

Implementing Service Design Methods and Tools into Software Development

A case study: Service Design sprint

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Abstract— Service Design is a comprehensive and collaborative design approach for creating value for all stakeholders. Service Design includes several methods and tools for the improvement of a new or an existing service. The implementation of Service Design into software development has been only partially studied. Likewise, research regarding the benefits and challenges concerning the utilization of Service Design precisely in software development is rather deficient. The aim of this study was to experiment applying Service Design methods and tools into software development through a pilot project carried out in a Finnish software development company. This research presents possible benefits and challenges that implementing Service Design into software development may have. In addition, critical factors to be considered while implementing Service Design are proposed.

Keywords-service design; agile software development; SaaS; design sprint.

I. INTRODUCTION

Nowadays, all companies are involved in the software business either directly or indirectly. Software affects all industries and can be seen as the main driver for innovation [1]. Software development teams often experience pressure to keep up with the dynamic business environment and continuously changing customer requirements. The success of a product or service is determined by the created customer value and therefore software development teams constantly aim to create and develop innovative features to provide added value for the customer [2]. Customer participation and active involvement throughout the software development process are key factors to ensure focusing on the correct matters and consequently creating customer satisfaction. However, there are often several layers of people and processes between the end-users and the software development team, which complicates the user involvement. Service Design offers methods to bridge the gap between developers and users [3].

Service Design is a comprehensive and collaborative design approach for creating value for all stakeholders. In Service Design the creation of value is not limited to the end-user or customer but includes creating added value throughout the process. Therefore, Service Design can be utilized for Business-to-Business (B2B), as well as for

internal services or public services [4]. Service Design includes several methods and tools for the improvement of a new or an existing service. Service Design has been studied widely in the field of creating new products and services [5] [6]. The implementation of Service Design into software development has been only partially studied. Likewise, research regarding the benefits and challenges concerning the utilization of Service Design precisely in software development is rather deficient.

The aim of this research was to experiment applying Service Design methods and tools into software development through a pilot project carried out in a small Finnish software development company, referred to as Company X. The company follows the principles of agile software development and provides Software-as-a-Service (SaaS) for human resource management. This research presents possible benefits and challenges that implementing Service Design into software development may have. In addition, critical factors to be considered while implementing Service Design are proposed. The field of research is relevant, because Service Design has been a ponderable subject during the past years, but it has not yet been studied as widely in software development as in many other fields.

The main research questions are:

RQ1: *How can Service Design methods and tools be implemented into internal processes in B2B software development?*

RQ2: *What are the benefits, challenges and critical factors when implementing Service Design methods and tools into software development?*

The key findings of this research consist of suggested factors to be considered while implementing Service Design into internal processes in B2B software development and an aggregation of the benefits, challenges and critical factors of implementing Service Design into software development.

The paper is initiated with Section 1 including the introduction. This is followed by Section 2, which describes background and related work around the subject. In Section 3 the empirical research design is presented, and this is followed by Section 4 and the introduction to the actual case study: the Service Design sprint. In Section 5 results and

discussion are presented. Lastly, Section 6 combines the conclusions of the research.

II. BACKGROUND AND RELATED WORK

A. Service Design

In this research, Service Design means a holistic and collaborative approach to create value for the service user as well as the service provider [7]. The Service Design approach includes multiple tools and methods for different phases of the development process to enable comprehensive understanding of user emotions and motivations for all stakeholders [8]. In the context of this research Service Design has an outside-in aspect on the development of services and the emphasis is especially on applying different design methods and techniques to the design process of services [9]. Service Design combines different methods and approaches that have been utilized before [10].

Service Design highlights the fact that value is co-created between the customer and the service provider. This is not similarly emphasized in other design approaches like participatory design [11] or digital interaction design [12]. Even though, the term “service” is common in both of the above-mentioned, the center of attention does not exceed the customer experience beyond the user experience or use experience outside of the service touchpoints. In a way, Service Design has been able to revive other design approaches [13].

B. Implementing Service Design

In order to successfully implement Service Design methods and tools to the software development processes of a company, it is crucial to recognize all the people involved in the required changes, both internally and externally. The implementation of Service Design may require change management. Junginger & Sangiorgi [14] present a framework for the link between organizational change and Service Design based on their findings in their research. They found four similarities in their case studies regarding the link between organizational change and Service Design.

