

Fostering Business Model Extensions for ICT-Enabled Human-Centered Service Systems

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Abstract. When improving human-centered service systems (HCSSs) with information and communications technology (ICT), financial aspects are important but challenging for companies with established business models (BMs). The use of ICT and changes in value creation reflect business needs, but commercial success requires modifications and extensions of the BMs. However, prevailing approaches do not take account of these requirements. In this paper, we present a BM design process that fosters the extension of BMs for ICT-enabled HCSSs to support service innovations. Using an action research project in the field of volunteering, we iterated and revised the BM design process in a project collaboration with three end-user companies having similar objectives. The process guides those responsible for service innovation in structuring, analyzing, and the decision-making of alternative BM extensions. Thus, the presented approach contributes to ICT-related service innovation projects by describing systematic and repeatable activities that are the first step for commercial success.

Keywords: Business Model Design, Service Design, Service Innovation, ICT, Action Research

1 Introduction

From a business perspective, leveraging information and communications technology (ICT) to improve human-centered service systems (HCSSs) makes sense as it enables productivity improvements, cost reductions, and innovation [1, 2]. Visionary companies take advantage of this and put established competitors under pressure to respond to new trends and rethink their value creation [3, 4]. While it appears that not all of the ICT-enabled service innovations solely focus on the strategic competitive advantages, the commercial success of the innovations is important [5]. Here, ICT has to generate value in the corresponding business model (BM) [1]. While companies have problems to generate successful and sustainable BMs [6], neither general approaches that foster BM extensions for ICT-enabled HCSSs exist [7] nor do existing BM approaches cover the required activities of BM design [8].

13th International Conference on Wirtschaftsinformatik,
February 12-15, 2017, St. Gallen, Switzerland

Kleinschmidt, S.; Peters, C. (2017): Fostering Business Model Extensions for ICT-Enabled Human-Centered Service Systems, in Leimeister, J.M.; Brenner, W. (Hrsg.): Proceedings der 13. Internationalen Tagung Wirtschaftsinformatik (WI 2017), St. Gallen, S. 897-911

Both research and business practices have recognized the potential of BMs for ICT-enabled HCSSs. In research, the influence of ICT on service innovations and the development of corresponding BMs are named as top research priorities [9, 10]. The connection between the two concepts is seen as important because digital BMs can change the way value is created in ICT-enabled services [7, 11]. Moreover, design knowledge for BMs includes an explicit contribution answering these strategic business questions [12]. In business practice, the commercialization of ICT-enabled HCSSs can have profound economic consequences within an emerging market [2].

Given the importance of the systematic extension of BMs for ICT-enabled service innovations in HCSSs, it is surprising that little research has been done on this topic. Therefore, the research question that is to be answered in this paper is:

How can business models be adapted to commercialize ICT-enabled service innovations in human-centered service systems?

We use an action research project in the field of volunteering to derive a systematic and repeatable BM design process. This process can foster the extension of BMs for supporting ICT-enabled service innovations in HCSSs and facilitating their commercial success. We derive the process based on the existing literature on BM design and test and iterate it in three different project settings. We use the learnings from each case to improve the BM design process that aims at structuring, analyzing, and the decision-making of alternative BM extensions. In conclusion, this paper 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.

The paper is structured as follows. After this introduction, the next section provides the theoretical backgrounds of ICT-enabled HCSSs and BM design, which define the key terms and concepts relevant to these related fields. The third section justifies and describes the action research approach used in this paper. The fourth and fifth section contain the derivation of the BM design process from the literature and learnings from the three use cases in our project. The application of this process is described in the sixth section before we then discuss it with regard to its improvements and limitations in the seventh section. In the end, the findings are summarized and a proposal for further work is presented.

2 Theoretical Background

2.1 ICT-Enabled Human-Centered Service Systems

Service and service systems are essential concepts for the understanding of HCSSs. In line with the service-dominant logic, we understand service as a process cocreating context-specific value [13]. It takes place in service systems as it includes several participants, with one of them being the beneficiary. These service systems are “configurations of people, information, organizations, and technologies that operate together for mutual benefit” [2]. Put simply, services are problem-solving based on the capabilities and interaction between the different actors. The various parts are connected via coordination and cooperation to create services [13].

HCSSs, which are service systems with a focus on human interaction and personal services, require particular attention [2]. They differ from other service systems because personal interaction is essential for the value creation [14]. These properties are present in diverse industries such as hospitality, healthcare, and retail, but not limited to these [1, 2]. In this paper, we base our findings on the field of volunteering. Volunteers are part of HCSSs as volunteering can be defined as “giving time or skills during a planned activity for a volunteer group or organization” [15], which implies interaction and personal engagement.

