Design Choices Framework for Co-creation Projects

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Co-creation has been adopted in many recent design and innovation projects, bringing different stakeholders together and creating a shared understanding and new ideas through creative and participative approaches. Despite this increasing popularity, there is still a lack of a systematic understanding of key dimensions and design choices in co-creation projects due to contextual complexity and contingencies. In this paper, we develop the design choices framework for co-creation projects as a result of analyzing 13 co-creation projects from multiple fields, including design research, process innovation and service innovation. The design choices framework provides us with vocabularies that help to explain what kinds of dimensions co-creation projects are built on, what influences the formulation of co-creation projects and what informs the selection and development of methods. The framework also helps to assess and plan co-creation projects. We introduce ten design choices identified from the cross-case analysis and discuss their dynamic interrelations.

Keywords – Co-creation, Design Choices, Design for Service.

Relevance to Design Practice – The design choices for co-creation projects provide a framework for researchers and practitioners to plan and evaluate their co-creation projects. The design choices can also function as shared vocabularies and a framework for a multi-disciplinary team.

Introduction

Recently, an increasing number of design and innovation projects apply co-creation as a process, agenda or tool. Beyond the field of design, these projects often include multiple disciplines such as marketing, service development and innovation, and management and organization studies. In marketing, Ramaswamy and Gouillart (2010) describe a co-creation approach to process design as involving several different stakeholders, exploring their experiences, organizing participatory workshops for improving interactions and building platforms for new interactions and continuous dialogue. In design, while different institutions define the term slightly differently (Mattelmäki & Sleeswijk Visser, 2011), co-creation is widely understood as practices where a design practice and one or more communities of practice participate in creating new desired futures (Holmlid, Mattelmäki, Sleeswijk Visser, & Vaajakallio, 2015).

In this paper, co-creation refers to the entire process of a design or innovation project, which involves different stakeholders in various phases of the project, aiming to create desired futures together from the planning and research phase, a "pre-design" phase according to Sanders and Stappers (2014), to the implementation phase, a "post-design" phase (Sanders & Stappers, 2014). The term co-creation has also been widely used outside the design field. Service innovation and marketing research, for example, use the term co-creation to explain the shifting role of customers who become co-creators of value (Prahalad & Ramasway, 2004) with the rising notion of Service Dominant Logic (Vargo & Lusch, 2008). In these domains, co-creation rather refers to co-creation of

values in the use context where service is co-produced (Grönroos & Ravald, 2011). In our paper, however, the term co-creation focuses on creative activities and co-creation of knowledge of various stakeholders in a design or innovation project.

The origin of co-creation in design goes back to 1980s when the participatory design (PD) movement emerged in Scandinavian countries. Research projects on PD were conducted to involve workers in the development of new systems for the workplace (Ehn & Kyng, 1987). Scandinavian PD carried a political agenda, asserting that people who are affected by a decision should have an opportunity to influence it (Schuler & Namioka, 1993). Since then, as Halskov and Hansen (2015) review the current PD research practices, the main concern of many current PD research projects is to clarify tensions among stakeholders and make sure that voices from different people are heard in the design process (e.g., see Buur & Larsen, 2010; Simonsen & Robertson, 2012).

In 1990s in the U.S., Elizabeth Sanders introduced a notion of "collective creativity", believing that everybody is the expert in regards to their life and can contribute to the design process.

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For collective creativity, a designer plays a role as a facilitator who scaffolds a process where users are invited to the design process, envision desired futures and generate ideas (Sanders, 2000; Sanders & Stappers, 2008). Sanders introduced a set of generative tools with which users—non-designers—can express their experiences and generate new ideas.

Designers and researchers in current co-creation projects are confronted with two main challenges: firstly, whom to involve and how to open the process for those who are affected and secondly, how to scaffold the setting for fostering people's collective creativity. These are crucial challenges for designers and researchers as current co-creation projects deal with more complex problems and stakeholder relations. Current practices to cope with these challenges are often situated (Suchman, 1987); designers and researchers plan and conduct the co-creation project by responding to the very local context of the project and contingencies that emerge at any points of the project. They choose, develop and modify methods for co-creation as situated practices within the project. There is then a lack of shared, systematic understanding of what kinds of dimensions co-creation projects are built on. What kinds of contingencies should the project consider? What information could support the selection and development of methods? This lack of systematic understanding also makes it hard to evaluate the co-creation projects.

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In this paper, we introduce a framework of key dimensions and consideration areas for co-creation projects, which we call the "design choices framework." Through this term, we mean an opportunity or an act of selecting from a variety of alternatives in designing a project. The term is in debt to Cockton's (2013) work, which talks about "types of design choices" as frameworks that cut across different vocabularies in different design paradigms, for example, engineering design's *problem*s versus the *briefs* in applied arts. Cockton identifies four types of design choices: artefact features and qualities, intended beneficiaries, intended purpose and evaluation practices.

In having the design choice framework as a conceptual lens, designers and researchers can take a more holistic and flexible view when planning, making decisions in and evaluating a project beyond the mere reliance on methods. As Cockton (2013) emphasizes, design choice as a concept can also be shared between different approaches to design and thus provides a useful starting point for integrating them. We believe that the design choices framework can especially benefit co-creation projects in a multi-disciplinary setting. Without shared frameworks and vocabularies for co-creation projects, a team may face difficulties when carrying out a project.

In this paper, we identify ten types of design choices for co-creation projects, based on our research in the multi-disciplinary consortium project ATLAS at Aalto University, Finland. The objective of ATLAS (2012-2014) was to create a cross-disciplinary map for future service co-development, based on cross-case analysis of a total of 13 earlier co-creation projects which had been conducted by the research groups of the ATLAS consortium. The research groups represent three different domains—design research, process innovation and service innovation. Each group had many years of experience in co-creation research and brought the data from their past co-creation projects into ATLAS for the cross-case analyses. In the following sections, we first introduce the theoretical perspectives to co-creation brought by the three research groups to explain the kind of theoretical lenses used in respect of co-creation in this paper. We then move on to explain the analysis process and the resulting ten types of design choices for co-creation projects.

Theoretical Perspectives

The three research groups in the ATLAS project brought their theoretical perspectives to co-creation, which formed the theoretical background for the cross-case analysis and the development of the design choices framework. At the center of the theoretical backgrounds are empathic co-design, knowledge co-creation and process innovation, and service innovation.