Firstly, Service Design often begins at the organizational periphery, which means that the marginal location where Service Design work is first started might limit the interference in the daily operations. Secondly, building trust relationships for change between the Service Design team and stakeholders was recognized as a similarity. A collaborative, flexible and transparent approach as well as generating interest were in a key role when building trust relationships. The third similarity was developing transformative insights into the values, norms, assumptions and behaviors of the organization in order to build trust, stimulate interest and co-create a new vision. Lastly, pilot projects as a seed for change were recognized in both case studies. Pilot projects can have an essential role in opening the way for transformative changes as they can help designers make behavioral values, norms and patterns tangible.

As a conclusion from the framework research Junginger and Sangiorgi [14] state that Service Design is still an

emergent discipline based mainly on informal and tacit knowledge. Applying this framework into a wide range of contexts is suggested as a future research focus in the paper. This research puts the theoretical framework by Junginger and Sangiorgi [14] into context and further studies how it can be utilized in B2B software development.

C. Service Design and agile software development

This research has a focus on how agile software development affects the implementation of Service Design methods. Therefore, the principles of agile software development will be compared to the principles of Service Design and similarities and differences will be pointed out. Following agile methods in software development means the ability to adapt to change. Environments and requirements change continuously, and agile methods aim to respond to the changes by being iterative, incremental and cooperative [15]. Agile methods are people-centric and strive to recognize the value that proficient people and their relationships bring to software development. Improving customer satisfaction through cooperation and involving customers and other important stakeholders are also in a key role while following agile methods. The organizations ability to emphasize learning, self-organization and teamwork has a notable impact on the created value [16].

Customer involvement is one of the key benefits that adopting agile methods brings. Satisfaction with the product has increased among both customers and developers after following agile software development methods [17]. Building successful software products and services requires understanding customers’ requirements and involving them throughout the development process. Customer involvement refers to different ways of active participation by the customer or the end-user in the software development process with different interactive techniques [18].

Customer collaboration is a key principle also in Service Design. The new principles of Service Design by Stickdorn et al. [4] include human-centered and collaborative as key aspects when applying Service Design. Involving customers to the design process can be carried out by organizing workshops with the customers and utilizing different design tasks and tools like prototyping in the workshops. Service Design approaches based on collaborative workshops have enabled applying Service Design as an abbreviated, but efficient design sprint as a pre-development phase in agile software development [3].

Applying Service Design methods into an agile Scrum process as sprints may support the service provider to recognize the correct small tasks for delivering a better Minimum Viable Product (MVP) for the customer [3]. This again enhances the basic principles of agile software development as early and frequent deliveries are emphasized in several definitions of agile software development [19]. Table 1 presents principles of agile software development and Service Design that have the most resemblance.

TABLE I. RESEMBLANCE BETWEEN AGILE AND SERVICE DESIGN PRINCIPLES

Agile principle	Definition	Service Design principle	Definition
Collaboration	Business people should work with developers throughout the project on a daily basis.	Collaborative	Stakeholders from different backgrounds should be involved throughout the service design process.
Motivated individuals, good environment, support & trust	Projects should be built in a supporting environment and around motivated individuals.	Human-centered	Highlights the importance of involving all the people affected by the service.
Customer satisfaction, continuous delivery, value	Satisfying the customer with early and continuous delivery of valuable software.	Holistic	Services should address the needs of all stakeholders across the business.
Sustainability, people	Promoting sustainable development. Sponsors, developers and users should maintain an ongoing pace.	Iterative	An experimental, adaptable and continual approach, iterating towards implementation.
Adaptability, competitiveness	Taking changing requirements into account.	Sequential	Taking interrelated actions into account.

The principles of Agile and Service Design have similarities, which can support applying Service Design methods into the software development process of an organization following agile methods. Both principles highlight the importance of collaboration between different stakeholders, involving all relevant people as well as sustainable and iterative development. These similarities can create synergistic effects when following both agile and Service Design principles. However, Service Design and agility have also slight differences, for example when considering the focus of the approaches in a bigger picture. Even though both approaches are user-centric agile has more focus on early delivery of valuable software to the customer, whereas Service Design highlights understanding the services from the customer perspective, but also the importance of creating value through the entire development process for all stakeholders.

