summary of the propositions): the definition and analysis of service value, processes, and structures; the iterative specification, implementation, and refinement of the service regarding its business logic, its underlying processes, and

software components; and the testing and evaluation of functionality, acceptance, usability, and practicality.

The insights on service interaction analysis offer details about the operant resources that previously have been considered as input for the SI practices (Chen et al. 2009). In detail, the analysis was identified as practice itself that service as prerequisite to determine problems with volume and scalability. In this context, the interaction between customer and service provider was considered as focus of scaling. The outcome of the analysis includes defined customer value, customer process, and customer experience that enable the identification of service modules and operationalize the findings of Täuscher and Abdelkafi (2018) on modular business design. Thus, the value definition, the process visualization, and the module definition are an extension to the innovation process.

Furthermore, the insights on service pivoting complement the discussion on ICT-enabled SI (den Hertog et al. 2010; Troilo et al. 2017) with an operationalization of activities and skills needed that was missing before. The iterative specification, implementation, and refinement of the ICT-enabled service were identified as part of the revision process for scaling in CIS. This iterative approach enables the identification of interdependences between the organizational context and ICT that is part of an ongoing discussion in literature (Storey et al. 2016; Troilo et al. 2017). The findings from this chapter demonstrate more clearly than previous research that an interplay of the personal and ICT-enabled processes allows limited scaling of CIS and advanced knowledge about design restrictions in ICT-enabled SI.

The insights on service validation demonstrate how services can be adapted more effectively to the requirements of customers in the SI process. Specifically, the service validation practice illustrates that testing and evaluation of functionality, acceptance, usability, and practicality are the core of customer feedback (Edvardsson et al. 2012; Russo-Spena and Mele 2012). This validation of the service concept, the service processes, and the customer experience give a desired integration of the key aspects in SI (Chew 2016) and stand in contrast to the existing literature. The combination of validation with customer acceptance testing and the field testing creates the prerequisite for an acceptance in the value review by the project companies. The description of the practices explicates prototyping and feedback that were implicitly included in iterations with the customer and thus represents an extension of the literature.

5.4.2 Implications for Practice

The findings reveal that the formative characteristic of personal interaction limits and determines scalability of CIS. However, the service scaling practices of service

interaction analysis, service pivoting, and service validation allow a substantial enhancement of CIS offerings and service delivery that leverage the scaling opportunities within the limits of personal interaction in CIS. Therefore, the findings offer implications for practice.

The practice of service interaction analysis reveals that an analysis and definition of the innovation object can be useful for finding effective service scaling approaches. In particular, the practice illustrates how companies can focus on scaling in CISs and SIs. Thereby, the visualization of the service concept, service processes, and ICT components promotes discussion and offers starting points for scaling services. A further breaking down of the CIS into modules can offer starting points for scaling and innovation in a limited area that is relatively independent of the overall service. In summary, a simplification of the problem can be achieved using the practice of service interaction analysis.

The practice of service pivoting indicates that the augmentation and substitution of employees with ICT components has been a critical aspect of implementing service scaling. In organizations, the service scaling aspects are mostly restricted to digital services (such as Amazon Web Service) representing an early operationalization of service scaling. However, the scaling practices and their activities offer implementation approaches to transfer those desired characteristics of scalability to other areas. The step-by-step approach, from the modeling of the processes to the modeling of the overall service business and then to the software development, is a specific and iterative approach that is accompanied by the customer. In summary, service companies can learn with the customer if the implementation of ICT components makes sense.

The practice of service validation offers guidance for acceptance of the scaling in CISs and the acceptance of SIs by the customer and the employees. The activities in the practice of service validation reveal that performing several iterations can increase the coherence between service concept, service processes with ICT components, and customer experience. Furthermore, the practice demonstrates the value of rapid feedback in the change of processes and structures. In summary, companies can rely on the impact of the actions taken in service scaling and SI, and thereby reduce the risk associated with SI.

5.5 Limitations

This chapter and its method have their limitations. First, the aim of this chapter was to identify and describe practices used in scaling CIS. These practices should include detailed and complete descriptions of the “embodied, materially mediated arrays of

human activity" (Schatzki 2001, p. 11). The descriptions of the three practices for scaling CIS were detailed on the basis of the activities and enriched with examples. However, the completeness in these descriptions requires a huge effort in the research process that is not proportional to the new knowledge obtained. Therefore, the data collection was focused on practices observable in all three cases and made a substantial contribution to scaling CIS. Further research could enlarge this data collection to include even more details and new practices, and thereby attain more complete knowledge of the scaling practices.

Second, the practice lens offers a unique view of the individual activities in scaling CIS. This unique view contains ambiguities in seeing and interpreting the practices because service scaling is a complex phenomenon with different knowledge needed at different stages. The data collection and analysis was designed in such a way that the research process is comprehensible and rigor on the basis of the same structure. However, this data collection and analysis included project teams and researchers with experience with the involved services. The limitation in this setting therefore results from the strengths and views of the persons involved. Future research may challenge these views by adopting a different approach to CIS scaling.

Third, the case-based setting provided the possibility to investigate service scaling in the context of CIS. This setting gave a unique possiblity of data collection and analysis that enabled the findings. The main limitation of this chapter arise from the individuality of the cases. The findings in these settings cannot be directly extended to other companies with the same degree of certainty that quantitative analyses can. An example of this uncertainty is that commercialization may be part of SI, but the focus of the SI in the considered CIS was more on value creation for the customer. At the same level of detail, it is certainly not possible to assume generalizability on other points in the practices. Thus, a further quantitative confirmation of the findings could make greater generalization possible.

5.6 Summary of the Chapter

The growing demand for personal services forces service providers to innovate and scale their CIS. However, knowledge about service scaling practices as an operationalization of ICT-enabled SI was missing. Therefore, the objective of this chapter was to identify and describe how service providers use practices in SI to achieve scalability of CIS. Drawing on qualitative methods – including a practice-based approach, a case-based data collection as well as an interpretive and in-depth analysis – this chapter identifies three practices for scaling CIS: service interaction analysis, service pivoting, and service

validation. The descriptions of the corresponding activities for each practice from the cases details the insights. Therefore, the practices offer contributions detailing the SI process, the role of ICT-enabled SI in scaling, and the adaption of the innovation. Service providers are thereby assisted with hands-on advice on how to approach scalability of CIS.

6 ANALYZING BUSINESS MODEL DESIGN PROCESSES[6]

This chapter addresses the second RQ, which is concerned with what constitutes the design of HCSSs in ICT-enabled SI. The focus of this chapter is on analyzing BM design processes that are used in the design of the service business. The chapter is structured as follows. Section 6.1 outlines the importance of the business perspective in the design of the service business. Afterwards, section 6.2 describes the action research approach used in this chapter. Sections 6.3 and 6.4 contain the derivation of the BM design process from the literature and learnings from three cases. The application of this process is described in section 6.5 before the findings are discussed with regards to their improvements and limitations in section 6.6. In the end, the findings are summarized and a proposal for further work is presented.

6.1 Motivation

From a business perspective, leveraging ICT to improve HCSSs makes sense as it enables productivity improvements, cost reductions, and innovation (Barrett et al. 2015; Maglio et al. 2015). Visionary companies take advantage of this and put established competitors under pressure to respond to new trends and rethink their value creation (Zott and Amit 2010). Although it appears that not all of the ICT-enabled SIs solely focus on the strategic competitive advantages, the commercial success of the innovation is important (Storey et al. 2016). In this regard, ICT has to generate value in the corresponding BM (Barrett et al. 2015). Whereas companies have problems to generate successful and sustainable BMs, neither general approaches that foster BM extensions for ICT-enabled HCSSs exist (Veit et al. 2014) nor do existing BM approaches cover the required activities of BM design (Ebel et al. 2016).

Both research and practices have recognized the potential of BMs for ICT-enabled HCSSs. In research, the influence of ICT on SIs and the development of corresponding BMs are named as top research priorities (Ostrom et al. 2015; Wirtz et al. 2016). The connection between the two concepts is seen as necessary because digital BMs can change the way value is created in ICT-enabled services (Veit et al. 2014). Moreover, design knowledge for BMs includes an explicit contribution answering these strategic

[6] This chapter have been published in an earlier version in the Proceedings of the 13th International Conference on Wirtschaftsinformatik (2017, pp. 897–911). For details please refer to the Overview of Publications (section 1.4).

business questions (Osterwalder and Pigneur 2013). In business practice, the commercialization of ICT-enabled HCSSs can have profound economic consequences within an emerging market (Maglio et al. 2015).

In this chapter, an action research project in the field of volunteering is used to derive a systematic and repeatable BM design process. This process can foster the extension of BMs for supporting ICT-enabled SI in HCSSs and facilitating their commercial success. Therefore, the process is derived based on the existing literature on BM design and tested and iterated in three different settings. The learnings from each case are used to improve the BM design process that aims at structuring, analyzing, and the decision-making of alternative BM extensions. In conclusion, this chapter contributes to the existing literature with an explicit and systematic approach to BM design in HCSSs that considers previous theoretical findings and solves real-world problems.

6.2 Research Method

Canonical action research is a qualitative method that combines the generation of scientific knowledge with researcher intervention to solve immediate real-world problems in a formalized form (Baskerville and Myers 2004; Davison et al. 2004). In this approach the fundamental assumption is that an understanding of complex processes can be achieved by changing these processes as well as observing and reflecting the effects. Good results can be expected when the goals of the researchers coincide with those of the field partners and the researchers are actively involved in the process of problem-solving (Davison et al. 2004). As action research runs in iterations, the cycles of diagnosing, action planning, action taking, evaluating, and specifying learnings are repeated until the problem is solved (Baskerville and Wood-Harper 1998). IS research and HCSS settings such as education have successfully used this research approach in the past (Baskerville and Myers 2004).

The data collection was embedded in a project that aimed at developing and introducing service platforms. The platforms support organizations to coordinate the placement of volunteers and people or nonprofits in need of help. The project contained a technical part including the development and testing of the service platform and a business part including the design and implementation of the services. The project collaboration consisted of researchers, technical developers, and the future operators of the platform. During the project, it became apparent that a BM design was needed based on existing services that had not been available in the prevailing approaches. The objective of the BM extension was to help those responsible for the service financing, improvement, and further operation.

The data collection was initiated in a joint problem analysis with all field partners. Based on the problem description, a literature review was conducted with keywords of "business model design", "customer development", "lean startup", "service design", "service innovation", and "value proposition design". High-quality literature was searched for processes that guide the BM extensions for ICT-enabled SI in HCSSs. Qualitative data analysis (Miles et al. 2014) was applied to the found literature to search where the design process starts and ends and what the different steps in between are. Workshops in three organizational settings (Table 16) were planned based on the results and with the method of collaboration engineering (Kolfschoten and de Vreede 2009). For every case a BM was developed. Therefore, the three settings represented the research cycles in the action research project. The BM design process took place in seven workshops. The analysis was conducted in one workshop with all field partners. In cases A and B, the remaining process was completed in one workshop with a larger group of experts. In case C, the BM design was performed in four internal workshops. Based on the learnings from the previous workshops, the BM design were revised and reapplied to the next setting. A documentation of the actions was made in the form of protocols.

Case	A	B	C
Industry	Care Service	Mobility Service	Matchmaking Service
Country	Germany	Germany	Switzerland
Staff	940	15	75
Project Owner	Project Manager	General Manager	Product Manager
Participants	9 (5 external experts)	14 (8 external experts)	4

Table 16: Research Setting for Analyzing Business Model Design
Source: Own Illustration

6.3 Knowledge Base

6.3.1 Literature

The BM design process is intended to help those responsible for the HCSSs in financing their existing and ICT-enabled service processes by guiding the extension of the BMs. Therefore, the process steps should focus on design including commercialization. Ten publications specifically deal with the design and extension of service systems and BMs. Table 17 includes the findings regarding the found publications and their coverage of the phases in the order of their publication date.

Publication	Steps of the Business Model Design Process			
	Analysis	Idea Generation	Evaluation	Implementation
Berry et al. (2006)	○	○	◑	○
Zott and Amit (2010)	○	●	◑	○
Osterwalder and Pigneur (2010)	●	●	◑	●
Chatterjee (2013)	●	●	◑	◑
Daas et al. (2013)	○	●	●	◑
Kuk and Janssen (2013)	○	●	○	●
Solaimani et al. (2013)	●	●	○	●
Chew (2016)	◑	●	○	○
Ebel et al. (2016)	◑	●	○	●
Giessmann and Legner (2016)	●	●	○	●

● = Covered ◑ = Partially Covered ○ = Not Covered

Table 17: Results from the Review on Business Model Design
Source: Own Illustration

Different steps in the process that could be identified include the analysis, idea generation, evaluation and selection, and implementation. None of the publications covers the full BM design process.

First, the analysis is mostly a preparatory activity that enables an effective and efficient design of the BM extensions. Because the BM is to be built on an existing service enabled by ICT, the analysis should include a particular service. A previous analysis of the environment is therefore not necessary. The result could include a visualization of the current service design and BM including ICT (Osterwalder and Pigneur 2010). This is used to challenge the individual activities of the service (Ebel et al. 2016).

Second, the idea generation contains the conception of the BM extension. This is most of the time the essential part of the design process. In this step, the possible BMs are developed in terms of the definition of activities that generate value for a particular customer segment, specify the service provider, and link the activities with each other (Zott and Amit 2010). The objective is to conceptualize value creation for the customer and derive revenues for the service provider. The result could be a collection of possible and realistic ideas (Osterwalder and Pigneur 2010). Nearly all publications cover this step.