Firstly, the design research group carries theories and approaches from empathic design and co-design. Empathic design stems from interaction design to enable designers to have an access to felt-experiences and emotions of users (Mattelmäki & Battarbee, 2002). The theories of and approaches to empathic design are currently applied in a co-design setting in terms of building empathy among various stakeholders beyond between just designers and users (Holmlid et al., 2015; Mattelmäki,

Vaajakallio & Koskinen, 2014). A variety of empathic, generative and participatory approaches such as design games, design probes, acting-out, storytelling and prototyping are applied in co-creation projects (e.g., Hyvärinen, Lee & Mattelmäki, 2015; Sanders & Stappers, 2014; Vaajakallio & Mattelmäki, 2014). Instead of explaining the existing, these approaches focus on developing future visions of the human world (Cross, 2006) and are typically context tied, democratic and practice driven (Keinonen, 2009). By contrast to traditions in human research science or marketing, these co-creation approaches are built on designers' genuine competences in respect of the visual, empathic and generative (Hanington, 2003; Lee, 2014).

These approaches have now been adopted in emerging fields like service design and innovation for making sense of complexity, articulating experiences and creating and supporting collaboration among different stakeholders (Hakio & Mattelmäki, 2011; Holmlid et al., 2015; Steen, Manschot, & De Koning, 2011). Tools like service blueprints, stakeholder maps or customer journeys are adopted in co-creation workshops. For service professionals and researchers, these methodologies provide rich co-creation instruments for making use of users' and other stakeholders' creativity, collecting tangible artifacts built by them and leveraging their engagement as full participants to the design of services.

The process innovation group carries theories and approaches from organization and management theory, educational sciences and design. They apply a developmental action research approach to inter-organizational participative processes and service development, focusing on the co-creation of knowledge embedded in the processes and their social practices and through that, the design of process innovation to produce added value to all actors (Smeds & Alvesalo, 2003). In its action research projects, the group prepares co-creative process development workshops, so called *process simulations*, and realizes them as a facilitated group dialogue in a virtual learning environment, including through tools for visualizing and modelling the objects of knowledge creation and innovation (Smeds, Lavikka, Jaatinen, & Hirvensalo, 2015). These shared objects, often referred to as boundary objects (Star 1989), include models and visualizations of the present or future processes. They help to create a shared understanding across organizational borders between collaborators and this shared understanding supports the creation of new knowledge (Bechky, 2003; Carlile, 2002).

Discussion and joint elaboration of the boundary objects help to perceive the viewpoints of the customers, the collaborating companies and other stakeholders. This joint process enables the co-creation of mutually beneficial solutions for shared problems (Valkeapää, Lavikka, Jaatinen, & Smeds, 2007). According to Bushe and Marshak (2009), social construction of new meanings through the facilitated group dialogue in a co-creative setting may encourage change in actions and new patterns of organization. A process simulation helps change management which involves empowerment of process actors, knowledge sharing and co-creation as well as creation of a shared vision for process innovation (e.g., Feller, Parhankangas, Smeds, & Jaatinen, 2013; Smeds, Haho, & Alvesalo, 2003).

Service innovation research is built on service studies, organization theories and innovation research. In this field, the challenge in services is to identify innovative ideas and manage them through the whole cycle until they are implemented in the marketplace. Current studies show that consumers' service ideas tend to be more innovative in terms of originality and user value than those of professional service developers (Matthing, Sandén, & Edvardsson, 2004) and that co-creation techniques are much more efficient than traditional market research techniques for creating profitable service offerings (Witell, Kristensson, Gustafsson, & Löfgren, 2011). This brings innovative service development traditions towards the design field, particularly as the visualization techniques and deep user engagement are established strengths of professional designers (Holopainen, 2010). Based on this idea, the service innovation group studies innovation in services, recognizing the spreading role and importance of customer involvement. In projects, they apply storytelling and participatory methods in working directly with customer groups.

Cross-Case Analysis

To identify common dimensions of co-creation projects, the three research groups analyzed 13 co-creation projects. Of the 13 projects, six were conducted by the design research group, three by the process innovation group and four by the service innovation group. The 13 projects were conducted from 2004 to 2014 and were considered successful in the sense that they produced a wealth of deliverables and outcomes that supported the participating organizations' co-creation and innovation as well as producing new scientific knowledge. In most of the projects, the main arena for co-creation was workshop-type events gathering various professional actors and end-users together. In the workshops, the researchers applied different co-creation approaches, including design games, design probes, storytelling, customer journey mapping, prototyping, personas, process simulation, scenarios and future recall. Table 1 summarizes the aims, participants and types of co-creation events and tools across the 13 projects.

We organized six data analysis workshops to analyze the empirical data from the 13 case projects. From each research group, the responsible researchers who had participated in the case projects took part in the analysis workshops. We used a stimulated recall method to examine the decision-making processes of the researchers who had planned and conducted the projects. Stimulated recall usually involves playing back an event to those involved to help them remember the thoughts and feelings they had during the event, often with the help of empirical data (Hodgson, 2008). The empirical data included the printed reports of the processes and results of the case projects, project plan documents, tools used in co-creative practices and co-created artefacts, pictures and videos of the co-creative workshops and simulations, publications from the case projects and so on. In the workshops, the researchers from the case projects explained the data and the details of each project (see Figure 1).

Table 1. The 13 co-creation projects for cross-case analysis.