On the other hand, when comparing Service Design to traditional software development models, such as the waterfall model, the benefits of Service Design stand out more clearly. In the waterfall model progress is seen flowing

steadily downwards like a waterfall and changes during the design phase should be avoided. It is a linear model, where each step of the process is frozen before moving on to the next one, and changes to the requirements will not be considered in later phases [20]. These are opposite to many Service Design principles such as continuous iteration, adaptiveness and involving stakeholders throughout the design process.

III. EMPIRICAL RESEARCH DESIGN

The research was composed with an action research approach, which included several data collection methods. Action research is a methodology that aims to support organizational learning to develop practical outcomes. In the end of the 1990's the importance and popularity of action research in information systems increased notably. One basic principle in action research is that the best way of studying complex social processes is changing these processes and observing the results and effects of the implemented changes [21].

Frequently, action research uses several different methods for the collection of data. Using multiple methods like analysis of relevant documents, in depth interviews and participative socio-technical design concurrently is encouraged. Similar methods are also utilized in Service Design and therefore the two approaches support each other. Service Design tools and methods are in line with qualitative research methods as both are holistic processes that require participation in a real-life setting. As action research focuses on organizational learning through problem solving together with Service Design tools and methods it can provide a comprehensive way of collecting data [22]. The data was mainly collected through a focus group interview, semi-structured interviews, a questionnaire survey and the actual case study: The Service Design sprint. Due to the global pandemic regarding Covid-19 the Service Design sprint had to be held remotely, contrary to the original plan. The remote implementation brought its own challenges to the planning phase, but also enhanced the efficiency of the workshops held during the sprint.

The trustworthiness of this research will be evaluated through four aspects: credibility, transferability, dependability and conformability [23]. In doing so, it should be taken into account that the researcher is part of the organization where the case study was carried out. The role of the researcher in the Service Design sprint was the role of a project manager. The researcher was responsible of the process in its entirety, including the scope, budget, deadlines and reporting. This may affect the objectiveness of the results to some point, but precautions were taken to ensure the objectiveness. The researcher did not facilitate or lead the sessions and workshops during the actual case study to ensure as objective results as possible and to make sure that the workshops were not even accidentally directed to a desired direction from the researcher point of view.

The credibility of this research is desirable as the empirical material is rather inclusive and based on the empirical results another person could end up with the same findings and conclusions. The transferability of the research is reliable as the research is grounded on similar previous research. The results are examined in comparison to the findings of these

previous studies, and similar findings from previous research are presented. Dependability is ensured by following a logical research process and carefully documenting each phase of the process. In addition, the conformability of the research is ensured by presenting logical links between the results and conclusions.

IV. THE SERVICE DESIGN SPRINT

The structure of the Service Design sprint was combined from different approaches and frameworks and further modified to best fit the needs of Company X. The structure of the Service Design sprint was mainly formed based on the idea of the Design Sprint developed at Google Ventures, the Double Diamond model [24] designed by the Design Council and the three-day Service Design session presented by Stickdorn [4]. The final version of the Service Design sprint held in Company X was basically a combination of an internal design sprint and a co-creative workshop with the customers. The sprint was held as a pre-development phase of the agile software development process.

As discovered by Junginger & Sangiorgi [14] pilot projects can have an essential role in successful organizational change. Stickdorn et al. [4] also propose starting with small Service Design projects as these can be used to modify the Service Design process as well as the company’s structures and culture. Therefore, a pilot project was carried out in Company X, to demonstrate and explore the benefits, challenges and critical factors that applying Service Design has in software development.

Service Design has not been applied to internal processes in Company X before this case. However, several different

design methods such as user stories and prototyping have been utilized in the software development process already previously. Thus, it was also mutually agreed in Company X that the company would benefit more of examining the use of the Service Design methods and tools during the research and ideation phase, than in the prototyping and implementation phase. Hence, the Service Design sprint will focus on the first diamond of the Double Diamond model, which includes the phases discover and define.

The selected Service Design methods and tools for the remote implementation of the Service Design sprint include the following methods and tools: desk research, semi-structured interviews, developing key insights, mapping key findings, 5 x Why’s?, voting and prioritization methods, “How might we..?” questions, brainwriting, brainstorming, mindmapping, feature planning, mapping features, idea portfolio, personas, user stories, wireframing, prototyping, warm-ups as check-in methods, feeling canvases as check-out methods and compiling research reports. The methods and tools were utilized during pre-sprint research, the actual three-day Service Design sprint and post-sprint debriefing.

See Figure 1 for the structure of the remote version of the Service Design sprint. The Service Design sprint was experimented as a pre-development phase of the agile software development process of Company X.