Third, the evaluation and selection aim at assessing the developed BM extension and choosing the most promising option(s). This include the critical questioning of the BM design decisions and the financial contribution (Daas et al. 2013). The evaluation outcome depends on the impact on the customer value, the sustainability of the

investment and innovation, and the ability to compete with competitors (Berry et al. 2006). The result should be a clear idea of which options are available, particularly for quick and long-term successes, and a selection of the most promising BM extension (Kuk and Janssen 2013).

Fourth, the implementation builds a starting point for a functioning BM as it integrates the transition from concept to operationalization. Therefore, the necessary steps for an implementation are defined including the associated risks (Chatterjee 2013). The initiation of quick wins is an integral part of this action (Osterwalder and Pigneur 2010). After that, the implemented BM is influenced by a revision and reconfiguration based on external feedback and learnings (Ebel et al. 2016). This revision ensures a design according to the customer needs.

In summary, the literature review shows that none of the publications depicts the complete BM design process. Findings were derived regarding the steps of the BM design process. An explicit application to the service system that focuses on human interaction and personal services is not included. Therefore, this adaptation is part of the workshop preparation and follow-up.

6.3.2 Workshop Insights

Following the action research cycles introduced in the method section, the different stages to improve and iterate the findings were completed. Table 18 includes the results from the workshops. The results from the diagnosing phase show that the objective of the BM extension is similar in all cases of the project. The primary problem throughout the cases was that the service was improved by ICT to support the offline service system with a value proposition that remains constant. As this is a platform business and primary customers are not willing to pay (they are volunteers), this challenge included the expansion of the use of ICT-enabled service systems to add additional customers who cover the costs. On this basis, the action planning and action taking for each workshop that describe the purpose of the workshop sessions were defined. The objective was to find new users, new uses, and new revenue opportunities. The learnings from the previous workshops initiated the changes in the workshop. Whereas the first workshop focused on the entire BM with its activities, the second focused on specific customer groups, which was more effective. Based on these customer groups, the associated value proposition, and corresponding revenue opportunities were defined. The learning from the second case was that the design includes the definition of implementation steps. The evaluation of the BM extensions was conducted in the form of a workup of the workshop results. The experts who participated in the workshops

commented on the quality of the BMs. In all companies, BM extensions could be triggered successfully.

Case	A	B	C
Diagnosing	Introduced and needs cross-financing.	Needs more users so that it is profitable.	Needs further use cases for continuous funding.
Action Planning	Definition of additional use with revenue.	Definition of possible users of the platform.	Definition of extended users and use.
Action Taking	Focus on the definition of customer groups with associated values and revenues.	Focus on the development of BMs via exploitation of existing resources.	Focus on BMs with new customers through new use cases.
Evaluating	BM extensions were developed for other service providers, local care facilities, and city authorities including a financial concept.	BM extensions were developed for other age groups and a supply service.	BM extensions were developed for municipalities and companies including implementation steps.
Specifying Learning	Extensions including customer groups, value propositions, and revenue streams.	More focus on customer values with associated revenues.	Further steps are necessary to implement the design.

Table 18: Results from the Workshops on Business Model Design
Source: Own Illustration

6.4 Findings

The result of the iteration and revision is the BM design process depicted in Figure 8. The process includes all activities that are necessary to create BM extensions for ICT-enabled HCSSs. The first three steps, depicted in gray, include activities that are directly related to the design process. The activities in the fourth step, the implementation, affect the BM design retrospectively and guarantee the desired service and BM design.

The first step is the analysis of the existing service. In this step, the service and the BM that is to be extended are identified and clarified. The value of the service to stakeholders and the activities in the form of a value proposition are an significant part thereof (Solaimani et al. 2013). The value proposition canvas (Osterwalder et al. 2015) or related tools can be used to describe the service and specify the customer needs and corresponding values. Moreover, for a shared understanding of the purpose and service output, the effects of innovation from ICT are described. This provides the opportunity to show all results, constraints, and interrelationships of the service system (Zott and Amit 2010). The analysis challenges the individual activities of the service system (Ebel et al. 2016) with a particular focus on the customers and their value proposition (Osterwalder et al. 2015). In HCSSs, the identification of capabilities and interaction is

important as they constitute the value co-creation (Maglio et al. 2015). For a description of all other activities included in the BM and SI, the BM canvas (Osterwalder and Pigneur 2010) or related tools can be used.

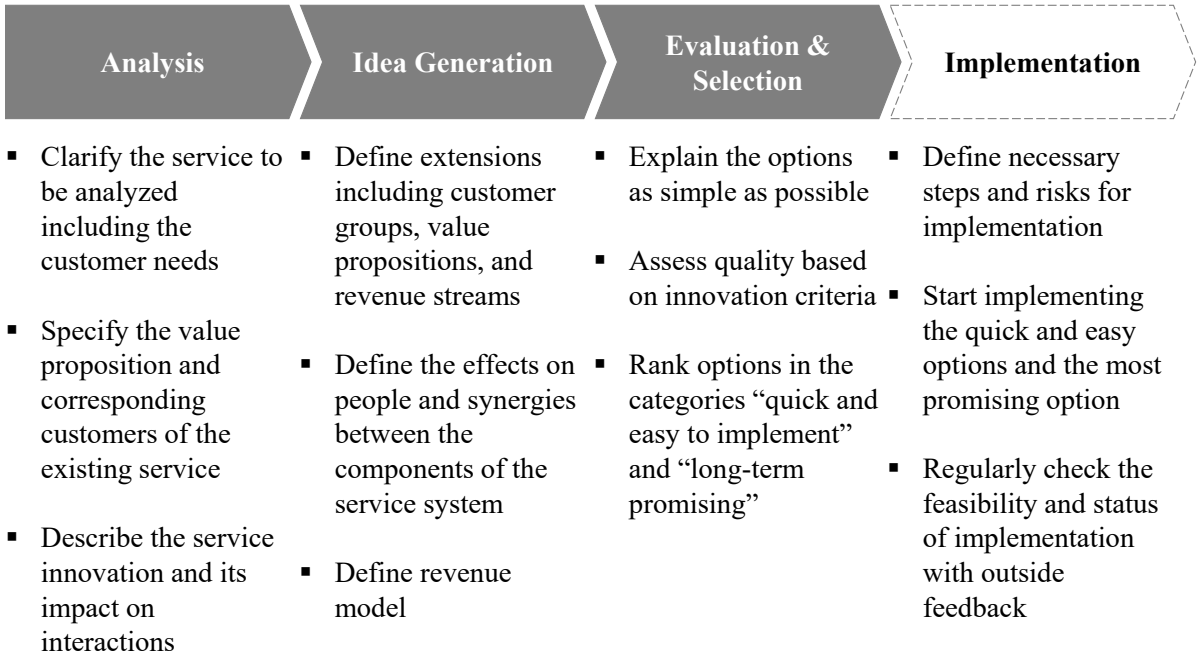

Figure 8: Resulting Business Model Design Process
Source: Own Illustration

The second in BM design is the idea generation. In this step, the BM extensions are defined in a structured manner including a customer segment, a matching value proposition, and the value capture expected for the service provider (Chatterjee 2013). There are different starting points for the collection of ideas (Chatterjee 2013; Osterwalder and Pigneur 2010). The basis for the considerations of BM extensions in HCSSs are the ICT-enabled SIs that include some new BMs (Breidbach et al. 2013). Desirable are innovations originating from an enhanced customer value that put the customer at the center of SI and innovations where the technology is the driver for the BM extension (Kuk and Janssen 2013). Thereby, it is necessary to know which parts are visible and desirable to the customer (Chatterjee 2013). A funding model complements a BM design (Osterwalder and Pigneur 2010; Zott and Amit 2010). It is the result of the division of investments, costs, and revenues. In the end, the options must be assessable regarding the effects and synergies (Daas et al. 2013).

The third step is the evaluation and selection of alternative BM extensions. In this step, the options that have been developed in the previous step are presented to increase a shared understanding. Based on this outline, the quality of the extensions is assessed regarding the BM design decisions and their financial contribution (Daas et al. 2013).

There are assessment criteria that help to evaluate the quality of the extensions (Berry et al. 2006; Osterwalder and Pigneur 2010). The evaluation criteria include the customer value offered in the BM, the sustainability of the investment, the stability of the innovation, and the ability to compete with competitors (Berry et al. 2006). Moreover, part of the evaluation is whether resources are available or acquisition is possible for the extended BM (Chatterjee 2013) and whether changes in the relationships and interactions in the service system are needed. The selection will provide the most promising BM extension alternatives and a guide for decision-making (Kuk and Janssen 2013). Quick improvements are a component as well as long-term oriented and promising options (Kuk and Janssen 2013). The evaluation is the basis for incremental improvements (Osterwalder and Pigneur 2010).

The fourth step is associated with the implementation. The process steps include preparatory actions as the actual implementation is not part of the BM design process. Nonetheless, decisions that are made here have an influence on the final design of the BM extensions. Therefore, Figure 8 shows this step by dashed lines. To prepare the implementation, the steps necessary need to be defined. In human-centered design, customer integration should be part of the implementation. Therefore, it should be part of the planning (Kuk and Janssen 2013). Results of these activities are documents that specify milestones, structures, finances, and the project plan (Osterwalder and Pigneur 2010). Furthermore, the risks of changing the service system associated with the implementation should be documented (Chatterjee 2013). In particular, this includes the substitution of humans by ICT (Ostrom et al. 2015). After that, it is possible to follow change management protocols to implement the BM and review the efficacy and any further improvements (Chew 2016). The implementation can be monitored by the design dimensions and the decision-making and evaluation criteria (Daas et al. 2013).

6.5 Application

The developed BM design process was applied in the three companies. For illustration and understanding, the use of the process is demonstrated in case A step by step. The field partner offers care services that help aged people or persons in other difficult situations to cope with everyday life as independently as possible. Due to the limitation of public and private funding, the care services cannot be applied unlimitedly. When there is little help needed or the need for assistance is at an initial stage, it is not possible to take advantage of these services. To cover this gap and to identify any further demand, the care service and a housing association started organizing neighborhood assistance in one of their residential properties. To reach more volunteers outside the residential

property and to cross-finance the service, the care service decided to organize the placement of volunteers online.

In the analysis, the existing service has been formally defined. The results show that the residents are people who usually live alone and have little money from their pension. Some of the people may feel social isolation, loss of importance, and physical decline. They want to experience joy, meet other people, have a structure in their lives, learn, and have the feeling of being needed. The placement service helps older people with early physical handicaps to deal with their everyday life with the assistance of their neighbors. This, including social contacts, helps with simple daily tasks and allows participation in various activities. Neighbors that accompany elderly people can thereby expand their competencies and receive cost compensations due to legal regulations. The ICT-enabled innovation changed the service with the result that the offers and requests can be published and arranged online. Thus, it expanded the group of volunteers to the neighborhood.

In the idea generation of possible BM extensions, options were discussed based on the existing service visualized in a BM canvas. In this step, the employees of the care service, from the housing association, and representatives of the city authorities discussed ideas and their consequences based on their experiences. Sources for reflections were the needs of the residents and other possible uses of the platform. Obstacles consisted in the clear definition of the users and their needs. Therefore, the prerequisite for adding a new idea was a specified customer group and a corresponding value customers are willing to pay for. In addition, the scalability of the platform was important.

Customer	Value Proposition	Revenue Stream	Consequences
Professional service provider	Service platform	Placement fee	Supplementary offering
Local facilities for elderly people	Advertising platform for future customers	Advertising fee	Advertisements for users
City authorities	Execution of municipal tasks	Participation of retirement benefits	Need assessment may be outsourced

Table 19: Selected Business Model Extensions
Source: Own Illustration

In the evaluation and selection, the workshop participants presented the initial idea and summarized the generated BM extensions. In this step, a clear definition of the evaluation criteria was crucial for the success. Evaluation criteria were the benchmark from the other volunteering services and the revenue potential. Because competitors

already offer similar but specialized services, the BM extensions were evaluated and discussed considering switching costs and a differentiation from competitors. Because the cross-financing of the service was the primary objective, the recurring revenues depicted crucial quality criteria. At the end of the workshop, participants had the opportunity to place their vote for a quick win and a promising long-term solution. For case A, the three BM extensions from Table 19 were selected. These include offers to professional service providers, local facilities for elderly people, and the city authorities. Professional service providers could offer services such as care or medical services for direct booking on the platform. Other local companies that target elderly people could promote their offers on the platform. Due to the fact that the platform supports the city authorities in assessing the needs in the neighborhood, the platform provides help for social tasks.

After the workshops, the implementation started with the definition of the steps for each BM extension. In this step, the tasks included the acquisition of the appropriate partners that meet the quality standards, definition of the necessary technical adjustments in the system, and activation of a test group that can provide feedback on the developments. The usage as an advertising platform was a quick win and starting point as the technical adjustments were the smallest and the potential customers easy to reach. Because each placement on the platform poses a threat to individual privacy, the protection against fraud was a significant risk aspect that needed to be considered for all options. The selected BM extensions enable the care provider to use different revenue streams that can together ensure long-term financing. Commercial success can be achieved even though the main objective has a social and voluntary background.

6.6 Discussion

Several different approaches aim at generating successful and sustainable HCSSs and corresponding BMs. However, how BMs can be adapted to commercialize ICT-enabled SI in HCSSs remains unclear. Consolidating contributions from different approaches and considering characteristics of ICT-enabled HCSSs, the chapter answers the RQ by deriving and testing a BM design process. The objective of the four-step process is enabling those responsible for SI in structuring, analyzing, and the decision-making of alternative BM extensions. Although prevailing approaches offer the possibility to design BM extensions, the proposed BM design process provides operationalized steps that allow for the integration of HCSSs, can be used for established service systems, and enable a combination of BM design and SI. The value of the method combination is thus included in the in the prescriptive knowledge of the BM design process and its steps.