Based on emerging trends such as an increase in digital innovation, there is an expansion of ICT in service systems [1]. ICT is fundamental to many HCSSs [4, 16]. Here, ICT and people are an integral part of the ICT-enabled value creation [17]. As coordination and cooperation are critical to value creation, the leveraging of ICT for HCSSs influences how HCSSs work. Furthermore, ICT enables service innovation that helps to improve and expand the service systems [1, 9]. On the one hand, ICT can enhance the efficiency of current services by simplifying coordination and cooperation. On the other hand, ICT offers possibilities to come up with new services when integrating customers and employees into the service process and substituting them [9].

The presented properties produce a number of challenges. Service innovation, a service system reconfiguration to increase the value for the involved actors [18], is important to remain successful [9]. This is difficult to implement as HCSSs resist traditional optimization solutions and their economic contribution is hard to measure [2]. Also, the dependency on knowledge and customization, as it is the case in volunteering, increases customer involvement in value creation [19]. The support of ICT could solve these challenges [17]. Here, ICT-enabled HCSSs have to prove their benefit over traditional service systems and require mechanisms to build synergies with existing systems [5]. For the systematic design of service systems, concepts of service engineering have been expanded to the system’s perspective, which are coined under the term service systems engineering [20]. So far, none of these concepts, methods, or design processes cover a BM perspective.

2.2 Business Model Design

BMs and their components cover the essential functions of service systems. 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” [10]. The objective of BM design is to expose business opportunities by defining a value for the participants involved in the service system [3]. The customer value proposition that “describes the benefits customers can expect from products and services” reflects this purpose [21]. Thus, it also shows how a client's problem is solved [22]. This approach is related to how a service is designed and can therefore not be considered separately [6, 23]. A BM refers mostly to a particular product or service with an associated value to the customer [21]. This value to the customer is the basis for the financial return of the product or service [22]. BM design is a critical task for managers and represents a challenge when established BMs are reconsidered and revised [3].

The result of BM design is a set of relevant and individual activities that represent the positioning of the company to customers and competitors. The process of the design is similar in many cases although there is no uniform approach [8]. What is challenging to BM design is that contrary to partial optimization, system-level design is important [3]. A BM that only focuses on value creation and/or delivery without simultaneously considering revenue streams from that value will likely be economically unsustainable [24]. Additionally, when reconsidering existing BMs, there are forces of inertia and resistance to change that represent a challenge [3].

The activities in BM design are supported by different concepts. These concepts represent interfaces to BM design [10]. They help in the development and commercialization of service systems and their corresponding BMs. Thus, we searched for research streams that follow these objectives. To verify the completeness of our findings, we asked two experts of the field for input on such concepts. Table 1 lists the concepts including their objectives and the connection they have with BM design.

Table 1. Concepts Related to Business Model Design

<i>Concept</i>	<i>Objective</i>	<i>Interfaces</i>
Customer Development [25]	Align product development with customer needs and market	Service ideation, revenue model
Lean Startup Approach [26]	Service development with shortened development cycles	Service development and implementation
Service Design [27]	Design service according to the needs of customers or participants	Service ideation and development
Service Innovation [1]	Reconfiguration to increase the value for the involved actors	Service ideation and development
Value Proposition Design [21]	Define the functionality of services and customer needs	Service ideation, development, and visualization

3 Research Method

Canonical action research combines the generation of scientific knowledge with researcher intervention to solve immediate real-world problems in a formalized form [28, 29]. Here, 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 [28]. As action research runs in iterations, the cycles of diagnosing, action planning, action taking, evaluating, and specifying learning are repeated until the problem is solved [30]. IS research and HCSS settings such as education have successfully used this research approach in the past [29].

The research presented in this paper was embedded in a research project that aimed at developing and introducing online matchmaking platforms for volunteers. The platforms support organizations to coordinate the placement of volunteers and people or nonprofits in need of help. The research project contained a technical part including

the development and testing of the matchmaking software and a business part including the design and implementation of the service system. 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 project partners. Based on the problem description, we conducted a literature review 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 service innovations in HCSSs. Qualitative data analysis [31] was applied to the found literature to search where the design process starts and ends and what the different steps in between are. Based on the results and with the method of collaboration engineering [32], we planned workshops in three organizational settings (Table 2). We had the chance to develop a BM for every company. 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 done in one workshop with all partners. In company A and C, the remaining process was completed in one workshop with a larger group of experts. In company B, the BM design was performed in four internal workshops. Based on the learnings from the previous workshops, we revised the BM design and reapplied it to the next setting. A documentation of the actions was made in the form of protocols.