Project name	Research group	Project aim	Participants	Co-creation events and tools
TULE (2011-2012)	Design research	Design a new cancer center based on patients' needs	Hospital staff, patients, architects	Co-design workshops with patient journey mapping and a real-scale paper prototyping technique
Wellbeing365 (2011-2012)	Design research	Design for public services focusing on citizen's wellbeing	Citizens, municipal officers	Pre-interviews, co-design workshops with storytelling and design games
Palvelupolku (2009-2011)	Design research	Develop cross-sector service networks within a municipality	Citizens, service business partners, NGOs, municipal officers	Design probes, personas, co-design workshops with stakeholder mapping, service blueprinting and make tools
Spice (2009-2011)	Design research	Design for metro experiences based on storytelling	Multi-disciplinary research groups, partnering companies	Design probes, co-design workshops with role playing, make tools and storytelling techniques
Active@work (2004-2006)	Design research	Design for wellbeing and work conditions for ageing workers	Ageing workers, managers, various experts	Design probes, personas, make-tools, video observation
Extreme Design (2008-2010)	Design research	Help various companies from building, banking and social media to co-design services for customers	Company representatives, customers	Co-design workshops with design games, exhibitions
VisciTools (2010-2012)	Process innovation	Develop a company's internal innovation process and related innovation practices	Company managers, employees	Process simulations, co-design exercises with personas, scenarios and idea cards
INNOSchool (2007-2010)	Process innovation	Develop educational services in a public-private network	School teachers, principals, students, parents, municipal officers	Process simulations with future recall and scenarios in a workshop setting
PRO2ACT (2010-2013)	Process innovation	Develop a proactive contracting process and software	Procurement officers, associations, companies	Process simulations
Inno-Wellness (2010-2013)	Service innovation	Develop employee-driven innovation management models	Company employees, managers	Visualizations of management models
LEAPS (2012-2014)	Service innovation	Develop user-driven productization of KIBS (knowledge-intensive business services)	Employees, managers	Storytelling, co-development of leadership models
Innopex (2010-2012)	Service innovation	Improve user experience by comparing users' and the firm's perspective	Users, company managers, employees	Storytelling
ISO (2007-2010)	Service innovation	Develop user-driven service innovation processes and methods	Customers, company managers, employees	Co-development of methods

Figure 1. Data analysis workshops involving the three research groups.

The ATLAS project had an external advisory board consisting of academic experts and practitioners. The practitioners were mostly from the organizations that had been involved in the case projects, so they had knowledge about the case projects and their impact afterwards. The practitioners were invited to the second workshop. Later, the whole external advisory board was invited to the fourth workshop to ensure scientific validity and practical relevance of the analysis results. Each analysis workshop took a half to a full day and involved small meetings before and after for preparation and debriefing. The size of each

workshop varied according to the aims, substance matters and cases. The researchers' workshops (1st, 3rd, 5th and 6th workshop) were smaller in varying from 10 to 17 participants. In other workshops with external partners, there were an additional 5 to 10 participants. Figure 2 encapsulates the overall process of the cross-case analysis, participants, activities and results of each workshop.

The goal of the first data analysis workshop was to map the different co-creation methods used in the 13 case projects and to classify them according to their characteristics and purpose. 17 researchers representing the 13 case projects participated in the workshop. They were divided into three multi-disciplinary teams to classify the methods. During the analysis, the researchers discovered a difficulty in classifying the methods into a fixed framework because the same method could be applied in a variety of ways and for different purposes. Instead of classification of the methods, the first workshop resulted in various dimensions that serve as criteria for choosing methods, such as purpose of phases, power distribution, mind-sets of participants, types of knowledge, concreteness of outcomes, time scale of change and so on.

In the second workshop, the researchers tested and elaborated the initial dimensions with the external practitioners. Four case projects were chosen for deep analysis with the invited practitioners and researchers discussing in groups what role these dimensions played in the four case projects and elaborating the attributes of each dimension. The practitioners also discussed the concerns and challenges when taking such dimensions into account. Soon after the second workshop, the researchers conducted the third analysis workshop to synthesize the results from the previous workshops. This third workshop resulted in a refined version of seven dimensions, including purpose of intervention, time scale of change, mind-sets of the participants, types of knowledge and so on. This list served as a very preliminary framework of design choices.

The fourth data analysis workshop served as an important milestone in improving the scientific rigor and practical relevance of the design choices. The external academic experts and practitioners were invited for this purpose. The project researchers presented each design choice in a card format with a design choice name and a short description. The workshop participants were divided into two groups, one with the academic experts to clarify the concepts and connect the design choices with theories; the group with the practitioners sought to validate practical relevance and priorities of the design choices. As a result, some design choices merged, a few new design choices were proposed and relations between the design choices were identified.

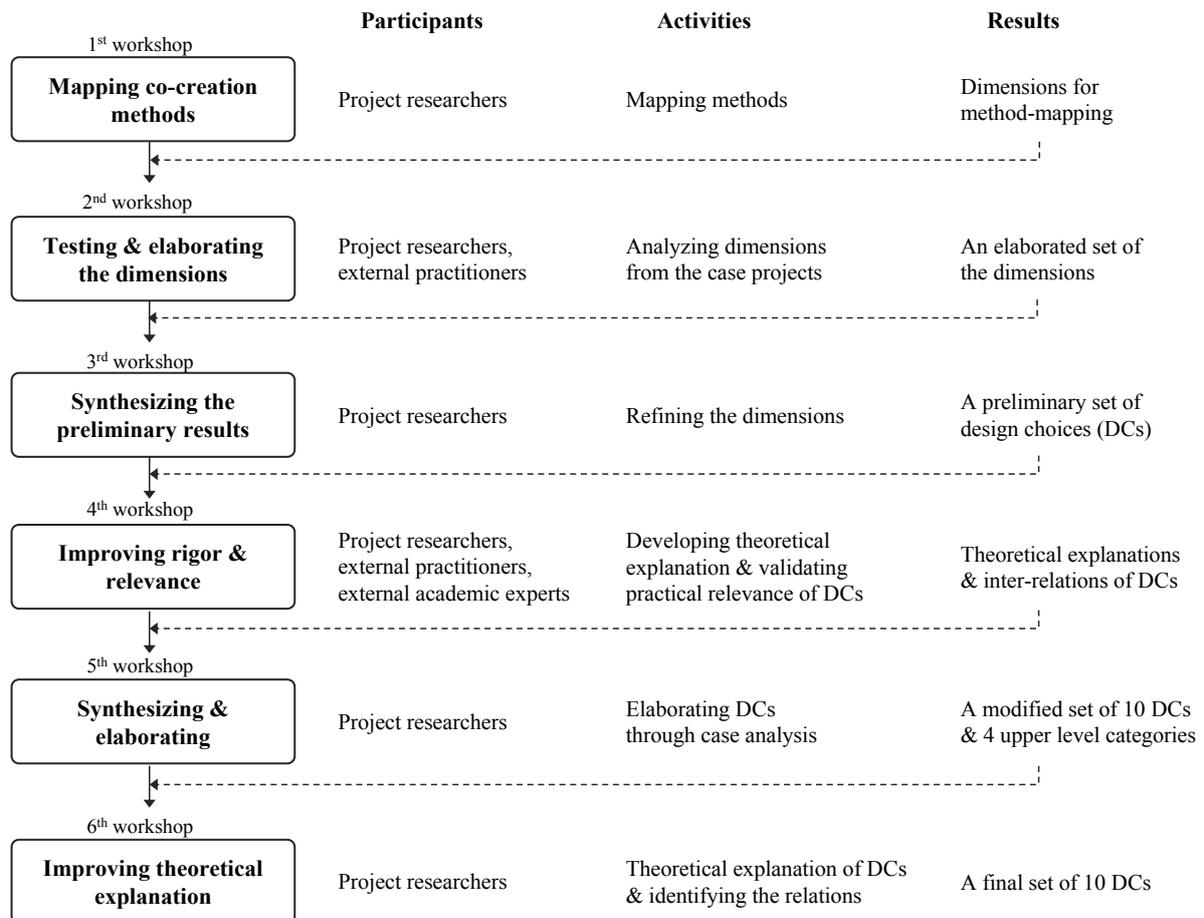|	Participants	Activities	Results
1st workshop **Mapping co-creation methods**	Project researchers	Mapping methods	Dimensions for method-mapping
2nd workshop **Testing & elaborating the dimensions**	Project researchers, external practitioners	Analyzing dimensions from the case projects	An elaborated set of the dimensions
3rd workshop **Synthesizing the preliminary results**	Project researchers	Refining the dimensions	A preliminary set of design choices (DCs)
4th workshop **Improving rigor & relevance**	Project researchers, external practitioners, external academic experts	Developing theoretical explanation & validating practical relevance of DCs	Theoretical explanations & inter-relations of DCs
5th workshop **Synthesizing & elaborating**	Project researchers	Elaborating DCs through case analysis	A modified set of 10 DCs & 4 upper level categories
6th workshop **Improving theoretical explanation**	Project researchers	Theoretical explanation of DCs & identifying the relations	A final set of 10 DCs