BM design is a distinctive activity that requires a systematic approach (Zott and Amit 2010). Nevertheless, present approaches do not comprise the entire process and do not include any operationalization in form of a step-by-step instruction of activities that should be done. What they offer are, on the one hand, rules that help to find the right design for the right market (Berry et al. 2006; Chatterjee 2013; Giessmann and Legner 2016; Kuk and Janssen 2013). These are useful because they make generally accepted statements that are valid for all product and service systems. In addition, they are useful to verify the BM design in terms of strategic fit and competition. They do not have a specific character and do not refer to any specific domain. On the other hand, present approaches offer a high-level process in which BM design represents only a part (Chew 2016; Daas et al. 2013; Ebel et al. 2016). These approaches are necessary to consider all the steps. This does not define a result and does not specify when, what, and how something should happen in the design process. Other approaches include the right steps but are difficult to use because of their large coverage (Osterwalder and Pigneur 2010). The presented approach is a guide that includes all steps with specific activities. This is associated with a beginning and end of the design process. This allows for an application in different domains and a clear adaptation to the needs. In this chapter, there is a special consideration of HCSSs in the form of an analysis of the interaction and the impact on the people in the service system. The workshops showed that these points were important in the discussion about the suitability and sustainability of the BM design alternatives.

Although BM design is particularly difficult for managers of established service systems (Zott and Amit 2010), no approach provides a guide for this situation. Some approaches are assumed to be able to be applied to already established service systems (Osterwalder and Pigneur 2010), but they offer no distinction between their actions. The analysis of the environment and competitors (Ebel et al. 2016; Osterwalder and Pigneur 2010; Solaimani et al. 2013) provide knowledge that exists in an established service system. These activities focus primarily on gaining competitive advantages, contrary to the focus on commercial success of the ICT-enabled service system (Storey et al. 2016). The proposed BM design process starts with the analysis of the existing service system to promote a shared understanding of the existing service system and its value proposition. In addition, the aspiration of the previous approaches to create new markets (Berry et al. 2006) is not always practical. Starting with SI as a system reconfiguration (Breidbach and Maglio 2015), the ICT-enabled extension of the service system usually aimed at improving existing services. A commercialization on new markets is afflicted with risks (Chatterjee 2013) and the acquisition of new resources (Osterwalder and Pigneur 2010),

which may not be desirable. The presented approach is based on existing ICT-enabled innovations and their ability to create a new value for customers. It turns out that the adaptation of the service system offers the possibility for compliance with restrictions, for example, the focus on interaction, as it is the case in HCSSs.

The development of the process shows that BM design is interdisciplinary as it covers both the design of the service itself as well as related BMs. This is relevant because a service is a process co-creating a context-specific value (Vargo and Lusch 2016) and HCSSs depend on human interaction and personal services (Maglio et al. 2015). The value creation and thus the commercialization can only happen with the connection of both. Correspondingly, the literature used in this context comes from various directions. It should be noted that most of the existing approaches focus on the BMs or service. Contributions that include a combination of both are usually of theoretical nature (Chew 2016). The proposed solution provides a BM design that includes the interrelationships between service process and BM innovation, as it has been requested (Ostrom et al. 2015). Different aspects are considered. The process aims at both the customer and the technical innovation. Thus, it covers the most likely drivers of innovation (Osterwalder and Pigneur 2010). In addition, BM design provides the possibility to do system-level design and the design of service components (Zott and Amit 2010). Overall, the presented approach thus includes different aspects of BM design and SI.

The research in this chapter is not without limitations. As BM design is an iterative process (Chatterjee 2013; Teece 2010), the development of the BM extensions with the help of the BM design process is just the first step in achieving a sustainable financing for the ICT-enabled SIs. The process was developed and iterated with the field partners based on a theoretical background. In doing so, new activities were tested in different settings to improve the results. The process presented here includes all activities that have been found useful. Thereby, completeness is not claimed. Nonetheless, the proposed design process generates several possible and realistic BM extensions that are a good starting point for iterations with customers and partners. In addition, the acquired knowledge provides an understanding for and from a domain with a specific problem. The action research method used to develop the BM design process provides the possibility to learn from joint problem-solving but does not allow an overall generalization of the findings. An abstraction of the findings is only acceptable if the situation and domain are similar to that presented in this chapter. To counter this, the development of the BM design process was based on prevailing approaches and iterated the findings in different companies. This allows a comparison with these approaches and expands the application to the presented theoretical background. Therefore, the

findings on BM design can be helpful for situations in which SI is enabled by ICT and value creation is changed.

6.7 Summary of the Chapter

BM design for ICT-enabled HCSSs focuses on creating value for companies and customers. To capture the value, a BM design process was derived that guides the development of BM extensions. Building on previous contributions from this field, the process was iterated and revised in an action research project. Thereby, the learnings from three organizational settings were used to create a systematic and repeatable approach. The result is a BM design process that allows for the revision of the service systems and the corresponding BMs in synergies with and with respect to the existing ICT-enabled HCSSs. The resulting BM extensions foster the commercial success and the long-term financing of the service systems.

This chapter includes several contributions. First, the BM design process guides those responsible for SI in structuring, analyzing, and the decision-making of alternative BM extensions. The BM design process provides steps and activities and is designed for an application in ICT-enabled HCSSs. Thus, it provides an approach that is relevant to all ICT-related SI projects. This process is the first step for the commercial success of ICT-enabled HCSSs. Second, the insights into the combination of the two research streams that is, BM design and SI, and contribute to the body of knowledge as it have mostly been tackled independently. This knowledge promotes a further understanding of the steps and activities in the design of BM extensions and enables a systematic support of both. Third, the research solves real-world problems by enabling the funding for three service platforms. This confirms the relevance of BM design and shows other objectives besides sustainably competitive advantages.

Future work can build on the developed BM design process. The documentation of the successful application can extend the discussion on BM design and produce suggestions for further improvement. The process can be adapted to other application areas to support the digital transformation. In addition, the long-term success of the developed BM extensions can be examined.

7 DEVELOPING DESIGN PRINCIPLES

This chapter addresses the third RQ, which is concerned with how to systematically design an ICT-enabled SI in HCSSs. The chapter presents a DSR approach that results in five structuring DPs for the service business. The rest of this chapter is organized as follows. After the introduction to the challenges in the systematic design of ICT-enabled SI, section 7.2 explains the design-oriented research process including the systematic building and evaluation cycles in the case settings. Then, in section 7.3, the design requirements (DRs) and the DPs as the findings of the chapter guide the development of NCSs. The advantages of the DPs are evaluated in a case study in three different neighborhood settings (section 7.4). This approach allows to show the contributions of the generated design knowledge to the ICT-enabled innovation of NCSs in the discussion section 7.5. In the end, avenues for further research are revealed and the findings concluded.

7.1 Motivation

The aging of society is producing quality- and cost-related challenges in healthcare services (Johansen and van den Bosch 2017). Countermeasures include social innovation that aim at the distinctive participation of civil society actors to solve a societal need (Edwards-Schachter and Wallace 2017). A remarkable example of such social innovation takes place in NCSs that are private or professional services in a residential area that improve the quality of life in the social contexts (Edwards-Schachter and Wallace 2017; Gallouj et al. 2018). A successful example of such NCSs is the “Buurtzorg” Model implemented in the Netherlands to help self-organized caregivers (Kreitzer et al. 2015). Such NCSs are provided by local care providers (service providers) who employ care personnel in the neighborhood (caregivers) to support those in need of care (customers).

In recent years, a rethinking and supplementation of social innovation with ICT has become more attractive due to its positive effects on quality and costs (Williams et al. 2008). This innovation of existing services with ICT components with the aim of enhancing the service offering and service delivery is referred to as ICT-enabled SI (Barrett et al. 2015). However, this ICT-enabled SI in social innovation is challenging for service providers (Srivastava and Shainesh 2015). On the one hand, standardization of care services is difficult to achieve because these kind of services have a human components (Johansen and van den Bosch 2017). This human component implies customer value creation in the context of the service (Jaakkola et al. 2017). On the other

hand, NCSs are mainly driven by human interaction (Johansen and van den Bosch 2017), the service providers now have to adapt to a digital logic (Barrett et al. 2015). This new logic requires a structured design that is not available yet (Böhmann et al. 2014).

ICT-enabled SI in social industries such as care service is regarded as important for society and individuals (Majchrzak et al. 2016). NCSs allow medium-cost, high-quality care in a local environment (Johansen and van den Bosch 2017). For customers, ICT-enabled SI in NCSs can increase access to care, transparency of information, and collaborations among customers and caregivers (Kreitzer et al. 2015; Srivastava and Shainesh 2015). For service providers, the ICT-enabled SI in NCSs helps them respond flexibly to the emerging needs of customers and contributes to the competitiveness of the service providers in the care market (Johansen and van den Bosch 2017). For society, addressing real-world problems in service design and innovation is crucial for developing services with customers, organizations, and societal actors in general (Patrício et al. 2018). Despite this relevance, the potential of ICT-enabled services in the care sector is not yet adequately addressed (Berry 2019). Therefore, further theoretical and empirical research is needed (Borzaga and Bodini 2014).

In summary, due to the nature of NCSs and social innovation, it is desirable to innovate systematically the services with ICT. Therefore, this chapter aims to close this research gap and provides guidance in the form of DPs that improve NCSs (as social innovation) using ICT-enabled SI.

7.2 Research Method

Given the limited guidance for designing SI in NCSs, a DSR approach is appropriate. This research approach includes a domain-specific output that is directed to utility and uses an iterative process of building and evaluating this output (Hevner et al. 2004). The domain-specific output of this chapter is the DPs. Such DPs are clear prescriptions about how to design “a class of artefacts” (Chandra et al. 2015; Gregor and Hevner 2013), which in this research refers to ICT-enabled SI in NCSs. Design-oriented research and DSR as research approach are recommended as methodology in ICT-enabled SI (Joly et al. 2019; Ostrom et al. 2015; Patrício et al. 2018) and has been successfully used in service research (Beloglazov et al. 2015; Teixeira et al. 2017, 2019). As with all DSR, the DPs are directed to utility that defines the theoretical contribution the research activities are aiming at (in contrast to other types of research that, for example, try to falsify hypotheses). By using DSR, the RQ of this chapter can be answered, which in

turn helps service providers in designing NCSs and researchers in extending the knowledge base in this domain.

The iterative process of designing and evaluating the DPs is known as the design cycle (Hevner 2007; Teixeira et al. 2019) further illustrated in the following sections. The design cycle explicitly integrates a relevance cycle using inputs from the practice environment as well as a rigor cycle drawing from the existing knowledge base (Hevner 2007). For the relevance cycle, the iterative design and evaluation of the DPs draw from the environment and practice of the domain and use other research methods suitable in the given context of the cases. In the next section, the three practice cases are illustrated.

7.2.1 Case Setting

The data collection in the DSR approach for design and evaluation of the DPs was carried out in a multiple case setting with three providers of NCSs. The selected cases did the following: (1) aimed at the improvement of quality of life in social contexts (social innovation); (2) involved private or professional care services in a local environment (NCSs); and (3) wanted to enhance their service offering or service delivery with ICT components (ICT-enabled SI). Three NCSs were selected that offer similar services in different regions and at different scales. The data collection in the cases took place in iterations. As the underlying DSR process of this chapter is clearly structured, the data collection can be clearly mapped to its corresponding phases.

In all cases, it was the aim to innovate the service concept and the service delivery leading to higher utility, quality, and efficacy compared to the traditional service structures. Therefore, in each case, the ICT-enabled SI involved the development and implementation of software as ICT component, and thereby the innovation and enhancement of the NCS. All three SI projects included access to the decision-making of service providers. This critical asset was used to iteratively build and evaluate the DPs. Various interviews and focus groups were conducted. This data collection enabled a reflection on activities, problems, and decisions regarding the design and provided insights to iteratively improve the DPs within the overall DSR process. The selected NCS cases and their relation to social innovation and SI are summarized in Table 20.

Setting	Country/ Context	Participants	NCS as Social Innovation	Planned ICT-enabled Service Innovation
Case A	Germany – metropolis setting	Care service providers, house residents, volunteers in residential area	The service allows customers to get involved in the neighborhood for different local activities or to get to know someone in the neighborhood who can provide residents with support for everyday life.	The ICT components should support the involvement process. Residents can give help and can receive help from their neighbors or associations in the neighborhood before they hire professional service providers. Besides just an information service (e.g., on neighborhood events), other services can be offered such as booking short-term accommodation.
Case B	Germany – small town setting	Care service providers, small town residents, volunteers in the small town	The service enables customers to participate in the neighborhood by organizing informal support from other community members. For the residents, these services include both giving and receiving help in different forms (e.g., a mobility service).	The ICT should support matchmaking within various services (e.g., household support, medical care, mobility, etc.) provided by a network of local service providers and customers.
Case C	Switzerland – rural setting	Volunteers, placement agency, associations	The service brings together people for social projects in the neighborhood or region but also helps organize corporate volunteering programs.	Basing on a job portal, the ICT components should help to increase service selection and simplify the process of agreement. Individuals willing to take on voluntary or honorary duties in organizations should find institutional volunteering work opportunities.

Table 20: Research Setting for Devoloping Design Principles
Source: Own Illustration

7.2.2 Approach for Developing Design Principles

The development of the DPs that guide ICT-enabled SI in NCSs involves a systematic and iterative process (Figure 9). This process is based on guidelines for DSR (Hevner et al. 2004) and adopts activities from a well-known DSR process (Peffers et al. 2007). The iterative process involves five steps: (1) problem definition, (2) objective definition, (3) design & development, (4) demonstration, and (5) evaluation of the DPs. The iterative process enabled a resumption of the process from previous steps due to the insights gained in the subsequent process steps. Table 21 summarizes the activities and data collection in the design and evaluation of the DPs.