V. RESULTS AND DISCUSSION

The results of the action research cycle are compared to previous research on the field. The findings of this research support some of the previous findings, but also differences and additional factors were identified during this research.

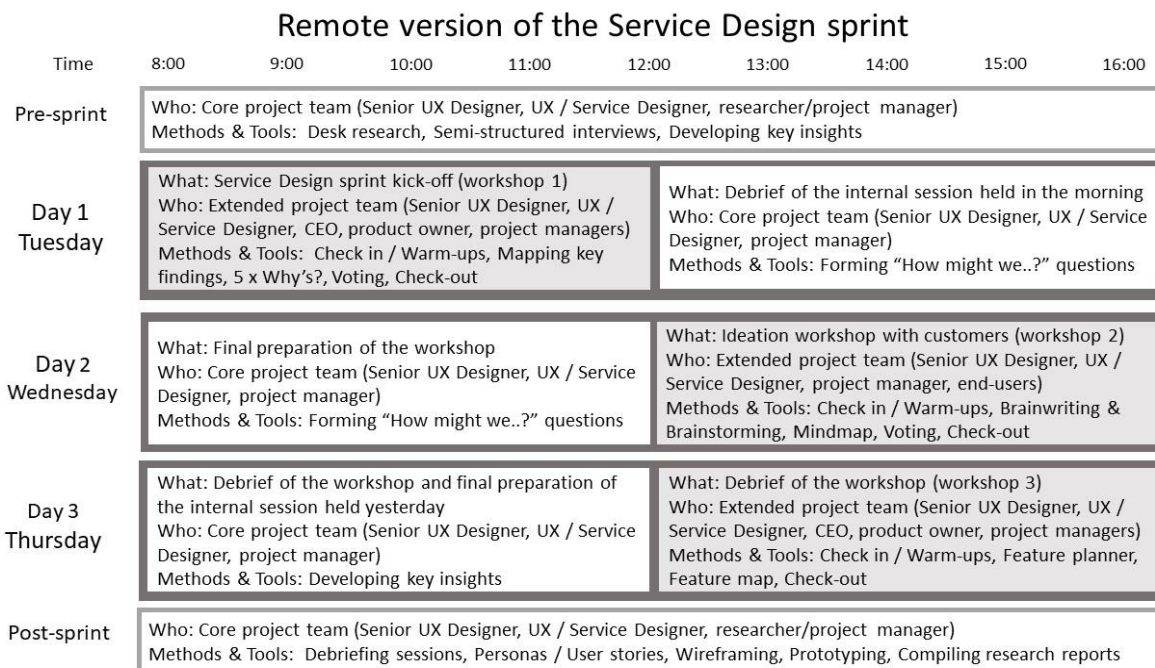


Figure 1. Structure of the remote Service Design sprint

The key findings and the discussion with previous research will be presented under three aspects based on the benefits, challenges and critical factors of implementing Service Design into software development. Each subchapter will be approached with the support of a table to present the key findings regarding the aspect in question.

A. Identified benefits

The benefits of Service Design that have been identified in previous literature regarding software development [2] include improved communication, instant feedback, increased motivation and innovation, mindset change, learning and decision making, identification and prioritization of features or potential market segments and value creation. The research done by Sauvola et al. [3] focused on experimenting the prototyping methods of Service Design whereas this research had the focus on research and ideation methods. However, several similar benefits that Sauvola et al. [3] have identified previously can be recognized based on this research. For example, improved internal motivation, delivering added value to the customer and improving the understanding of the customer and typical use cases of the software were identified based on the empirical research and are reminiscent to the benefits identified by Sauvola et al. [3]. Based on this research, the identified benefits that implementing Service Design can bring for software development are listed outright in Table 2 below.