Figure 2. Overall process of the cross-analysis of the 13 case projects.

The project researchers conducted a fifth analysis workshop to synthesize the results from the fourth workshop and to refine the relations of the design choices. That workshop resulted in the modified version of ten design choices and four upper level categories, such as purpose of the change, participants dynamics, methodological choices and outcomes; later modified into project preconditions, participants, co-creation events and project results. Finally, the sixth analysis workshop was conducted by the project researchers to improve the theoretical explanation of each design choice and clarify the interrelations between the design choices. The final list of ten design choices was generated from this workshop.

Design Choices Framework

As result of the elaborate stepwise cross-case analysis process, we developed the Design Choices Framework of ten design choices, grouped into four categories: *project preconditions*, *participants*, *co-creation events* and *results* (see Figure 3).

In the following sections, we describe each design choice under its respective category. We use two case projects to illustrate the problem dimensions and contingencies that could exist in co-creation projects and how each design choice can be made in response to the contingencies and problem dimensions in real project contexts.

Two Cases for Illustration

To illustrate the design choices, two case projects out of the 13 were selected as examples, based on the following criteria; the case projects had a comparable scope but applied different types of co-creation approaches according to different aims and participants of the projects. The comparable scope helps to illustrate how different decisions can be made concerning the same design choice according to different project contingencies.

Case 1. TULE Project: Co-creation for a New Cancer Center of the Hospital

TULE project (2011-2012) was conducted by the design research group. The initiative for the project came from a regional hospital in Finland that planned to design a new cancer center as part of a two-year long program to develop a patient-centered care management model for sarcoma-type cancers. The project management team from the hospital wanted to include patients' needs and ideas in the development process so engaged the design research group to plan and facilitate the co-creation process. Three rounds of co-design workshops were conducted to bring different stakeholders' views and create ideas together.

Case 2. VisciTools Project: Co-creation of a Process for a Digitally Supported Collaborative Innovation in the Company

VisciTools project (2010-2012) was conducted by the process innovation group. The project set out to develop the innovation process of a global manufacturing and service company that has R&D units in different countries. The company wanted to develop a new innovation process and practices with a digital tool, especially for collaborative innovation across geographically distributed units. Altogether, the project held five co-creation workshops over a year and a half time span.
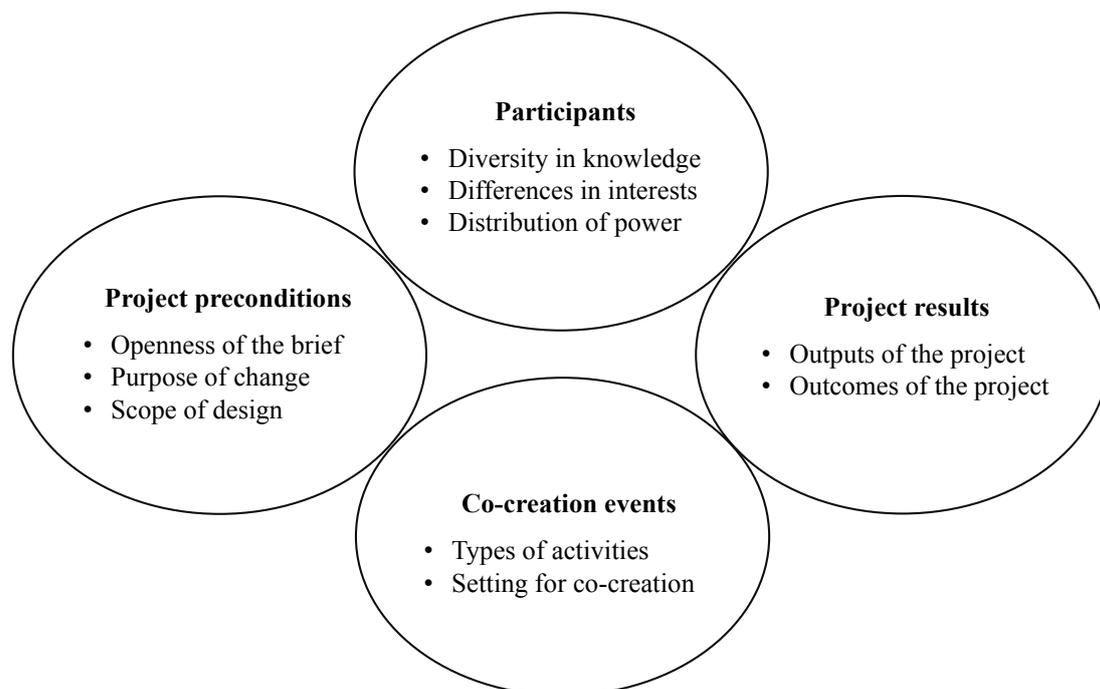

Figure 3. Ten design choices grouped into four categories.