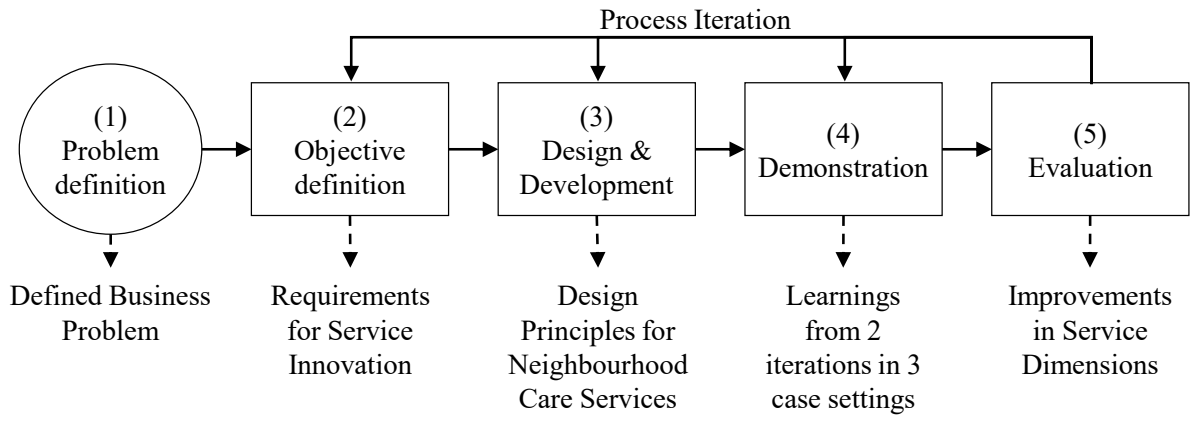

Figure 9: Design Science Research Process for Developing Design Principles
Source: Adopted from Peffers et al. (2007)

(1) Problem definition. To identify each cases' current problems and challenges in innovating the service, eight open interviews with the three service providers in NCSs and their ICT providers in Germany and Switzerland were conducted. Focus was laid on discussing the challenges of the service providers in innovating their NCSs based on planned or ongoing SI projects. This step ensured the relevance of the research problem to practice (Gregor and Hevner 2013; Hevner et al. 2004)

(2) Objective definition. In order to ensure that potentials of social innovation can be leveraged, the objective definition step began with verifying that NCSs can be regarded as social innovation. The findings from the problem definition phase were pre-structured and it was made sure that based on the social innovation characteristics, distinctive objectives for SI could be derived. Then, it was discussed whether and to what extent these characteristics applied to the service providers in the three cases. Therefore, three focus groups were conducted. The discussion included the potentials and the influence of the ICT components on the resulting services. Accordingly, DRs could be defined for the different ICT-enabled NCSs. Defining the DRs involved three activities. First, the service providers were helped to define their individual DRs. Second, the service providers were helped to formalize their findings. As a result, the service providers specified DRs for their services and planned the implementation for the individual services. Third, the findings of the individual service providers were abstracted to deduct generally valid DRs for SI in NCSs. The specification of the DRs ensured that the DPs are created for a particular context (Chandra et al. 2015) and ensured the theoretical and practical relevance of the design knowledge (Hevner et al. 2004).

(3) Design & Development. Based on the DRs, the revision and innovation of services were started. Together with the service providers, it was possible to derive a first draft of DPs for ICT-enabled SI in NCSs from the implementation planning. The DPs were

discussed with the service providers. Three focus groups were used to further adapt, formalize, and describe the DPs. These focus groups discussed general validity based on the industry characteristics of NCSs and elaborated on how an implementation and innovation of the service delivery is possible by using the DPs. For the documentation of the DPs, a notation was used that includes a clear and precise structure (Chandra et al. 2015). This structure assumes that the DPs "provide the system with [material property—in terms of form and function] in order for users to [activity of user/group of users—in terms of action], given that [boundary conditions—user group's characteristics or implementation settings]."

(4) Demonstration. The ICT-enabled NCSs were piloted in two iterations in two to enhance the innovation through customer feedback. The same iterations were used to adapt the DPs. In a total of six focus groups, the implementations and (pre-)resulting innovated services were assessed. Furthermore, needed adaptations of the DPs were discussed. The focus groups were held before the first pilot phase and after each of the two pilot phases. In the first iteration of the pilot phase, the objective of the revision was on challenging the effectiveness of the DPs for the customers. After the second pilot, the emphasis was on the usefulness and quality of the DPs for the service providers. The DPs and the adjustments were then used to guide the implementation.

(5) Evaluation. The aim of the evaluation was to demonstrate that the DPs improve the guidance of ICT-enabled SI in NCSs in terms of structure and help to leverage the potentials of social innovation. Following a DSR evaluation framework (Venable et al. 2016) the evaluation focused on proving the utility, quality, and efficacy of the developed and presented DPs. Thereby, three data points provided input for the evaluation. First, the demonstration included formative evaluations of the DPs. In each three-month piloting of the services, it was evaluated whether the service parts could be revised based on the DPs and could create value in the context of NCSs and social innovation. After the second piloting phase, the services went live to derive further feedback during operation. This showed whether the DPs could create value across a variety of contexts and conditions. Then, in the summative evaluation, four experts with expertise in ICT-enabled SI evaluated the DPs. Based on the services, it was examined whether: (1) a structured improvement could be achieved in the various services; and (2) SI could be facilitated by addressing issues of DPs.

(#) Step	Objective	Description of Action	Outcome
(1) Problem definition	Understand innovation needs	Eight open interviews (managing directors or service owners) with three service providers and their ICT provider to understand pains in implementing ICT in the neighborhood care services.	Description of the business problem
(2) Objective definition	Determine service innovation requirements	Three focus groups with overall 18 participants to discuss the validity of social innovation characteristics to service innovation in NCSs. Definition of (1) individual requirements, (2) their formalization, and (3) abstraction of the individual cases to derive design requirements that leverage social innovation with ICT.	Five formal described design requirements
(3) Development of design principles	Deduce innovation dimensions	Based on the design requirements, the revision and innovation of services was started in three services. A detailed planning of the activities in the services led to the formulation of implementation plans, which formed the first approaches for the design principles. Three focus groups with the service providers with overall eight participants to formalize the knowledge in the form of implementation plans.	Formal description of the design principles
(4) Demonstration of knowledge	Improve design knowledge	Feedback from two piloting periods that each lasted three months. The findings were used to improve utility, quality, and efficacy. The first pilot focused on the efficacy of the design principles for the customers. The second pilot focused on the utility and quality for the service providers.	ICT-enabled service innovation in NCSs
(5) Evaluation of the design principles	Determine utility, quality, and efficacy of the design principles	Field-testing and formal evaluation by four external experts that included feedback on whether (1) a structured design could be achieved and (2) the service innovation could be facilitated by adhering to the design principles.	Formal evaluation of the design principles

Table 21: Details of the Design Science Research Process
Source: Own Illustration

7.3 Findings

The findings of the research are presented in a two-stage approach that facilitates SI in NCSs: DRs and DPs. The final framing of the DRs originates from the implementations in the NCSs and can thus aggregate the requirements of the implementation in practice.

7.3.1 Design Requirements

During the implementation, the DRs for ICT-enabled SI in NCSs were defined. The independent characteristics of social innovation were used as a basis to create DRs that are free of overlaps. This resulted in five DRs about the objective, scope, participants, potential, and outcome of SI in NCSs. These requirements serve as a guideline for the development of the DPs.

Design requirement 1: *Service innovation in NCSs shall focus on personal care by increasing time with the customers.* The objective of the service providers is to improve existing home care beyond the capabilities of NCSs. Using ICT-enabled NCSs, they could offer more time to individual customers. The positioning of the ICT-enabled service and therefore the value propositions to the customers should cover the minimum viable product, which includes the personal care of the people by a caregiver. This should be possible by increasing productive time in terms of contact to the customers with the help of ICT components.

Design requirement 2: *Service innovation in NCSs shall empower caregivers by increasing informed decision-making through ICT components*. The innovation of NCSs should focus on the local caregivers who have the knowledge, skills, and empowerment to solve customer problems. Although every customer is different, the caregivers should be able to help every customer with his or her needs. The ICT components should help to improve the possibilities of empowerment and simpler decisions through transparency on existing customer information and infrastructure. This requirement is in line with the growing focus on personal service delivery that aims at satisfying customer needs.

Design requirement 3: *Service innovation in NCSs shall extend the care service system by advancing customer knowledge with ICT components.* The successful service delivery of the care service depends on caregivers and customers. Therefore, inclusion of the customers as participants in a value co-creation should be considered for SI. Customers taking over tasks should relieve the caregiver and maintain the independence of customers. For this, however, the customer needs more knowledge about the care process or parts of it. If requested from the customer, external participants and the network beyond should support the service delivery in case of missing resources or knowledge.

Design requirement 4: *Service innovation in NCSs shall reduce overheads in service delivery by outsourcing service coordination to ICT components.* As service delivery is ad hoc driven in NCSs, the caregiver should be ready for service delivery at the right

time and place. Thereby, human resources are the limiting factor. Therefore, the coordinating and orchestrating function of the service provider should get special attention in scaling the service. In doing so, the concentration on the core service with the customer should enable a meaningful use of this resource. The overheads should be reduced by the ICT components and the satisfaction of the caregivers in contact with the customer should be increased.

Design requirement 5: *Service innovation in NCSs shall document the effects on quality of life by introducing ICT-enabled performance indicators.* The service provider should be aware of all relevant output dimension of the service for the customers and caregivers. These qualitative dimension should affect both tangible and intangible parts of the service and focus on the value creation with or for the customer. For the ICT-enabled NCSs, the personal interaction of the customer with the service employee is seen as the main indicator of outcome because this is the time when the full attention is on the customer. A specific and measurable outcome dimension of the social innovation should help service providers to use SI in the right places.

7.3.2 Design Principles

To build SI on the characteristics of social innovation, the individual DPs were developed from individual DRs. The formal description of the DPs is based on the characteristics of social innovations and DRs derived from them. This connection to social innovation ensures that the principles consider all unique aspects and thus take a holistic perspective based on the current state of research. Thus, the DPs for ICT-enabled NCSs include objective, scope, participation, potential, and outcome. Figure 10 shows the interim results in the build and evaluate approach that included two pilot phases.

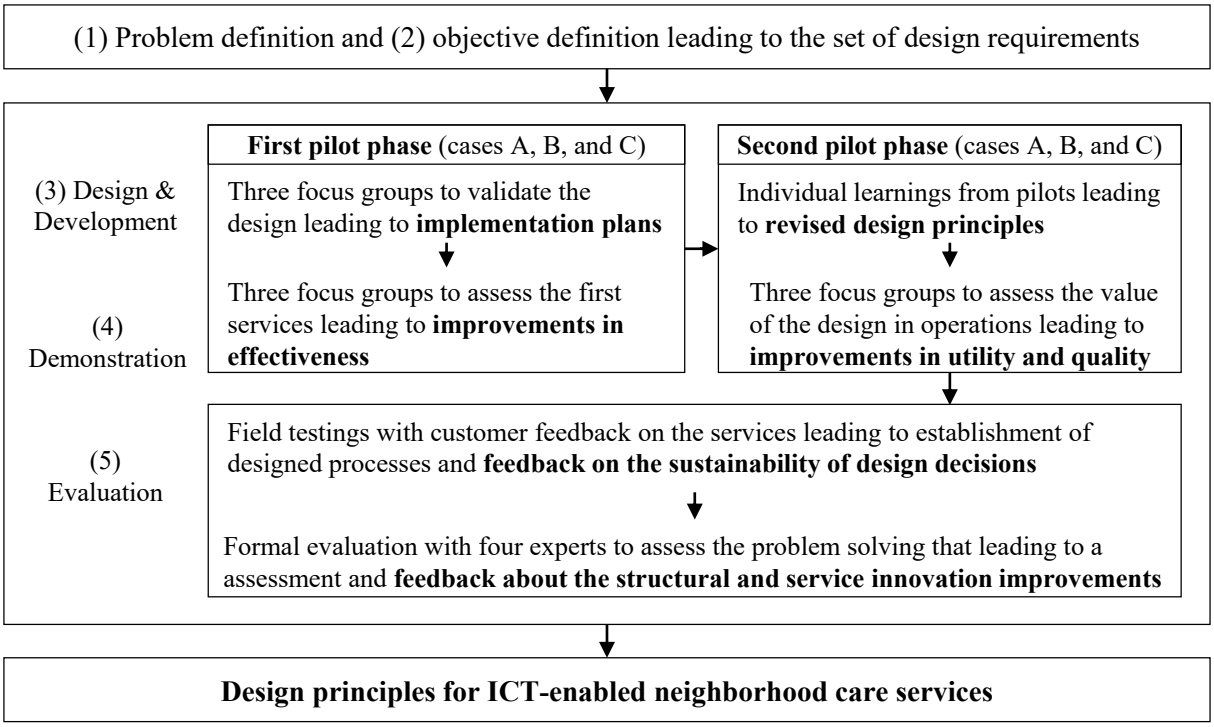

Figure 10: Interim Results Leading to Design Principles
Source: Own Illustration

The first DR shows that the core service of personal care and its context are a major focus of SI. Therefore, the service provider should ensure local availability of NCSs and have ready local service delivery structures. Establishing employees as contact persons in the neighborhood is therefore an important component of SI in NCSs. This local availability can be supported with ICT components. The local caregivers are enabled to be available to the customers. The focus of the caregivers should be on the contact with the customers and on the care circumstances. The advantage of having this focus is that the caregivers can concentrate more on customers through contextualization and thus create the basis for a long-term customer-caregiver relationship. Therefore, the first DP is about local service delivery:

Design Principle 1: *Provide NCSs with the ability to deliver local services* in order for service providers to establish a personal care relationship with the customer, given that the ICT-enabled service increases the time with customers.