Table 2. Organizational Settings (anonymized company profiles)

<i>Company</i>	A	B	C
<i>Industry</i>	Regional Development	Volunteering	Care Service
<i>Country</i>	Germany	Switzerland	Germany
<i>Staff</i>	15	75	940
<i>Project Owner</i>	General Manager	Product Manager	Project Manager
<i>Participants</i>	14 (8 external experts)	4	9 (5 external experts)

4 Knowledge Base

4.1 Literature Review

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. We found ten publications that specifically deal with the design and extension of service systems and BMs. Table 3 includes the findings regarding the found publications and their coverage of the phases in the order of their publication date.

Table 3. Results of the Literature Review

Publication	<i>Steps of the Business Model Design Process</i>			
	Analysis	Idea Generation	Evaluation & Selection	Implementation
[33]	○	○	◐	○
[3]	○	●	◐	○
[23]	●	●	◐	●
[24]	●	●	◐	◐
[34]	○	●	●	◐
[35]	○	●	○	●
[36]	●	●	○	●
[37]	◐	●	○	○
[8]	◐	●	○	●
[38]	●	●	○	●

● = Covered ◐ = Partially Covered ○ = Not Covered

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 business 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 [23]. This is used to challenge the individual activities of the service [8]. Second, the idea generation contains the conception of the BM extension. This is most of the time the essential part of the design process. Here, 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 [3]. 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 [23]. 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 could include the critical questioning of the BM design decisions and the financial contribution [34]. 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 [33]. The result could 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 [35]. 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 [24]. The initiation of quick wins is an integral part of this action [23]. After that, the implemented BM is influenced by a revision and reconfiguration based on external feedback and learnings [8]. This revision ensures a design according to the customer needs.

In summary, the literature reviews show that none of the publications depicts the complete BM design process. Findings were derived with regard to 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.

4.2 Workshop Insights

Table 4. Results from the Workshops

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

Following the action research cycles introduced in the method section, the different stages to improve and iterate the findings were completed. Table 4 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. While 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 done 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.

5 Result

The result of the iteration and revision is the BM design process depicted in Figure 1. 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.

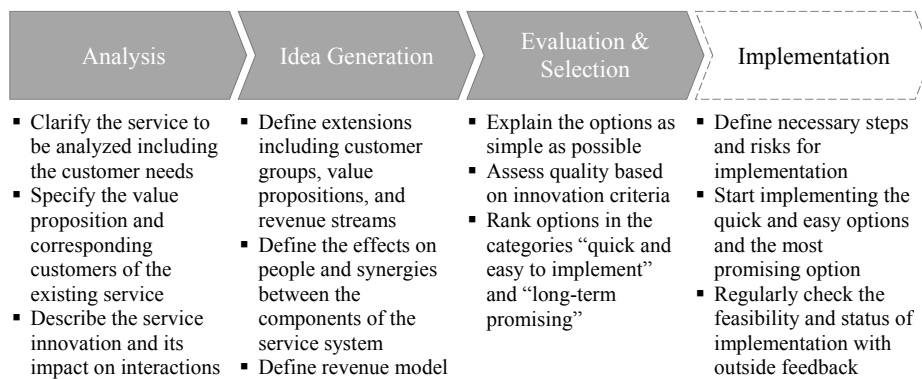


Figure 1. Business Model Design Process

The first step is the analysis of the existing service. Here, 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 important part thereof [36]. The value proposition canvas [21] 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 innovations from ICT are described. This provides the opportunity to show all results, constraints, and interrelationships of the service system [3]. The analysis challenges the individual activities of the service system [8] with a particular focus on the customers and their value proposition [21]. In HCSSs, the identification of capabilities and interaction is important as they constitute the value cocreation [2]. For a description of all other activities included in the BM and service innovation, the business model canvas [23] can be used.

The second and most important step in BM design is the idea generation. Here, 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

[24]. There are different starting points for the collection of ideas [23, 24]. The basis for the considerations of BM extensions in HCSSs are the ICT-enabled service innovations that include some new BMs [17]. Desirable are innovations originating from an enhanced customer value that put the customer at the center of service innovation and innovations where the technology is the driver for the BM extension [35]. Here, it is important to know which parts are visible and desirable to the customer [24]. A funding model complements a BM design [3, 23]. 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 [34].

The third step is the evaluation and selection of alternative BM extensions. Here, 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 [34]. There are assessment criteria that help to evaluate the quality of the extensions [23, 33]. 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 [33]. Moreover, part of the evaluation is whether resources are available or acquisition is possible for the extended BM [24] 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 [35]. Quick improvements are an important component as well as long-term oriented and promising options [35]. The evaluation is the basis for incremental improvements [23].