Within the figure:

Participants
- Diversity in knowledge
- Differences in interests
- Distribution of power

Project preconditions
- Openness of the brief
- Purpose of change
- Scope of design

Project results
- Outputs of the project
- Outcomes of the project

Co-creation events
- Types of activities
- Setting for co-creation

The attributes of Case 1 and Case 2 overlap with the case projects conducted by the service innovation group in terms of participant dynamics and methods used, although the service innovation group does not use co-creation tools and visualization as extensively as the other groups. We could thus select Case 1 and Case 2 as examples.

Design Choices Related to Project Preconditions

Design choices related to "project preconditions" set the ground for the project to start and for framing the overall scope, purpose and mode of the project.

1. Openness of the Brief

This design choice describes the mode of inquiry with which the project approaches the goals of co-creation. A project team could start a project with a pre-defined brief that leads to a project process with a problem-solving mode, or an open-ended brief that leads to a process with a more exploratory mode. Projects with a pre-defined brief focus on analyzing pre-identified problems and developing solutions for them. Projects with an open-ended brief focus on identifying and framing relevant problem areas, which then lead to the formulation of relevant design areas.

According to our analysis, many co-creation projects tend to have an open-ended approach as their aims are often to frame key problem areas in complex service systems. Burns, Cottam, Vanstone, and Winhall (2006) explain that "complex challenges" in current society are messy and more difficult to solve with a straightforward planning process (for "wicked problems", see also Rittel & Webber, 1973). We found that although a co-creation project is launched with a pre-defined brief, the brief can be re-framed to be more open-ended along the way as various stakeholders collaboratively frame and reframe objectives. Lanzara (1983) long ago suggested that a large part of the design process, especially in large-scale projects and organizations involving several actions, is not dedicated to analytical work to achieve a solution. Rather, much work of the designer is concerned with collective definition of the relevant problem and how to see it. The following cases demonstrate this finding.

Case 1

The hospital management team's initial brief proposed an architecture project focusing on the physical space solutions based on patients' needs. In early project meeting, the design researchers and management team realized that the brief should be more open-ended in order to identify real problems and create solutions for these beyond the physical space. The management team also wanted to develop effective approaches for patient engagement and co-creation. The brief was revised to be more open-ended, which led to a more exploratory process, encouraging the design researchers to create and experiment new types of co-creation methods.

Case 2

The original brief was concerned with designing an improved front-end for a global company's innovation process, starting from the existing innovation process model and aiming to promote the quality of ideas and the efficiency of the innovation process. This focus was defined in the project planning phase and arose from the company's internal needs. After the first process simulation workshop, the researchers and participants realized jointly that the initial focus neglected many of the undocumented and messy practices within innovation. Hence, the project team collaboratively reformulated the brief into a more open-ended form, i.e., the creation of new co-design tools and concepts to support the organization in changing its innovation practices. In the course of the project, the company shifted from a technology and results oriented view of innovation to a more human-centered orientation. For example, they began rethinking the roles of champions and the competencies needed to facilitate innovation.

2. Purpose of Change

Our analysis shows that the purpose for changes in a co-creation project can vary from customer experiences (customer level) to organizational practices and culture (organizational level) to an entire service system and a collaboration network (cross-organizational level). This finding is in line with the multiple levels of service design identified by Patricio, Fisk, Cunha, and Constantine (2011). Beyond these, an added purpose for change can be at the level of society in promoting new values and culture (Meroni & Sangiorgi, 2011).

We found these purposes for change involve a change in employees' mind-sets and practices, and in organizational culture. In addition, the different levels of change influence each other. Designers and researchers of a co-creation project will need to identify a main purpose of change on the map on different levels to determine the design scope and participant dynamics.

Case 1

With the open-ended brief, the project team altered the purpose of change from designing a new cancer center space based on patients' needs to the creation of new service experiences for patients and embedding patient-centered innovation approaches in the hospital.

Case 2

The project initially aimed to improve the employee's experience of using the new digital tool. The introduction of the tool, however, created a need to establish new roles, responsibilities and a tutoring system, including information about the new innovative working culture. Furthermore, it was realized that setting up a new service system was not enough; a simultaneous wide-scale change in organizational practices, employees' roles and attitudes towards collaboration was required.

3. Scope of Design

Although the design choice for "purpose of change" considers fundamental agenda and impacts of the project in a broader and long-term sense, "scope of design" is concerned with what is to be designed during co-creation activities. The most concrete scope of design focuses on service touchpoints and interactions where a customer has direct interactions with physical, digital

or human touch points. Beyond what customers can see and experience, the scope of design can also be on the operational and organizational level, including organizational processes and tools or cross-organizational collaboration models. As Patricio et al. (2011) explain in their analysis, the scope of design broadens for co-creation projects which aim to design a new service concept, new types of value co-creation platforms or business models. From more current projects, we found that the scope of design expands from designing products or services to that of conditions or platforms for future actions as Manzini (2011) puts it.

Case 1

As the main purpose of change was to design new service experiences for patients, the scope of design focused on new types of services and processes at the cancer center, including a new patient journey, spatial layout, environment and atmosphere, touchpoints like furniture, equipment and communications and so on.

Case 2

The initial scope was on improving the interactions of employees in the digital tool, including the roles and responsibilities in each phase of the innovation process and improvements to the user interface. However, as the work proceeded, developing new approaches to innovation in the company raised wider questions concerning, for example, multiculturality, work processes and the technological ecosystem in the organization. Thus, the scope of design widened to developing the whole service system around the IT-tools that can support new innovation processes.

Design Choices Related to Participants

The design choices included in the "participants" category concern who has relevant knowledge, what types of interests are involved and consideration of the power dynamics in the project.

4. Diversity in Knowledge

Co-creation takes place when involving various stakeholders who hold relevant knowledge and in seeking to achieve a polyvocal perspective in the design process (Muller & Druin, 2012). The 13 case projects required knowledge from different areas of expertise and scopes to solve complex social and business challenges.

In selecting the participants for the co-creation group according to knowledge diversity, we found two requirements for successful co-creation, these being holistic knowledge and hologram structure in line with Smeds' (1994) framework on knowledge sharing and management. The participants of a co-creation group should: 1) together possess all the requisite knowledge of a product, service, or process that they develop (holistic knowledge); 2) bring together into co-creation effort the practice-based knowledge of all identified stakeholders (organizations, functions, business areas, hierarchical levels, customers, etc.) whose practices will be affected by the co-created product, service or process (hologram structure). Holistic knowledge and hologram structure of a co-creative group

are needed for developing viable ideas that can be successfully implemented into innovations (Smeds et al., 2003). A co-creation project can thus be analyzed according to the diversity of knowledge it encompasses and according to the influence of this knowledge diversity on the success of the project.