The second DR shows that enabling of the existing resources is another focus of SI. Human resources are the limiting factor in the NCSs. Using ICT in service delivery can relieve this limitation by supporting caregivers in utilizing unproductive or unused time. The question for the service provider is where this can be implemented: i.e., which parts of the service provision should be supplemented with ICT and which parts of the existing infrastructure need to be transparent. As the coordinating function between the

service provider and the caregivers is an important aspect, this coordinating function can be a starting point for ICT support. It is necessary that the caregiver can decide and act independently, without being dependent on the support of the supervisor or back office. Therefore, the second DP is about empowerment of caregivers:

Design Principle 2: *Provide NCSs with simplified decision-making* in order for caregivers to make informed and useful decisions, given that the caregivers have the knowledge and the ability to use the information technology.

The third DR concerns the expansion of the participants in the service delivery. Therefore, the focus is on resolving the resource limitations of caregivers. In this regard, the customers themselves and their environment can be participants in the service provision. Customers should be included in the initiation, agreement, and coordination of the service, as it enables them to directly access the planning stage and relieves the service provider of this task. This inclusion of the customers may require provision of information via ICT components. If the customer is not able to carry out activities, close relatives or other related persons can take on this role. To relieve the resource limitation, other local service providers can be integrated in the NCSs to perform non-care tasks. Therefore, the third DP is about involvement in the service system:

Design Principle 3: *Provide NCSs with an information interface for customers* (or related persons) in order to take over the tasks in the service delivery, given that the customers have the information for increasing the efficiency of the service.

The fourth DR is about maximizing the caregivers contact with the customers. For the customers, the contact to the service employees in the neighborhood is an important element of value creation. Therefore, the contact between service employees and customers could fix simple problems and respond to the needs of the customer. The service employee should access the existing infrastructure in the neighborhood as well as the social and technical infrastructure of the customers in order to concentrate on contact with the customers. Prerequisite for the focus on customer contact and thus the possibility to scale limited resources as much as possible is sufficient capacity utilization. The support provided by ICT components must reduce the fixed costs for the service delivery. Therefore, the fourth DP is about the main purpose of caregivers:

Design Principle 4: *Provide NCSs with caregivers focused on contact with customers* in order for service providers to use their resources in the most efficient manner given that ICT components can support the outsourcing of overheads.

The fifth DR shows that improvements in quality of life is essential in NCSs. Thereby, the proof of the improvements and the reference to them is an essential prerequisite for

the quality assessment by the customers or third parties. The value proposition of NCSs indicates that the service provider must focus on service quality in the dimensions relevant to customers. Therefore, the focus should be on the improvement in quality of life in personal care for the customer. For ICT-enabled NCSs, this should include both tangible and intangible parts. Measurement via ICT components is not considered to be meaningful, as it is primarily a matter of interpersonal interaction. Therefore, the fifth DP concerns the improvements in quality of life:

Design Principle 5: *Provide NCSs with possibility to document improvements in quality of life* in order for service providers to validate innovation with the customer given that the improvements are relevant to the customers.

In summary, five DRs for ICT-enabled SI in NCSs have defined and five DPs have been derived. Figure 11 shows the DRs, the DPs, and their connection.

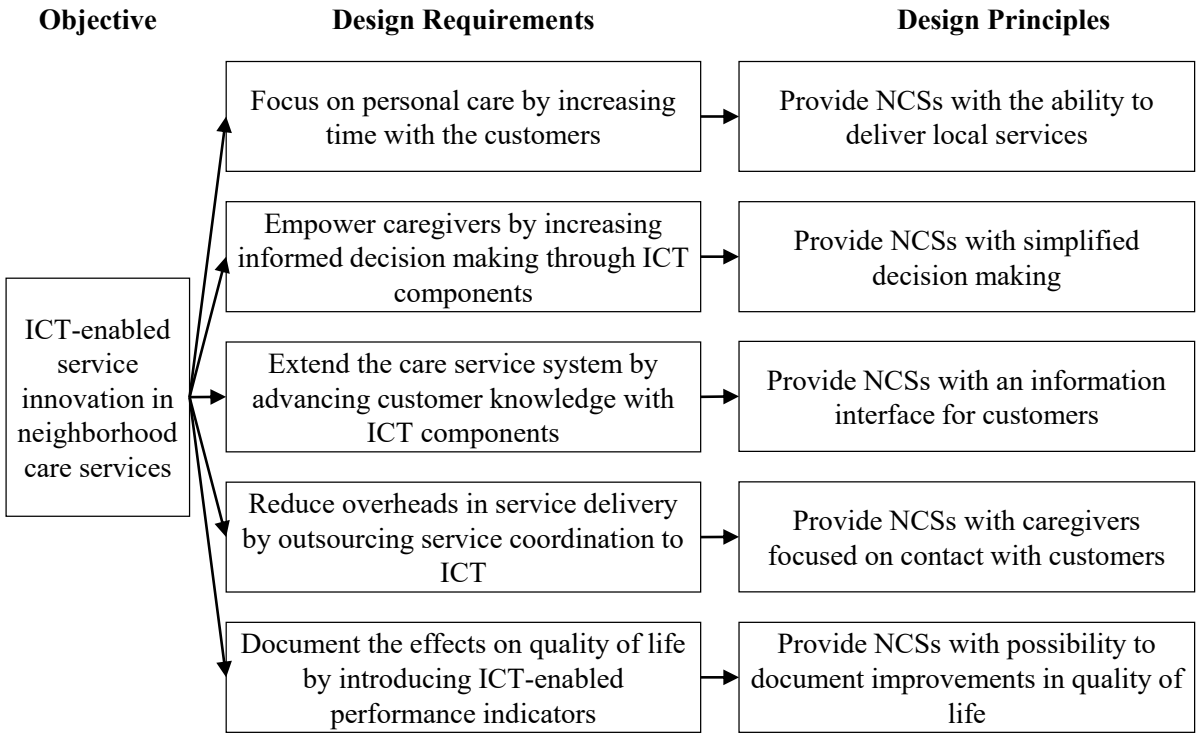

Figure 11: Summary of Design Requirements and Design Principles
Source: Own Illustration

7.4 Evaluation

The evaluation of the DPs is focused on proving their efficacy, utility, and quality (Venable et al. 2016). The efficacy of the DPs is proven when the introduction of SI improves the desired effects of social innovation. These effects are seen when the DPs address independent dimensions that are relevant to the design of NCSs. This means improving outcomes of NCSs for customers, caregivers, relatives, service providers, and

third parties. The utility of the DPs is proven when the DPs summarize the knowledge about NCSs more easily than previous guiding principles and make it accessible to the service providers. Service providers in NCSs should receive simple, practical, and effective guidance through the DPs. The quality of the DPs is proven when the designed services improve the characteristics of social innovation in a meaningful way. This includes an evaluation "in terms of functionality, completeness, consistency, accuracy, performance, reliability, usability, fit with the organization, and other relevant quality attributes" (Venable et al. 2016, p. 79). As described in the section 7.2, both formative and summative evaluations are used for evaluation. The findings from the evaluation are summarized in Table 22 and then described in detail.

Evaluation Phase	Focus	Intervention	Learning and Reflections	Main Implication
Formative Evaluation (First pilot phase)	Improve efficacy	Simplified and relevant processes as innovation focus Structural change as a leverage for innovation	Focus on the interaction to the customer to enhance the contextualization the service delivery Implement innovative service architectures including a service systems perspective that help service providers in focusing service delivery and in reducing wasted time	Include local service delivery (DP 1) Leverage customer contact (DP 4) Increase information sharing (DP 3)
Formative Evaluation (Second pilot phase)	Improve utility and quality	Individual implementation of service innovation Formalization of knowledge	Mobilization of resources via ICT enables easier decision-making in the care process and the expansion of service participants	Empower caregivers (DP 2) Include stakeholders (DP 3)
Summative Evaluation	Improve social innovation	Market launch of the revised services Change of behavior and outcome	Improving structured design depends on the objectives of the innovation. Focus can vary in the implementation Improving advantages of a social innovation include a combination of contextualization, innovative service architectures, and mobilization of resources	Document improvements (DP 5) Enable customization to NCSs (All DPs)

Table 22: Findings in the Evaluation of the Design Principles
Source: Own Illustration

7.4.1 Formative Evaluation

The formative evaluation was designed to determine if the DPs produce SI relevant to the NCSs. The focus was on redesigning the service and learning about the independent

dimensions. The two integrated piloting phases with feedback from customers and service providers were used for revising the DPs and improving the innovation of the NCSs.

At the beginning of the innovating of the services, the service providers recognized that their current service concepts in NCSs were physically limited. Care services can charge only for the hours physically worked with customers. However, any time spent interacting with the customer in a meaningful way is regarded as valuable both by the customers and the caregivers. The service providers needed strategies for identifying the "right" components of the service that should be enhanced. Thus, the DPs concentrated on the service parts that are not included currently in those valuable interactions with the customer. This focus put emphasis on the DPs as each adjustment was tested and verified in the pilot phase. The result of the piloting was that the requirements were adapted in such a way that the ICT components served to minimize the time without the customer and to use the time with the customer as well as possible. With the focus on simplified and relevant processes, the service provider could enhance the contextualization of their service delivery. An example of this learning is that the service provider in case A (see Table 20) started to formalize processes for initiating and agreeing on their care services, whereas the first acquaintance had previously arisen spontaneously.

The second pilot brought a general rethinking of the service delivery and the systematic improvements for caregivers. This rethinking referred to the reduction of unused time by using innovative service architectures in service delivery. The responsibilities and necessity of those involved in the service delivery was questioned. The resulting requirements aimed at ensuring that operational caregivers are provided with information and could make more decisions easier. Moreover, a fundamental change included the expansion of service participants by customers and their relatives. Although it turned out, for example, in Case C (see Table 20) that it was not possible to outsource a larger part of the provision of services to the customer, the basic concept was accepted. This meant that customers could be given a greater obligation in the service delivery and, at the same time, could directly determine the quality of the service. The decision of ICT-support in the different parts of the service delivery was simpler because the actions of caregiver are related to the user group's characteristics or implementation settings (boundary conditions). Exceptions in the DPs could be made based on boundary conditions (for example, the knowledge and information), and thus the design can be adapted to the user needs.

After the second pilot phase, the services went live to derive insights from service operation. This showed whether the DPs and the corresponding NCSs could create value across a variety of contexts and conditions. This was followed by a final formalization of the findings from the piloting of the three cases A, B, and C (see Table 20).

7.4.2 Summative Evaluation

The summative evaluation, in contrast to formative evaluation, was designed to determine whether the DPs solved the underlying problem. The problem concerned improving the structured design of ICT-enabled SI in NCSs and improving the advantages of social innovation. The underlying evaluation reviewed if the finished and formalized DPs represent an improvement for the service provider and after their application for the customer.

For all service providers, supplementing the offline service with digital components was a reasonable solution; the new services were well received by customers. Four external and independent experts, who had knowledge about social innovation and ICT-enabled service, assessed the implementation of the SI as effective because improving the initial intention of the SI with ICT components was sustainable and useful in all cases. However, the three service providers operated in the NCSs with focus on customer care and had little knowledge about the integration of ICT components to their NCSs. The combination of the focus on the employees and the customers moved the core service (not the ICT components) to the center of innovation. The DPs showed an improvement in the structuring of the service design by providing clearer starting points for ICT-enabled innovation of the service and guiding the service design through the design dimensions.

Regarding the advantage of the SI, the DPs enabled the development of improved NCSs. The structured introduction of the ICT components enabled the case study companies to increase the number of users because repetitive tasks could be either largely automated or executed by customers (self-service). Case companies A and B could substantially formalize their services from the definition of their digital core processes. Case C could reduce the workload for their caregivers and thus improve the quality of their after-care services and the information offered in the service delivery. The service concepts of the service providers were revised in several ways. The introduction of the ICT parts in the repetitive task allows an improved structuring of the offer, the restructuring of the services increases the utilization of the resources, and the caregivers in the neighborhood can attract new customers. Overall, the DPs have shown that they improve the services, which after all is the goal of the SI.

7.5 Discussion

7.5.1 Contribution

Designing SI in social industries requires research that tackles problems regarded as important for society and individuals. The DPs for ICT-enabled SI in NCSs, their evaluation, as well as the redesigned NCSs themselves offer theoretical contributions and practical implications. These contributions include enhanced guidance in the design and implementation of SIs, and knowledge about innovation spillover in social innovations.

The DPs provide a knowledge contribution for service providers in improving NCSs. Similar to Teixeira et al. (2017), the DPs represent an "improvement" type of theoretical knowledge contribution as they provide a new solution for a known problem (Gregor and Hevner 2013; Teixeira et al. 2019). This contribution is based on the content and structure of the DPs that helped in simplifying the redesign for the service providers. The use of service characteristics in the specification of requirements enabled a domain-specific design of the services. As a theory-based prescription, the DPs help in identifying independent dimensions that are relevant to implement ICT components and improve NCSs. The dimensions of objective, scope, participation, potential, and outcome provide an abstract starting point for the characteristics of social innovation. By incorporating previous knowledge and applying the design knowledge in the three services a knowledge contribution is generated that goes beyond the context of NCSs. Nonetheless, the application in NCSs offers the possibility of problem definition and solving. The structure of the DPs allows guided learning and problem-solving through the conceptualization and implementation of the NCSs. The evaluation of the external experts showed that the DPs provide starting points as well as an alignment in the iterative redesign of services and the implementation of the ICT components. In this regard, the relevance of the RQ – the leverage of social innovation with the help of DPs – is of importance. Thus, the DPs offer practical guidance in the design and implementation of SIs.