TABLE II. IDENTIFIED BENEFITS

Key findings – benefits	Provided empirical support	Related findings in previous studies
Improved internal motivation	Focus group interview, Case: Service Design sprint	Sauvola et al. (2018)
Improved understanding of the customer and typical use cases of the software	Focus group interview, Case: Service Design sprint, Questionnaire survey	Sauvola et al. (2018), Furrer et al. (2018)
Identifying the actual needs and challenges of the customer	Focus group interview, Case: Service Design sprint, Questionnaire survey	Sauvola et al. (2018), Stickdom et al. (2018)
Efficient resource allocation	Focus group interview, Case: Service Design sprint	Stickdom et al. (2018), García et al. (2013), Sauvola et al. (2018)
Delivering added value to the customer	Case: Service Design sprint, Questionnaire survey	Sauvola et al. (2018), Furrer et al. (2016)
Improved customer satisfaction	Case: Service Design sprint, Participant observation, Questionnaire survey	Stickdom et al. (2018), Furrer et al. (2018)

B. Identified challenges

The identified challenges of Sauvola et al. [2] differ partly with the ones identified during this research. This may be due to the difference between the utilized Service Design methods. However, one similar challenge was discovered in this research regarding the finding of Sauvola et al. [2] concerning stakeholder availability. In this research, the related identified challenges are commitment, selling Service Design as a concept to the customers and involving the relevant people to the process. Moreover, another discovered challenge of this research is that prototyping methods are difficult to execute in a workshop context remotely. In further iterations, as prototyping methods are also experimented within the workshops, the findings can be more profoundly compared to the previous findings of Sauvola et al. [2]. The possible challenges outright identified during this research, and that can be faced while implementing Service Design to software development, are listed in Table 3.

TABLE III. IDENTIFIED CHALLENGES

Key findings – challenges	Provided empirical support	Related findings in previous studies
Lack of time	Focus group interview, Case: Service Design sprint	Stickdom et al. (2018)
Commitment	Focus group interview, Case: Service Design sprint	Sauvola et al. (2018), Junginger & Sangiorgi (2009)
Internal assumptions	Focus group interview, Participant observation, Case: Service Design sprint, Questionnaire survey	Junginger & Sangiorgi (2009)
Selling Service Design as a concept to the customers	Focus group interview, Case: Service Design sprint, Questionnaire survey	Sauvola et al. (2018)
Involving the relevant people to the process	Focus group interview, Participant observation, Case: Service Design sprint, Questionnaire survey	Sauvola et al. (2018), Stickdom et al. (2018)
Prototyping methods in remote workshops	Case: Service Design sprint	
Implementing Service Design as an ongoing activity	Case: Service Design sprint	Junginger & Sangiorgi (2009)

C. Identified critical factors

The most important critical factor when implementing Service Design to an organization can be perceived as carrying out a pilot project. In order to achieve the above-

mentioned benefits and avoid recognized challenges, this research suggests taking into account the following critical factors when implementing Service Design into an organization. The critical factors are proposed to be considered when planning and executing a pilot project for implementing Service Design to an organization. The critical factors identified by this research are listed in Table 4.

TABLE IV. IDENTIFIED CRITICAL FACTORS

Key findings – critical factors	Provided empirical support	Related findings in previous studies
Pilot project	Focus group interview, Case: Service Design sprint	Junginger & Sangiorgi (2009), Stickdom et al. (2018)
Encompassing and detailed preparation	Case: Service Design sprint, Questionnaire survey	Sauvola et al. (2018)
Discovering suitable Service Design methods and tools	Focus group interview, Case: Service Design sprint, Questionnaire survey	Stickdom et al. (2018)
Scoping the sprint challenge	Case: Service Design sprint, Questionnaire survey	
Focusing on appropriate challenges	Case: Service Design sprint	
Finding a “light-weight” solution	Focus group interview, Case: Service Design sprint,	Stickdom et al. (2018)
Providing concrete results and findings	Case: Service Design sprint, Questionnaire survey	Stickdom et al. (2018)
Taking into account the possible impacts of a remote implementation	Case: Service Design sprint	

The findings of the empirical research of this study support the above-mentioned critical factors. Similar factors have been highlighted in previous literature [4][14] regarding Service Design as well. However, this research presents the critical findings in respect of software development and hence supports the corresponding findings of Sauvola et al. [2].

VI. CONCLUSIONS

The first research question “*How can Service Design methods and tools be implemented into internal processes in B2B software development?*” was addressed by mapping out a suitable way of experimenting the implementation of Service Design to the case company. The research question was first approached with the focus group interview in order to acquire understanding of the assumptions and knowledge that the employees of Company X had related to Service Design. The results of the focus group interview disclosed

that employees of Company X saw potential benefits regarding Service Design such as improving internal motivation and understanding the customer more profoundly. However, employees were simultaneously concerned of the lack of time and commitment regarding both internal and external stakeholders. The factors that were highlighted in the focus group interview were taken into account while planning the pilot project for implementing Service Design methods and tools in Company X.