Case 1

The participants represented healthcare staff, patients, architects and design researchers. The group presented a high knowledge diversity: the healthcare staff had extensive knowledge of the care processes; the patients could bring in their felt-experiences related to the hospital and the care processes; the architects needed to understand those stakeholders' knowledge and at the same time provide architectural knowledge to the project; lastly, the design researchers brought their expertise for design of the co-creation process and tools and facilitation of the collaboration among different stakeholders.

Case 2

Case 2 involved a group of stakeholders who together possessed diverse practice-based knowledge according to their fields of expertise, these ranging from R&D managers and engineers to marketing and service experts, from different hierarchical levels within the company and also from different geographic locations. To involve the knowledge of employees outside the geographical location where the project took place, the employees from six different countries were interviewed and the data was introduced as persona descriptions in the co-design workshops.

5. Differences in Interests

When there are several stakeholder groups in a project, interests can be varied and complex. We found that taking different stakeholder interests into account can influence the success of the co-creation project as also observed by Ramaswamy and Guillart (2010). The project team needs to carefully design the way different interests can be taken into account and the way in which stakeholders can be involved by considering the complexity of their relationships and possible conflicts. Stakeholders' different interests also influence their roles in co-creation activities and the way the project outcomes are created.

Case 1

The stakeholders had different interests in their participation. Hence, the project team needed to design the entire process to support the different interests. The project management team was keen to collect good ideas for new design and learn new approaches for patient involvement; hospital staff wanted to contribute their professional knowledge for the process optimization and more effective and friendly interactions with patients; patients were keen to express their needs and influence the design of the hospital; architects' interest was to gain an understanding of all those needs and ideas expressed by the hospital staff and patients. In addition, the design researchers had an interest to develop and experiment new types of co-creation methods. As a result, the co-design workshops were developed using patient journey mapping and a full-scale

participatory prototyping technique to enable hospital staff and patients to bring their experiences and knowledge, for the project management team and the architects to learn about the needs and new ideas, and for the design researchers to experiment with new tools.

Case 2

The R&D management who initiated the project aimed to renew the innovation practices and digital tools. While some employees saw the introduction of the digital innovation tool as an opportunity to create a collaboration platform among experts, some others saw it as a threat to the existing system that supports professional merit for individual work. The design researchers had an interest in experimenting with different co-creation methods and learning about their use in organizational development. In the five workshops, the design researchers employed various kinds of visual objects and facilitation techniques, for example, process simulation, personas, scenarios, process concepts with metaphorical design and storytelling with idea cards to help the participants negotiate their different interests (for details of the tools, see Salmi, Pöyry-Lassila, & Kronqvist, 2012). Those exercises helped the participants explore each other's motivations and concerns as well as build an empathic understanding of each other's experiences and the meaning of the whole co-creation process. In the last co-creation workshop, the managers and the employees were able to co-create a roadmap for future innovation practices where the differences in interests had been resolved.

6. Distribution of Power

Participants in co-creation projects have different degrees of power due to their different knowledge levels, interests, roles, societal and organizational backgrounds and so on. Considering the power asymmetries, designers and researchers who facilitate co-creation events apply tools and settings that aim to empower participants with less power to express their views and provide equal chances to all participants.

We found from our analysis that the diversity in power also exists between designers who facilitate the co-creation event and participants who have less expertise in creative activities. The level of power given to the designers as facilitators can also vary depending on the goal of the co-creation event and the complexity of stakeholder relationships. The facilitators can choose to take either a neutral position or an active collaborator position as Schein (1988) puts it. The neutral facilitator focuses more on supporting the participants to solve the problems on their own, minimizing their inputs for idea generation and decision-making, while the active collaborator-facilitator both facilitates the process and participates in idea generation and decision-making. When the participants lack ideas and cannot think out-of-box, designers could play the latter role in the co-creation, using their expertise of making creative inputs. Kankainen, Vaajakallio, Kantola, and Mattelmäki (2012) call this role of designers in the co-creation *creative secretary*. In order for users to take an equal role, they need to be given the necessary equipment for idea generation and visualization.

Case 1

In the early phase of the project, the design researchers noticed a power distance especially between the hospital staff and the patients due to their different knowledge levels of the care process and social roles in a hospital. This might hinder the patients from confidently presenting their ideas. The design researchers thus paid special attention to the power distance when designing co-creation activities to empower the patients regardless of knowledge backgrounds and to develop a full-scale participatory prototyping technique. With that technique used in a workshop setting, all participants move around and work in a visual and making mode, regardless of their expertise backgrounds. During the co-design workshops, the design researchers tended to play a neutral facilitator role, focusing on helping the participants perform the co-creation tasks rather than making creative inputs as the architects were in charge to make new design proposals.

Case 2

The workshops in Case 2 aimed at levelling out the power difference between managers and employees by requiring an equal hands-on participation from both and by using the difference in experiences as a source of new ideas. In the process simulation workshops, the researchers—as facilitators—used their expertise in process modelling and simulation. They guided the company representatives in their innovation process modelling and facilitated the subsequent process discussion but refrained from taking a stand on substance related matters as the company representatives were the experts who possessed the knowledge of what their work entails. In the co-design workshops, the participants were required to explore the process from the viewpoint of the others and to work curiously on an unfamiliar ground by using visual and storytelling methods such as personas, scenarios and idea cards (Salmi et al., 2012). This way of working resulted in a fine-grained understanding of the requirements of collaborative innovation.

Design Choices Related to Co-creation Events

The design choices related to "co-creation events" concern what types of co-creation activities are chosen and developed according to project preconditions and participants and what the setting should be like in order to achieve desired outcomes.

7. Types of Co-creation Activities

The activities in co-creation projects aim at eliciting knowledge from stakeholders and creating new ideas, which can be achieved through a step-by-step procedure that moves from articulating experiences and building mutual understanding to generating future ideas together. These phases are often structured as a multi-stage process within one co-creation event or a series of co-creation events during a project, as observed in previous design literatures (e.g., see Binder & Brandt, 2008; Sanders & Stappers, 2014; Vaajakallio & Mattelmäki, 2014). The best-known practices include Future Workshop in participatory design (e.g., Kensing & Madsen, 1991), the overall framework for which

proceeds through critiquing the present, envisioning the future and implementing, and generative tools (Sanders, 2000) under an overall conceptual strategy that combines market research (what people say), ethnography (what people do) and participatory design (what people make).