From a theoretical perspective, the developed DPs contribute to the literature of SI and social innovation as they offer a first example of the diffusion of SI to social innovation. The DPs confirm that "social innovations are not necessarily driven by the profit motive and business innovations need not be social innovations" (Pol and Ville 2009, p. 881) but the combination is desirable. The knowledge about innovation spillover effects to social innovation shows the integration of personal, technical, organizational, and societal issues in SI. This interrelationship provides novel insights about applying

strategies from the business and service sector to the social context. Other than former research, the DPs are not derived from redesigned services but developed based on a specific problem, the characteristics of the services, and the existing knowledge base in SI and design. Those insights are relevant outside this setting in the context of NCS as they provide knowledge about social SIs. Thus, the DPs enhance knowledge about innovation spillover in social innovation.

7.5.2 Limitations and Further Work

As every research project, ours faces some limitations that must be mentioned to allow a proper assessment of the contributions in relation to the existing literature.

First, the DSR research approach aims at developing effective DPs. Thereby, it was necessary to ensure that the DPs as independent dimensions influence the outcome of the ICT-enabled NCSs. This chapter included this aspect by carefully choosing the dimensions of the DPs and the type of evaluation. In these design dimensions, the focus was on defining characteristics of social innovation to strengthen desirable effects. In the evaluation, the interpretivism of the business problem was considered by choosing a naturalistic setting that "embraces all of the complexities of human practice in real organizations" (Venable et al. 2016, p. 81). Nevertheless, other influencing factors such as environment, experience and individual competence cannot be completely excluded. Therefore, further research is needed where the existing DPs are verified. This can be analyzed, for example, by applying the DPs to a large number of existing NCSs.

Second, the chapter includes an extensive DSR project to not only theoretically develop the DPs but also use them practically in the ICT-enabled SI of social innovation. The feedback of the experts and service providers enables the evaluation of the concept and the value of the DPs. In order to show the proof-of-value of the DPs, the DPs were tested in different case settings in Germany and Switzerland. The tested services have specific characteristics that have noted but which might not be valid for all types of ICT-enabled NCSs. Future research could extend the research regarding the DPs to related research areas and validate this in other contexts. This further research could increase the knowledge in the research area and the dissemination of DPs.

Third, the DPs are structured to be as independent and timeless as possible to enable the reuse of the gained knowledge. As shown in section 2.2.1, there are different types of SI and ICT-enabled innovation that are subject to trends and technological development. Although this development was considered in creating DPs independently of specific ICT components, the state of the art in technology influences the design and evaluation. Therefore, other researchers and practitioners should be clear about the possibilities of

the technology at the time of publication and the limitations that arise in the design. To maintain this independence, there should be a regular review of the validity of the DPs in future research.

7.6 Summary of the Chapter

ICT-enabled services can decrease costs and improve quality in social innovation. To support this desirable improvement, this chapter included the developed of design knowledge for ICT-enabled SI in NCSs in the form of DPs. The development followed a DSR approach in which these DPs have been built and evaluated in an iterative manner. Specify DRs for ICT-enabled SI in NCSs could be defined based on the characteristics of social innovation. Afterwards, five DPs that represent independent dimensions relevant for ICT-enabled SI could be developed and piloted. For each DP, specific features, needed activities of users, and boundary conditions are outlined to ensure that the created DPs are useful for researchers and practitioners. The evaluation via three cases of NCSs demonstrated that the DPs improved the design of the ICT-enabled SI in NCSs as well as the advantages of the social innovation. The findings contribute to service research through the DPs that provide guidance in the design and implementation of SIs, and advancing knowledge about innovation spillover in social innovation.

8 SYNTHESIS OF THE FINDINGS

The objective of this dissertation was to develop systematic design knowledge for service business design enabling the benefits of ICT-enabled SI in HCSSs. To break down this objective, three RQs were formulated. Based on the four studies carried out in sections 4 to 7, specific findings could be collected that answer the RQs. The first part of this dissertation described which focus areas and previous literature are related to the topic of ICT-enabled SI in HCSSs (RQ 1). Afterwards, the second part showed the practices in the design of HCSS for ICT-enabled SI (RQ 2) and covered specifically the BM design and the scaling of the services. The third part showed how to systematically design ICT-enabled SI in HCSSs (RQ 3). The findings are summarized in this section.

8.1 State of Research in ICT-Enabled Service Innovation

In the first part of the dissertation, the state of the research in ICT-enabled SI in HCSSs was presented. The findings of the SLR in section 4 could provide insights into this research area. In terms of content, the SLR showed a diverse research area of topics and growing interest in ICT-enabled SI in the research context of HCSSs. The maturity of the topic can be considered ambitious but not fully covered in all presented aspects. The overview in Table 14 provides a summary of the progress in the fields of research. Most of the literature to date focuses on understanding the innovation process. This focus has concentrated primarily on the factors influencing ICT-enabled SI. Value capture is also evident in the contributions but is the topic that has so far been least associated with the SI process.

In understanding ICT-enabled SI in HCSSs, much of the literature focuses on the investigation of individual influencing factors and their acceptance at a personal and individual level. Examples for those influencing factors are the behavioral intention, the attitude toward ICT-enabled innovation, and personality traits that promote the consideration of ICT-enabled SI. Factors are examined that require the use of SIs and then include the utilization of ICT-enabled SI as an influencing factor in the research model. These contributions look at small parts of the research area, as the technology used is diverse. Results from the examination of individual factors can lead to complex research models that bring these factors together and give a bottom-up picture of ICT-enabled SI. The understanding of what has the most influence helps to develop priorities in the initiation and management of ICT-enabled innovation. Research in the design of SIs is based on this knowledge. Such design research is specifically concerned with the

optimization of value creation. Examples from the SLR are the design of decision-making for ICT components and the design of interactions.

An opposite research stream is concerned with understanding the innovation process. This top-down research approach focuses on understanding how the innovation process itself works and how it can possibly be influenced. Individual studies (e.g., Essén (2009)) show that ICT-enabled SI in the research area of HCSSs include a nonlinear innovation process. This form of innovation process means less predictability of the influencing factors in research and practice, as the service providers are not the only participants and the assumption is made that the innovation is created in iterations. This includes learning steps that require follow-up adaptation. Examples from the SLR are the role of individuals in the service processes and changing customer needs. Both influencing factors should be considered on a high level and on an implementation level in the innovation process. Clarity about the possibility of influencing factors in the innovation process could help the actors in the service system to structure their actions. An implementation of the innovation and thus the realization of value capture builds on this knowledge. A measurement of the output variables can improve the iteration with different options. Examples from the SLR of such output variables are the interaction and contribution of individual service providers.

The found research streams, bottom-up and top-down, show that the context determines much of the current knowledge. This insight includes that research findings can have limited validity in a diverse research area such as HCSSs. Understanding the mechanisms related to ICT and interactions in HCSSs and doing so at a higher level appear valid for finding a starting point. The influencing factors are individual starting points for service analysis and design. However, that is not to be equated with an overview for the service providers to influence the process. What is needed in this regard is an overall understanding of the innovation process including the ICT but also the people, information, and organizations (as definition used for service systems). Answering the first RQ of what the state of the research in ICT-enabled SI for HCSSs is, this section shows that previous knowledge does include different perspectives on ICT-enabled SI in HCSSs with much successive research that builds on the previous knowledge.

8.2 Practices in Service Business Design

In the second part of the dissertation, the practices for service business design were closely examined to find out what the core of the used practices is. The analysis of the service scaling activities (section 5) and the BM extension process (section 6) provided

insight into this area. This analytical part of the dissertation answered RQ 2. In terms of content, the practices focus on the improvement and utilization of SI. The focus of the service provider is problem-centered and includes strategic objectives as described in the introduction section with situations with the customer that lead to a need for change. The practices direct the objectives of the service providers towards the development of customer solutions. The service scaling model (Figure 7) and the BM design process (Figure 8) provide a summary of the practices. Although there is a focus in each of the studies, a combination of value creation and value capture is highlighted in both cases.

A specific innovation of practices for scaling that are adapted from existing knowledge is the first part of the service business design. A substantial part of the practices is the analysis of value creation and the specification of a target state. Simple methods such as the value proposition canvas or process modeling that are already established for the service providers build the basis for this purpose. Based on a created vision, service providers can accompany the SI and adapt processes, structures, and ICT. User requirements and needs play a primary role in this process. The SI consists of the reconfiguration of existing parts and the sensible addition of new service components. An example from the studies is the combination of people and technology to use the advantages of the actors. The innovation practices enable an improvement in value creation through iterative application. This iterative approach is reflected in the main findings of the service scaling model (Figure 7). The processes of analysis, adaptation, and validation are iterated in such a way that the result of the innovation is no surprise to the service providers and customers. Verification of the solution with acceptance tests, field tests, and proof of the improvements is necessary in this process. The result of the practices is that the value creation is adjusted based on the customer needs and at the same time the optimization opportunities are used.

Practices for BM design that allow for anticipatory and retrospective adaptation of the service concepts are the second part of the service business design. The actions are based on the value creation that is analyzed as a first step. The purpose of this analysis is that all components of the value creation are clear to the service providers. Based on the result of the analysis, the change and adaptation of the BM can be discussed in the idea generation process. The core of the ideas should result from a change in customer groups, value proposition or revenue streams. Effects on all participants of the service system and the existing revenue model are considered before an evaluation and decision is made. The decision itself should be based on transparent criteria and consider the ease of implementation and the strategic relevance. Although the process can basically be carried out linearly in workshops, the decision made is to be tested in the

implementation. During implementation, it can quickly become apparent that the valid options make sense or need to be changed. The BM process can, thus, quickly provide practical feedback. The result may not only be the adaptation of the BM but may also have an impact on the complete service.

Both methodological approaches, starting from value creation or starting from value capture, enable a meaningful design for the service providers. The summary of the findings shows that both focal points in the analysis have validity. This validity includes that an innovation of existing services requires a fundamental orientation that starts at the core of the service, respectively in the creation of value. Considerations to give an extension to this core can only be the next step, which represents a priority for the customer. A meaningful iteration proves to be the best approach for service providers to innovate services or service systems. The outcome of this knowledge is that customer focus is an essential part of service business design. The service providers need feedback from customers to take the customers' priorities into account early on and invest in the right parts of the services.

The analysis shows that service providers have lacked transparency about the activities and the process in SI. The presented analysis of the service business design makes it possible to tackle problems of the service providers with easy-to-do steps. The findings demonstrate how processes and methods can be applied by the service providers. The summary of the findings is designed so that different service providers can adapt the results. Answering the second RQ of what constitutes the design of HCSSs in ICT-enabled SI, the two approaches show patterns that contain a combination of the reconfiguration of value creation and value capture. The iteration with the customer provides priority in the implementation. This nonlinear innovation process is not necessarily faster but provides certainty for the service provider.

8.3 Design Principles as Design Knowledge

Based on the theoretical and analytical findings, the third part of the dissertation allows a systematic design of ICT-enabled SI with DRs and DPs. This design-oriented part takes up the findings and develops it further to make it applicable for service providers. Referring to the three cycles of the DSR, the input from the knowledge base was applied in the research environment. Specifically, the design knowledge for the service providers was enhanced in iterative cycles and tested in such a way that the expectations of the service providers for relevance and rigor can be satisfied. The DRs and DPs in sections 7.3.1 and 7.3.2 contain design recommendations that support the service

providers in their design of SI to the extent that they offer starting points and can serve as guidance in ICT-enabled SI.

The presented DRs provide needs of service providers in the application of ICT-enabled SI in NCSs. Thereby, the DRs are based on the characteristics of the NCSs. This focus allowed nonoverlapping requirements for a type of service that offers the possibility to push topics independently. The focus covers objective, scope, participants, potential, and outcome of SI in NCSs. Specifically, the topics of personal care, caregiver empowerment, expanding the care service system, reducing overheads, and documenting changes in the quality of life were addressed. The topics have been described in such a way that it is clear to service providers what needs to be improved and to which measurable and relevant dimension the requirements contribute. The most significant insight of the DRs is that they show how the ICT components are used to support employees and customers in ICT-enabled SI. It turns out that the personal interaction should be encouraged and activities that do not directly add value must be identified. This focus on interaction is strongly linked to the focus on value creation in NCSs. The remaining process offers the possibility of substituting manual process steps with automation and ICT components. Those ICT components enable the transparency of information and knowledge. The new process parts, on the one hand, allow customers and employees to work independently and, on the other hand, to focus resources. A corresponding need to prove the improvements is part of the DPs.

DPs could be derived from the DRs, which provide a recommendation for action to the service providers. The primary objective was to put the needs of the service providers into practice. The topics of the requirements were each implemented in their own DP. DR 1 provides an example of implementation from the findings. The resulting DP 1 puts the focus on personal care, which aims to extend the time spent with the customer. Therefore, the DP includes the ability to provide local services. The description focuses on local supply structures and specifies contact persons as action. Thus, a direct implementation can take place. The further findings show possibilities for action based on the restrictions that are included in the nature of service. First, human resources, which show themselves to be limited, are supported by simpler decision-making. Second, the service system could be extended by an information interface to further ease this restriction. Third, to avoid overhead costs, a focus on customer contact is being promoted to solve customer problems more effectively. Finally, it should be possible to demonstrate the improvements. Therefore, a documentation possibility is essential. All DPs are directed according to the capabilities of the services.