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 1 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 [35]. Results of these activities are documents that specify milestones, structures, finances, and the project plan [23]. Furthermore, the risks of changing the service system associated with the implementation should be documented [24]. In particular, this includes the substitution of humans by ICT [9]. After that, it is possible to follow change management protocols to implement the BM and review the efficacy and any further improvements [37]. The implementation can be monitored by the design parameters and the decision-making and evaluation criteria [34].

6 Application

The developed BM design process was applied in all partner companies. For illustration and better understanding, we demonstrate the use of the process in company C step by step. The 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 company 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 company decided to organize the placement of volunteers online.

In the analysis, the existing service has been formally defined for the first time. 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. Here, 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.

Table 5. Selected Business Model Extensions

<i>Customer</i>	<i>Value Proposition</i>	<i>Revenue Stream</i>	<i>Consequences</i>
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

In the evaluation and selection, the workshop participants presented the initial idea and summarized the generated BM extensions. Here, a clear definition of the evaluation criteria is 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 company C,

the three BM extensions from Table 5 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. Also, 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. Here, this task 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. Since each placement on the platform also 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 business model 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.

7 Discussion

Several different approaches aim at generating successful and sustainable HCSSs and corresponding BMs. However, how business models can be adapted to commercialize ICT-enabled service innovations in HCSSs remains unclear. Consolidating contributions from different approaches and considering properties of ICT-enabled HCSSs, we were able to answer the research question of this paper by deriving and testing a BM design process. The objective of the four-step process is enabling those responsible for service innovation in structuring, analyzing, and the decision-making of alternative BM extensions. Although prevailing approaches offer the possibility to design BM extensions, our 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 service innovations. 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 [3]. 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 have to be done. What they offer are, on the one hand, rules that help to find the right design for the right market [24, 33, 35, 38]. 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 [8, 34, 37]. These approaches are important in order to consider all of the steps. This does not

define a concrete result and does not specify when, what, and how something has to happen in the design process. Other approaches include the right steps but are difficult to use because of their large coverage [23]. Our approach is a guide that includes all steps with specific activities. This is associated with a specific beginning and end of the design process. This allows for an application in different domains and a clear adaptation to the respective needs. In our case, 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 [3], no approach provides a guide for this situation. Some approaches are assumed to be able to be applied to already established service systems [23], but they offer no distinction between their actions. The analysis of the environment and competitors [8, 23, 36] 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 [5]. Our 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 [33] is not always practical. Starting with service innovation as a system reconfiguration [18], the ICT-enabled extension of the service system usually aimed at improving existing services. A commercialization on new markets is afflicted with risks [24] and the acquisition of new resources [23], which may not be desirable. Our approach is based on existing technical innovations and/or 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 cocreating a context-specific value [13] and HCSSs depend on human interaction and personal services [2]. 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 [37]. Our solution provides a BM design that includes the interrelationships between service process and BM innovation, as it has been requested [9]. Different aspects are considered. The process aims at both the customer and the technical innovation. Thus, it covers the most likely drivers of innovation [23]. In addition, BM design provides the possibility to do system-level design and the design of service components [3]. Overall, our approach thus includes different aspects of BM design and service innovation.

The presented research is not without limitations. As BM design is an iterative process [22, 24], 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 service innovations. We developed and iterated the process with our 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, we showed that the proposed design process generates several possible and realistic BM extensions that are a good starting point for an iteration with customers and partners. In addition, the acquired knowledge provides an understanding for and from a particular 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 paper. To counter this, we based the development of the BM design process 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, our findings on BM design can be helpful for situations in which service innovation is enabled by ICT and value creation is changed.

8 Conclusion

BM design for ICT-enabled HCSSs focuses on creating value for companies and customers. To capture this value, we derived a BM design process that guides the development of BM extensions. Building on previous contributions from this field, the process was iterated and revised in our action design research project. We used the learnings from three organizational settings 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.

With this paper, we offer several contributions. First, the BM design process guides those responsible for service innovation in structuring, analyzing, and the decision-making of alternative BM extensions. The BM design process provides concrete 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 service innovation projects. This process is the first step for the commercial success of ICT-enabled HCSSs. Second, we contribute to the body of knowledge as we provide insights into the combination of the two research streams that have mostly been tackled independently so far, that is, BM design and service innovation. We promote a further understanding of the steps and activities in the design of BM extensions and enable a systematic support of both. Third, by enabling the funding for three volunteer platforms, we solve real-world problems with our research. 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.

9 Acknowledgements

The research presented in this paper was partially funded by the Active and Assistive Living (AAL) programme and the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number AAL-2013-6-145.

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