From the knowledge co-creation perspective, these steps can be explained as knowledge dissemination, knowledge sharing and knowledge creation according to the knowledge boundaries that need to be crossed (Carlile, 2004) and the type of learning occurring (Paavola, Hakkarainen, & Lipponen, 2004). In disseminating activities, knowledge is transmitted by a sender to a recipient when participants express their experiences and different perspectives through visual and narrative tools. In knowledge sharing activities, knowledge is shared between participants through dialogue. These activities include plenary discussions and workshops which aim to visualize different views, build empathic understanding and create a shared meaning and a collaborative relationship among the participants. In knowledge creating activities, knowledge is co-created by the participants in the form of ideas, concepts and solutions. The focus of co-creation often takes the form of developing shared artefacts. The following cases illustrate how this occurs in practice.

Case 1

Co-creation activities in Case 1 were designed by considering the purpose of change and the scope of design in the project as well as different knowledge, interests and power distribution among the participants. The full-scale participatory prototyping technique was applied in the workshop so the participants could model the spatial arrangement and the interactions together and physically experience how the future services would be (see Figure 4). Before actual prototyping, however, the workshop consisted of gradual steps of knowledge dissemination, sharing and creation to help build ideas on a shared understanding of the different stakeholders.

Firstly, all participants were asked to bring pictures to the workshop of places that were inspirational and pleasant for them. The workshop started with the participants' telling stories about the pictures to other participants, followed by discussion of the kinds of experiences a new hospital might provide. The participants then built a journey map about patient care processes. Visualizing each step of a patient journey through discussions helped the participants negotiate their ideas and

build a shared goal for participatory prototyping. After this, the participants started participatory prototyping with the real-size cardboard furniture.

Tools for visualization and physical modelling provided a shared means of communication for participants from different knowledge domains, helping to avoid situations where the doctors might use medical-specific terms or the architects might use architecture-specific terms, which could create a power distance and hinder equal participation. Further details of the co-design process and participatory prototyping techniques can be found in Kronqvist, Erving, and Leinonen (2013).

Case 2

The project included a series of altogether five co-creation workshops, out of which one was process simulation with the case company participants and four were co-design workshops. The process simulation workshop started with a presentation by the manager on the status of the innovation tool and the development of the innovation process in the company. This was to facilitate a shared understanding of the project background and motivate the employees to participate in the workshops as there were knowledge boundaries arising from differences in professional backgrounds and roles in the innovation system. In the workshop, discussions concerning the participants' different experiences of innovation and their expectations regarding the innovation process supported the creation of shared meanings that provided the basis for development.

Knowledge sharing about the process in the workshops was followed by co-design exercises in which the groups developed shared artefacts. The researchers believed that such concretization helps participants to negotiate the key aspects of ideas or concepts, embodied participation or the use of different materials help the participants engage in knowledge co-creation while recording ideas in the form of words and pictures helps participants recall the ideas and develop them over time. Further details of the co-creation activities in Case 2 can be found in Salmi et al. (2012).

8. Setting for Co-creation

In addition to a co-creation activity's type, a project team also needs to pay attention to the physical setting of the activity. We found that the physical location of the activity and the design of different materials influence the success of a co-creation event.

Figure 4. Co-creation activities in Case 1: Storytelling with pictures (left), building a shared goal by mapping a patient journey (middle), participatory prototyping with real-size cardboard furniture (right).
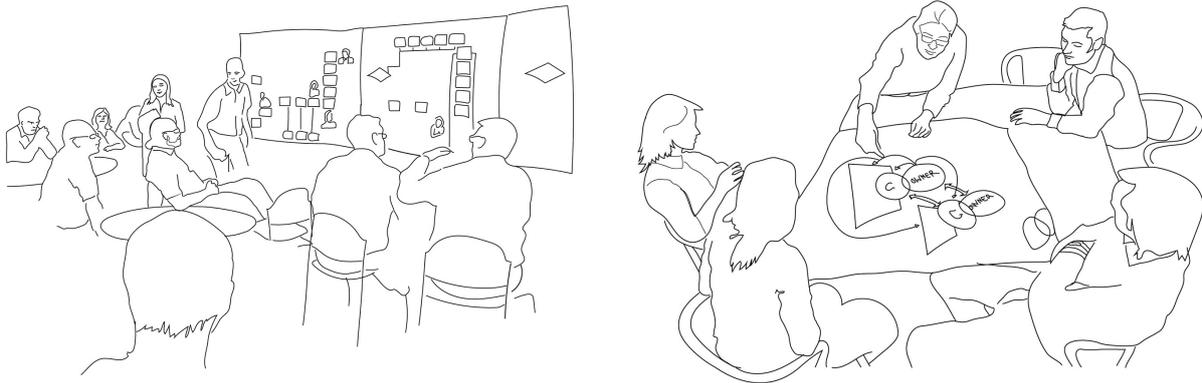
Figure 5. Co-creation activities in Case 2: Discussion about the innovation process (left) and co-design of new ideas (right) (pictures redrawn due to non-disclosure agreement).

In participatory design, siting and setting of co-creation has been recognized as one of the important parameters. Muller (2003) emphasized that the selection of site can be a deliberate strategy to introduce new experiences and perspectives to one or more practices in the design process—*a de-centering move that can bring people into positions of ambiguity, renegotiation of assumptions and increase exposure to heterogeneity.* The designer's role is important in creating "the third space" beyond the participants' domain boundaries. The third space contains an unpredictable and changing combination of attributes of each of the bordering spaces (Bhabha, 1994; Muller, 2003). Recently, the importance of the material settings of co-design has been as also emphasized by Eriksen (2012).

In organization sciences, there has been an upsurge of interest in the material side of knowledge creation, on objects and artefacts that support knowledge creation and on spaces that support creative group processes. The material setting can motivate action, facilitate collaboration and provide infrastructures for work (Nicolini, Mengis, & Swan, 2012). The following cases illustrate how designers and researchers then considered the setting for co-creation.