The developed service business design in the form of DRs and DPs makes it possible to address problems of the service providers. The design approach offers a starting point for the systematic design of ICT-enabled SI. The application environment of the HCSSs offers various services whose characteristics require a focus on people and interaction in the SI. Thereby, the focus of the design knowledge is primarily on value creation. The focus on the customers and their needs improve the service. If parts of the service provision are not in focus, ICT components can be added to improve cost structure. A corresponding iteration and adaptation of the BM is a matter of course to use the new services. Answering the third RQ of how to systematically design ICT-enabled SI in HCSSs contains an orientation towards the customer and the core of the service. The "classical" implementation of requirements is supported by an iterative approach, whereby both requirements and design can be constantly adapted. ICT components can help to avoid resource bottlenecks and create transparency about information, resources, and outcomes.

9 THEORETICAL CONTRIBUTIONS

The purpose of the research was to create a contribution that extends the existing knowledge. Due to the nature of the selected RQ and the selected methodology, the dissertation focused on the creation of design knowledge that solves problems better than previous solutions could. The findings offer theoretical contributions for research on ICT-enabled SI, research on business design, and research on HCSSs. The following section summarizes the theoretical contributions.

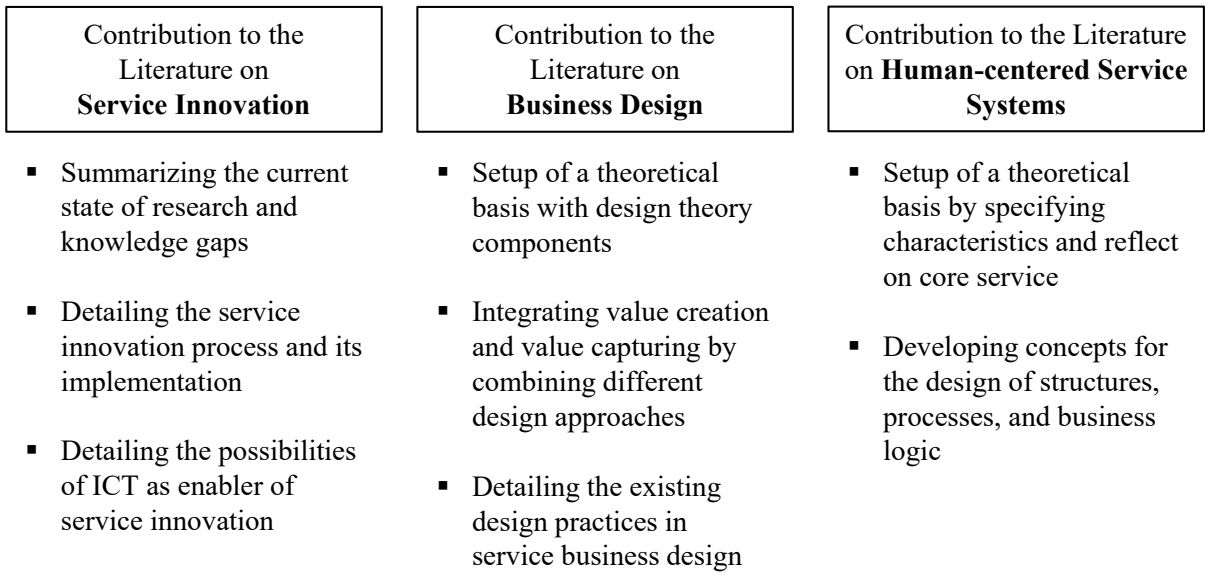

Figure 12: Summary of the Contributions
Source: Own Illustration

9.1 Contribution to the Literature on Service Innovation

The research on SI focuses on the innovation process and influencing factors. Thereby, SI as a topic has already been dealt with in existing studies, but the meta-analysis shows that a clear view and a common definition of the terms does not yet exist (Snyder et al. 2016; Witell et al. 2016). The focus of the existing studies has been on a meta level of the innovation process (Nambisan et al. 2017). Accordingly, proposals for a common understanding are made (Chew 2016; Gustafsson et al. 2020) but are not yet developed beyond conception. Many previous studies looked at individual factors that help to improve the understanding of SI. The individual studies show that topics such as the service concept are unclear regarding their components as well as their relationship to the conceptual ideas of SI. The understanding of SI is extended to complex research models that are used to explain the overall context of SI (Cocosila 2013; Pramatari and Theotokis 2009; Smith et al. 2014). Nonetheless, the details of the SI context and process remain unclear and represent a research gap (Fielt et al. 2013). In this research area the

dissertation can make its contributions to the innovation process and the details of the process steps.

First, the SLR summarized the current state of research in SI, where knowledge and knowledge gaps in the innovation process were identified and described. The findings revealed that a detailed description and inclusion of service processes and customer experience as part of the innovation has not yet been made. Therefore, the SLR offers a review of the individual process steps and explains what has already been worked on in terms of content and in which research areas there is still room for improvement. The entire innovation process was examined, and structure was brought into the discussion about the SI process. Based on the qualitative content analysis, it is now possible to discuss the influencing factors investigated so far. Moreover, the SLR offered a conceptualization of SI that improved the basic understanding of the SI process and the activities. Thus, the level of abstraction is significantly reduced with the findings. Additionally, it is possible to keep a structured discussion due to the applied innovation process. Furthermore, the discussion of the individual factors can clearly identify the weaknesses of the small-scale approach so far. Thus, the SLR can contribute both structure and detail to the SI literature.

Second, the dissertation can contribute to this state of research in SI by detailing the innovation process and its implementation. Thus far, detailed activities in these SI practices are missing (Skålén, Gummerus, et al. 2015). Both practices and tools to be used remain unclear because the discussion has been taken to a high level (Helkkula et al. 2018). This is where the present dissertation has a focus and can close an existing research gap. The dissertation elaborates on practices used in the implementation of SIs. Thereby, a high level of detail could be achieved both in the scaling of services and in the expansion of BMs. This detailing extends the existing knowledge in activities and tools that are useful for the service providers. Thereby, the studies show what a possible innovation process can look like. This detailing complements the existing high-level view and can thus extend the construct of SI. Important in the SI process is the clarification of the nonlinear approach, which could be shown comprehensibly by explaining the iterations in implementation. In doing so, the SI can be linked to other areas of research, such as service design, in which this approach is already applied.

Third, the dissertation contributes to literature on SI by detailing the possibilities of ICT as an enabler of SI. Thereby, ICT is considered as the main enabler of SI. This point of view allowed an investigation of the opportunities in the SI process. This investigation involves an improved distinction between ICT-enabled SI and ICT SI. The distinction is mainly reflected in the focus of innovation. SI is used to innovate existing processes

and supports them with new technologies. In contrast, ICT SI focuses on new technologies that are the innovation. The findings can detail previous knowledge because they can, for example, in the DPs, show how the facilitation of SI can be made feasible. This includes the use of iteration in the implementation that has already been used in software development. Design restrictions that occur when using ICT to enable and scale SI are addressed. Furthermore, the findings for CIS can contribute to a new perspective of ICT-enabled SI, as new literature focuses on data-driven innovation (Troilo et al. 2017). The enablement of offline service can thus help to focus the effort on the core of the service. In contrast to existing literature, this dissertation identifies starting points for the implementation.

9.2 Contribution to the Literature on Service Business Design

The design of the service business comprises the structured organization of the service (including its service concept, the service processes, and the customer experience) and the corresponding BM. The design of services and their associated BMs is essentially an implementation of SI (Möller et al. 2008). Previous findings show that methods in service business design are driven by customer problems and have little theoretical backing (Edvardsson et al. 2011; Essén 2009). The priority in combining approaches from different contexts is to improve the overall value creation for the services (Christensen et al. 2016). This involves a strong focus that prevents approaches that are outside of this focus to be integrated (Chew 2016). Although other studies addressed the SI process, research is still lacking an integrated view of its key aspects and their relationships (Gustafsson et al. 2020). In particular, the BM design is a critical task for managers and represents a challenge when established BMs are reconsidered and revised (Zott and Amit 2010). A service science perspective could enable the inclusion of BMs in the business design (Maglio and Spohrer 2013). In this research area the dissertation can make a significant contribution in the consolidation of a service business design.

First, the dissertation can contribute to the literature with a setup of a theoretical basis for service business design with design theory components. This theoretical basis relies on existing processes and variance theories from the research areas of SI, service design, and BM design. The DSR approach used in the dissertation helps to summarize the existing theories and to provide a collected knowledge base. The analysis includes proposals for processes in which the SI is specified. Examples are the BM design process or the service scaling model. These proposed SI processes were tested in real world settings to increase their validity and relevance. The resulting design knowledge is a design contribution in the form of components of prescriptive design theory (Gregor and

Jones 2007). The DRs and DPs are expressions of this design theory and create a basis for further investigations. In contrast to previous literature, this design knowledge has been prepared in such a way that it is suitable for systematic application and further use. The prescriptive knowledge thus allows the further development of the previous theoretical basis. The components of design theory create an application of knowledge and an expansion of the knowledge base.

Second, the dissertation can contribute to the literature on service business design with an integration of value creation and value capture. In this dissertation, the integration can be achieved through the combination of different design approaches. This integration was mentioned theoretically in the previous literature but is supported by empirical findings in the presented studies. The implementation of the service business design in SI practices is primarily evident in the use of service design and BM design methods. Other design approaches, such as those from software development, support the integration. The practices were examined together, and their basic procedures were analyzed. The combination of value creation and value capture is an integral part of the SI processes and is used in the studies with different emphasis. The integration enables a systematic design of services with the consideration of revenue opportunities and effects on the BM. The aim was to react individually to the customer needs. For example, in some service developments, only changes to the BM may be necessary to implement changes. The focus is on the joint development of services and BMs. The integrated approach is shown to be advantageous to previous literature because it enables the optimization of more than one result variable.

Third, the dissertation can contribute to the literature on service business design with a detailing of the existing design practices. The description of the process steps, tools, and results allows a detailing of the existing literature on service design and BM design. The practices included in the designs were examined more closely than the previous high-level approach allowed. This focus allowed the analysis, concept, design, development, test, and verification of services in different settings. This distinction between the activities is reflected in various forms in the result of process steps that build on each other and allow for a purposeful design. Other than previous literature, for each process step tools could be named that were examined individually. Thus, context to the tools and processes can be given. This level of detail can extend the existing literature that has previously examined individual factors. The results of the processes showed that iterative development is an integral part of an integrated approach in the BM design process, the service scaling model, and the DPs. This extends the literature for systematic design to include variables that are not yet core elements.

9.3 Contribution to the Literature on Human-Centered Service Systems

HCSSs are service systems with a focus on human interaction and contact intensity. These service systems were described and researched before (Breidbach and Maglio 2015; Maglio 2015; Maglio et al. 2015). HCSSs are characterized by a complexity that cannot necessarily be planned in advance (Barrett et al. 2015; Spohrer et al. 2007). Accordingly, the focus of previous research was based on the complexity of the human interaction (Breidbach et al. 2016). A comprehensive understanding could not be achieved. However, the research opportunities were highlighted (Peters et al. 2016). What remains unclear in the literature so far is the possibility of starting points for design (Breidbach et al. 2016). Knowledge that is necessary for the value creation is usually implicit and unique and is thereby slowing down the processes of change (Skålén, Gummerus, et al. 2015). Starting points for how innovation in this type of service system can be used to achieve business objectives are still unclear (Oeij et al. 2019). Due to the lack of clarity, the scaling of these service systems is still not used and implemented (Lewis et al. 2011). Thereby, the dissertation closes those research gaps and provides a contribution in the research area of HCSSs.

First, the dissertation can contribute to the literature with a setup of a theoretical basis for HCSSs. Starting with a rather abstract idea, the type of services was described in more detail. The characteristics of HCSSs could be identified by examining specific services. The services such as CIS or NCS were analyzed and their characteristics documented. The general characteristics of HCSSs were derived from existing services and related constructs such as social innovation. This type of systematic analysis has not happened in previous studies on HCSSs. Results from the SLR show that definitions of HCSSs were minimized, as the characteristics of HCSSs were not the main interest. The contribution of this dissertation is that there is a reflection on the core service. Specific characteristics were identified for the CIS and the NCSs that decrease complexity in the analysis of the services. In addition, the knowledge about characteristics of HCSSs allowed statements about influencing factors and outcome variables to be made and verified. Among the influencing variables, personal interaction can be shown as the most important variable. Regarding outcome variables, the ability to solve problems was optimized.

Second, the dissertation can contribute to the literature with a concept for the design of HCSSs. Based on the characteristics of HCSSs, the dissertation advances the theoretical discussion with links to other research areas. This contribution is strongly intertwined

with the design theory contribution and the practical implications for implementation. On the one hand, the link to social innovation can be created, which supports the objective of the services. Thereby, the concepts for HCSSs reinforce the objectives of social innovation by using the unique dimensions for which services are optimized. The dissertation can contribute to previous literature by setting guidelines for the design of HCSSs. These guidelines are given with DPs. On the other hand, the dissertation provides a link to business innovation, which supports the objectives of social innovation in the real world. This business innovation aspect completes the concepts for HCSSs, which embrace the viability of the services and service systems. This view includes an introduction of scaling in HCSSs by extending the existing theory with ICT components. This scaling provides the necessary theoretical extension of CIS and HCSSs. Thus, the dissertation can contribute to the existing literature on HCSSs by presenting concepts for the design of structures, processes, and business logic.

10 PRACTICAL IMPLICATIONS

Beyond the theoretical contribution, the findings offer practical implications for service providers as a systematic approach to designing and implementing SI processes, service business, and HCSSs. These implications are strongly connected to practical motivation. This includes the processes of ICT-enabled SI, the practices as guidance in SI, and the design of HCSSs. The following section summarizes the practical implications that go beyond the individual studies.