The Service Design sprint was created based on the knowledge gained from previous literature as well as utilizing the know-how of the employees of Company X. On the grounds of the research process it was discovered that implementing Service Design methods and tools into internal processes requires Service Design to be considered as an ongoing activity in the organization. This means that in order to embed Service Design to the organization permanently further Service Design iterations are required. The Service Design activities should be continuously improved and modified if needed to achieve even better results.

It can be stated that a carefully planned pilot project is in a key role when implementing Service Design into B2B software development. Regarding the second research question it can be concluded that Service Design can be implemented to B2B software development through a pilot project, for example a Service Design sprint, which involves both internal and external stakeholders. Moreover, it was experimented that a compact Service Design sprint can be used as a pre-development phase in agile software development. In addition, to be able to carry out a successful Service Design pilot project it is crucial to communicate the objectives of the pilot project as well as the results and findings to all stakeholders.

The second research question “*What are the benefits, challenges and critical factors when implementing Service Design methods and tools into software development?*” was first addressed through the focus group interview by initially mapping out the benefits, challenges and critical factors that employees of Company X saw possible regarding the implementation of Service Design. These findings were then taken into account while planning action and creating the pilot project which was based on the three-day Service Design sprint. Lastly, the final results of the pilot project were mirrored and compared to the previous findings of the focus group interview while evaluating and specifying learning.

Regarding the second research question it can be concluded that the possible benefits of Service Design in software development include improved internal motivation, improving understanding of the customer and typical use cases of the software, identifying the actual needs and challenges of the customer, efficient resource allocation, delivering added value to the customer and improved customer satisfaction. Furthermore, achieving all these benefits while utilizing Service Design can simultaneously assist the organization in finding a common language between different teams and stakeholders. On the other hand,

the possible challenges that may be faced when implementing Service Design in software development are related with the lack of time and commitment, internal assumptions, selling Service Design as a concept to the customer, involving the relevant people to the process, prototyping methods in remote workshops and implementing Service Design as an ongoing activity.

Related to the identified benefits and challenges it can be further concluded that the motivation or reason behind the above-mentioned factors often depends on the stakeholder in question. For example, the lack of time for Service Design activities from the developers point of view may be related to the pressure of delivering new features promptly, whereas from the customers point of view this may be due to the fact that they might need a permission for participating to a Service Design sprint from their superiors, who might not realize the value of Service Design activities with the service provider. In order to truly understand the motivations behind the identified benefits and challenges, further research about the background of different stakeholders may be required. The findings could then be advisable to consider while planning the pilot project for implementing Service Design.

This research proposes that by taking into account the following critical factors when implementing Service Design into software development the above-mentioned challenges are more likely to be overcome and consequently the above-mentioned benefits are more likely to be achieved. The critical factors when implementing Service Design are composed on the pilot project carried out in Company X. The key critical factor identified by this research is starting the implementation of Service Design through a pilot project. Other critical factors identified are suggested to be considered while planning and executing the Service Design pilot project in question. The critical factors regarding the pilot project consist of detailed and encompassing planning, discovering suitable Service Design methods and tools, scoping the sprint challenge, focusing on appropriate challenges, finding a lightweight solution and providing concrete results and findings.

In addition, this research demonstrated that carrying out a design sprint remotely is possible and profitable. While planning a remote implementation of Service Design the remote aspect should be consciously investigated as working remotely may bring its own challenges to the implementation.

The limitations of this research include that the research was carried out in a single case company, which means that the results may differ in distinct circumstances. Therefore, generalizations based on the results of this research are limited. Albeit, the results provide an approach for implementing Service Design to software development, the sprint was just one way of carrying out a pilot project. Different approaches may be discovered more suitable and functional in other organizations. Therefore, each organization should discover the best practices for embedding Service Design in the organization in question.

For future studies, this research suggests validating the Service Design sprint model. It can be stated that the Service Design sprint model presented in this research requires further iterations before it can be considered practical. For example, experimenting the Service Design sprint as the first phase in agile software development could be further studied. The way Service Design and agile software development may be able to complete one another is worth examination in practice. In addition, evaluation of combining a design sprint and a co-creation workshop would be interesting. An interesting similar approach combining design thinking, lean startup and agile development is provided by Flores et al. [25].

Another topical subject of research would be comparing the results of traditionally held workshops to the remote workshops. The remote working aspect is truly actual considering the current situation globally.

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