10.1 Processes of ICT-Enabled Service Innovation

The findings regarding the SI processes provide a deeper understanding of ICT-enabled SI by describing and detailing the processes involved. Service providers who operate in a VUCA context seek orientation in existing processes. The missing theoretical background of the topic of ICT-enabled SI does not help to address specific issues. This dissertation can help service providers to understand the SI process and to act accordingly. This includes the knowledge about influencing factors and the improvement in the innovation process.

First, the dissertation can help service providers in understanding that SI in HCSS focuses on human interaction and the use of ICT to enable value creation. Thereby, the findings in each chapter show that the SI basically starts from the core service and directs the service concept accordingly. This knowledge allows service providers in HCSSs to focus on human interaction. The focus can result, for example, from an analysis of the value-adding processes between customers and service providers and may not be limited to HCSSs. This focus helps to maximize the value creation and customer experience. These variables allow a focus on efforts in the SI process and thus allow service providers to make an individual investment in the SI. Furthermore, ICT components are a variable that plays a significant role in the findings. The findings for this variable allow service providers to improve how they support their service process. The findings show that ICT components should be used to enable other processes. ICT components can ensure that existing processes run more efficiently for service providers and that desired effects occur more quickly. Examples are simplified decision-making and an information interface for customers, which use exactly this effect in the DPs.

Second, the dissertation can help service providers in unterstanding how processes and tools in SI are related. Despite the existence of studies concerning the SI process, research is still lacking an integrated view of its key aspects (service concept, service processes, and customer experience). The findings can show that these key aspects of a

SI are based on individual goals. This knowledge can help service providers to set priorities and to plan their activities in the SI. An example for using this knowledge is the service scaling, which contains a specific objective for the service providers in HCSSs. In this case, several aspects overlap, whereby the processes can be designed based on the service concept and then the customer experience is reviewed. The insights gained offer orientation for the service providers in planning their individual concept, processes, and customer experience. The findings in the different studies show which processes are covered by SI. The definition of the necessary SI process depends on this objective and can be based on existing examples of this dissertation like the service scaling model or the BM design process. Thus, the dissertation can improve the SI process for the service providers.

10.2 Practices as Guidance in Service Business Design

The dissertation contains practices of service business design that support service providers in the implementation of SI. Thereby, the findings for previous literature show that detailed activities in these SI practices are missing. This means that the implementation remains unknown to the service providers. The practices resulting from the findings of the studies enable service providers to implement SI more easily. This includes knowledge about the activities and the application of the iterative approach.

First, the dissertation can help service providers with knowledge about the practices that detail activities and tools in service business design. The practices assist service providers with the implementation as they provide further detail on the SI process. The dissertation offers details on activities that directly relate to the SI process. The findings can thus increase the understanding of the activities to support individual planning of SI activities in detail. Furthermore, it can serve as a guideline for the service providers during implementation. Specifically, the detailing and derivation of the DPs are helpful, as they contain instructions but can also serve as an assistance in finding individual DPs. The assignment of tools to the SI process and activities enables the service providers to use these tools appropriately and to sharpen the understanding of the purpose of the tools. Thus, the use of innovation tools such as the service blueprinting or value proposition canvas can be expanded. The process understanding together with an improved understanding of the tools in SI enable service providers to coordinate their activities in SI. Such findings help service providers to analyze, pivot, and test their SI and the improvements involved.

Second, the dissertation can help service providers in understanding how an iterative approach can help to innovate the services. This iterative approach to service business

design helps to reduce uncertainty in ICT-enabled SI as they involve high investments. The prescriptive knowledge shows what such an iteration in the SI can look like. Thereby, the findings include that the considering and processing of user requirements is a top priority for service providers. In doing so, the service providers learn to differentiate which requirements are important for innovation and which of these can be implemented successfully. The dissertation can show that this iterative approach can be successful for non-digital services as well as ICT components that enable those services. The iterative approach in SI can help service providers to achieve innovation in small steps. The user requirements are designed, implemented, and tested requirement by requirement. The service providers can learn quickly if something is successful. This applies to personal interaction as well as to value creation with other parts of the service delivery. The iterative approach can help service providers to avoid unstructured implementations and establish a systematic approach. The immediate feedback thus enables the service providers to quickly take action.

10.3 Design of Human-Centered Service Systems

The dissertation offers starting points for the design of HCSSs. Thereby, the dissertation includes the particularity of these types of services with their special characteristics and the challenges for the service providers. The knowledge about the characteristics help to improve the understanding about the services themselves and enable a setting in which ICT-enabled SI take place. Service providers in this area can thus use the knowledge about services and service systems to derive their own conclusions. Specifically, the dissertation can help to improve the understanding of service systems and to optimize the capabilities of service providers.

First, the dissertation can help service providers in understanding their service systems. This understanding includes knowledge of structures, influencing factors, and interdependencies for designing and operating HCSSs. The structures of HCSSs, which are characterized by human interaction, can show which parts of the service provision should be prioritized. The type of analysis presented in this disseration, focusing on the core service, can help service providers to understand the services. Thereby, the service providers analyze value creation in interaction with the customer. The knowledge about dependencies on different factors includes an improved understanding of which capabilities should be fostered to increase the value creation. In addition, this analysis enables an adaptation to the context of the service that is at the core of the knowledge. The customer problem thus becomes the basis of knowledge about the service systems. Thereby, the iterative approach can help service providers to learn about structures,

influencing factors, and interdependencies of HCSSs. In specific terms this means that the design of personal and interactive services enables a development in small planning and implementation steps. The service providers can thus reflect their understanding of the HCSSs.

Second, the dissertation can help service providers to optimize their capabilities in the service business design of a specific type of service. This optimization is about using the knowledge about the specifics in HCSSs for utilizing resources. The findings enable service providers to understand the complexity of the service delivery that can hardly be planned before. Therefore, creating long-term structures and preparing short-term orientation become more important in the design of the service delivery. For long-term orientation, the findings enable the consideration for which outcome variables the services should be optimized. In the dissertation, the social component as well as the BMs behind the service were presented. Ideally, both goals can be achieved together by the service provider. This knowledge enables service providers to determine the investment in certain variables such as ICT components. This investment knowledge is particularly relevant when it comes to components that have not yet been used by service providers. Explicit knowledge and action through investment improves the awareness of service providers so that learning effects can be further increased. For short-term orientation, the service providers could learn how to support the customer via the DPs. This knowledge enables service providers to make their own capacities more flexible by supporting the customer process.

11 LIMITATIONS AND IMPLICATIONS FOR FUTURE RESEARCH

As with any research, the findings and contributions of this dissertation have their limitations. These limitations offer restrictions in the generalizability of the findings but also provide opportunities and implications for further research. The main limitations for the individual studies have already been mentioned in the limitation section of the studies. This section summarizes the main points and overall limitations.

11.1 Human-Centered Service Systems as Research Context

HCSSs as a research context offer an ideal basis to research ICT-enabled SI as the characteristics represent the focus on personal interaction. The context offers an extreme setting in which value creation and value capture are strongly influenced by knowledge and customization. Such services fulfill social responsibility and contribute to society. At the same time, the use of characteristics should be critically examined as the settings are unique. The context of HCSSs has limitations because personal interaction is the core of value creation. This core impedes the separation of service resources and service delivery. It becomes apparent in the findings that it requires a breakdown into special services or even specified settings. The characteristics are therefore specific to HCSSs, CISs, or NCSs, and a generalizability of the findings is difficult to achieve. The research area of HCSSs should be further explored to increase the knowledge about these desired service systems. RQs can be proposed to improve the relevance and generalizability of existing knowledge and to open new lines of research:

(1) How can HCSSs be innovated to take advantage of the characteristic of personal interaction? This RQ is related to research investigating characteristics of HCSSs. Now that the basic characteristics have been clarified, we need to analyze how the findings can be used to improve HCSSs compared to other types of services.
(2) How can collaboration in HCSSs be organized to increase value creation and value capture? This RQ is linked to how the organization between different service providers and customers can be optimized. This was not the focus of this dissertation but offers possibilities for further improvements and innovation.
(3) How can a collaborative service design in HCSSs be organized? This RQ is related to the research on the design of HCSSs. Because value creation does not happen alone, the planning and design of the service in the service system should be researched. Collaboration can take place with customers but also with other service providers.

11.2 ICT-Enabled Service Innovation as Research Topic

ICT-enabled SI includes the process of revising the service with ICT to increase output. The dissertation includes a proposal for SI processes and practices to make the process more transparent and understandable for service providers. This includes a definition and details for ICT-enabled SI. For each term used, a definition based on existing research is specified. Nevertheless, the discussion about the definition of the term is not conclusive. As other research shows, there are different well-founded and valid understandings of SI. Influencing factors play a decisive role in this understanding and the investments of service providers. Although this dissertation could provide a more detailed description, it was not possible to make a generalized statement about the influencing factors that are reliable for all service providers but rather to guide them in planning, adaptation, and innovation. Furthermore, the dissertation focuses on the topic of ICT-enabled SI. In doing so, the thesis does not deal with the overall process of SI in all aspects but focuses on special aspects such as scaling and BM extension that are relevant for implementing SI. The use of ICT as an enabler of SI is obvious but certainly not exhaustively discussed in this dissertation. Additional useful influencing factors and practices can help service providers to optimize their activities in SI. Other research topics can be considered and further improved in this context. RQs can be proposed to improve the relevance and generalizability of existing knowledge and to open new lines of research:

(1) Which prerequisite factors should be encouraged to make ICT-enabled SI more effective? This RQ is related to the influencing factors of SI. It is assumed that service providers can also take preparations that promote the prerequisites of SI even before the actual innovation process.
(2) How can service providers simply adapt the SI process to their needs? This RQ is related to the individualization of the SI process and activities. The DRs and DPs provide starting points on how this can be implemented. A further adaptation seems desirable.
(3) Which processes and practices can help service providers innovate their services independent from technology? This RQ is designed to shift the focus for the SI. It is intended to question what other major influencing factors exist for service providers that can fundamentally improve the SI.

11.3 Service Business Design as Design Knowledge

Service business design provides the opportunity to positively influence the SI process. This design knowledge includes the design of services with its components and the BMs.

A generalization of the design knowledge, and thus effectiveness for all service providers, cannot be guaranteed. The findings in this research area can help service providers in HCSSs in a more systematic design of their services. Nevertheless, the design knowledge behind service business design is not a finished planning or service concept for service providers but rather a guideline on how to get there. Service providers in HCSSs should understand the findings as an orientation that enables a more systematic approach of service design and BM design. As the practices are described in detail with their tools, this should be possible for the service providers. An important finding in the practices is the use of iteration. These iterations mean that the innovation outcome is not the result of a one-time effort but the beginning of a constant improvement. The cooperation with and focus on the customer is crucial. The insights can initiate the approach to analyze requirements and their implementations for the service. This analysis cannot guarantee a success of the implementation. The design knowledge helps to find an individualized approach to implementation through the practices. Other research topics can be considered and further improved in this context. RQs can be proposed to improve the relevance and generalizability of existing knowledge and to open new lines of research:

(1) How can service providers individualize the DPs for service business design? The RQ is linked to the generalizability of individual findings. The use of individual findings seems desirable, whereas an adaptation requires further consideration and effort.
(2) How can service business design be used for other types of services? This RQ is concerned with the generalization of knowledge. The aim is to use the insights gained from focusing on the customer and iterations in other industries to further validate the findings.
(3) How can the customer's involvement in the service business design be made more effective? This RQ is connected to the core of service business design with customer focus and requirements analysis. Positive effects of a more intensive and earlier involvement of the customer are assumed.

12 CONCLUSION

The objective of this dissertation was to develop systematic design knowledge for service business design enabling the benefits of ICT-enabled SI in HCSSs. To break down this objective, the dissertation was divided into three RQs that examined individual aspects of service business design. As a methodological basis, this dissertation included a DSR approach. In addition, different qualitative methods were used to collect and test requirements and validate results. For data collection, the research was embedded in a three-year research project that aimed at developing service platforms based on existing offline services.

The findings of the dissertation include the state of research, practices in the field, and novel design knowledge in ICT-enabled SI. In the first part of the dissertation, the state of the research in ICT-enabled SI in HCSSs was presented. The findings of the SLR provided insights into ICT-enabled SI in HCSSs and highlighted the different perspectives on SI. The progress of work reveals gaps in research. In the second part of the dissertation, the practices for service business design were examined to find out what the core of service business design is. Two methodological approaches for the service providers were revealed that enable a meaningful design: starting from value creation or starting from value capture. A nonlinear innovation process was presented that includes iterations with the customer and provides priority in the implementation. In the third part of the dissertation, a systematic design of ICT-enabled SI with DRs and DPs was developed. The implementation of requirements is supported by an iterative approach, whereby both requirements and intended design can be adapted.

The findings offer theoretical contributions and practical implications for ICT-enabled SI, service business design, and HCSSs. The dissertation focused on the creation of design knowledge that solves problems better than previous solutions could. Thereby, the different parts of the dissertation contributed to SI with a summary of the current state of research, details of the innovation process and its implementation, and details of the possibilities of ICT. This knowledge helps service providers to understand the SI process and to act accordingly. Furthermore, the dissertation can contribute to service business design with a setup of a theoretical basis, the integration of value creation and value capture, and the detailing of the existing design practices. This knowledge supports service providers in the implementation of SI. Moreover, the dissertation can contribute to the literature on HCSS with a setup of a theoretical basis and a concept for the design. This knowledge enables service providers in this context to use a more structured design.

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