Case 1

The design researchers paid careful attention to the physical setting, materials and atmosphere of the workshop to encourage the participants to be motivated and generative. They first piloted the workshop in the hospital building. It was found that the existing power distance between the hospital staff and the patients influenced their collaboration, the familiar environment hindering them from thinking out-of-the-box. The design researchers, therefore, set up the workshop in a TV production studio with full scale, simplified cardboard models of furniture that resembled hospital beds and equipment—"the third space" according to Muller (2003). This decision was to freshen the participants' existing perception of a hospital but still give them a symbolic association with the hospital.

Case 2

The researchers paid attention to the ways in which the participants' knowledge creation could be enabled through spatial arrangements and various artefacts. In the process simulation room, the seats were organized in a comfortable cafeteria layout to diffuse the division between a stage and audience and to encourage discussion and participation. To facilitate the process discussion, a visual process model, enhanced with persona descriptions, was projected on a 10-meter white board. Being able to view the process as a whole and to perceive it in all its complexity was eye-opening to the participants. For the co-design workshops the researchers chose to invite the participants to a site different from their ordinary working environment, a university working space designed for creative collaboration. The choice of space for the co-design workshops was to inspire the participants by providing a new experience of an innovative place for collaboration.

Design Choices Related to Project Results

The "project results" category includes two levels, from immediate results and deliverables as "outputs" of the project to further implementations and impacts as "outcomes" of the project.

9. Outputs of the Project

Various kinds of outputs are produced from the co-creation activities during the project. Some are immediate outputs from the activities created by the participants. Some are consolidated reports and proposals by the researchers or designers. The outputs of the project can vary in a range from ideas about concrete changes and their visualizations (e.g., improvement ideas, touch points, customer journey maps) to new service concepts (often presented as scenarios, videos, service blueprints and process models) to future strategies (e.g., a set of experience goals and future road-maps). At the end of the project, the outputs are handed to the project owners as deliverables.

The scope and content of the outputs are influenced by the preconditions for the project, i.e., purpose of change and scope of design. In addition, the medium of the outputs, whether documents, visualizations or prototypes, are decided for efficacious delivery of the content. Already defining the outputs of the project at the beginning of the project informs how to collect findings and ideas during the project as well as who will do this.

Case 1

After the co-design workshops, the design researchers created a report that compiled key stakeholder insights and new design ideas for the hospital with visualizations. The report also included the descriptions about the methods, including the participatory prototyping and patient journey mapping. The reports were to fulfil the interests of the project management team and the architects in collecting patient experiences and new ideas as well as learning new methods for involving patients in the innovation process.

Case 2

The results of the first process simulation were compiled into a written report, whereas the results of the latter co-design workshops were summarized in slide sets that included visualizations of the company's future innovation process and the concept of the digital tool as well as digitized material for shaping tomorrow's innovation workshops. The co-design process produced grounded recommendations about the new front-end innovation practices and about the related digital tools. It also produced strategies for developing the roles in the innovation system in the form of user profile posters, process concepts, scenarios about future uses of the tool and a five-year roadmap for the future development of innovation practices in the organization. The outputs of the co-design process took advantage of various visual formats whereas the process simulation report employed a textual manner of presentation.

10. Outcomes of the Project

The co-creation projects in our analysis created impacts and further implementations beyond the project outputs. They include new mind-sets, processes and culture, future project ideas and so on. The outcomes of the project usually refer to the direct effect on target population, which could result from outputs of the project as well as other changes gained in the participants or the project context (Munns & Bjeirmi, 1996; Wardale, 2013; Sangiorgi, 2011). Whether the goals of the project are achieved depends on many different factors in the project and its context. The implementation of the outputs of the project also plays a role. The analysis of the outcomes of the project gives important information about its success. Poor outcomes can be a signal of a problem in the planning and execution of the project. Sometimes the projects can also have unintended consequences or a wider impact than initially expected.

Case 1

As the proposed ideas for the hospital are now in implementation, the effect on patients' experiences cannot yet be evaluated. However, there has been evidence on changes in hospital management towards adopting more active patient-centered, co-creation approaches in their innovation, for example, planning a series of future projects on patient-centered services by working together with patients. In addition, the co-creation workshops and participatory prototyping techniques applied in the project have gained strong attention from service design communities and the healthcare sector inside and outside Finland.

Case 2

The service system stabilized its position in the company's "tool ecosystem" to a point that the managers decided to continue the expansion of the user base. The novel front end of the innovation process, supported by the ecosystem of tools, should enable non-linear work processes and collaboration through time and space. Simultaneously, an organizational transformation process was set in motion in the R&D function of the company. This change concerned a rethinking of role assignments, the integration of work processes and tools to the innovation process, company policies as well as adopting a human-centered mind-set and methods to develop organizational practices. Due to the wide scope of changes to be made, the complexity of the network of actors involved and the multinational nature of the organization, not all the changes could be implemented during the two-year project, but a five-year road-map was drafted to support the continuing of the development process.

In Table 2, we overview the ten design choices and summarize the case illustrations on how the attributes of each design choice have been considered and the decisions have been made in the co-creation projects.

Discussion

The design choices framework helps us understand what kinds of dimensions a co-creation project consists of and which attributes and alternatives can be considered and chosen between when planning and conducting the project. In addition, we identified influential relations among the different design choices.

Influential Relations among Design Choices

In the previous section, we explained how one design choice influences decision-making for another, consequently shaping the co-creation project as it proceeds. From the illustrations of the design choices in Case 1 and Case 2, we identified a few influential relationships, especially (a) between participants' knowledge, openness of the brief and purpose of change, (b) between scope of design and participants and types and settings of co-creation activities and (c) between interests and power of the participants and outcomes of the project (see Figure 6).

Between Participants' Knowledge, Openness of the Brief and Purpose of Change

In both Case 1 and Case 2, we observed that the involvement of diverse knowledge of participants widens the openness of the brief, which in turn leads to reframing the purpose of change. In Case 1, for example, the involvement of design researchers at the early phase of the project made the project brief more exploratory in order to identify real needs of the patients and develop new methods for patient-centered innovation at the hospital. This widened brief reframed the purpose of change from the design of the space to designing for new patient experiences and embedding a patient-centered innovation approach in the hospital.

Table 2. Overview of the ten design choices and design choice illustrations in the case projects.

Design Choices	Case 1: TULE project	Case 2: VisciTools project
Category 1: Project preconditions		
Openness of the brief is often required in co-creation projects as various stakeholders frame key problem areas during the projects.	Widened to identification of real problems and co-creation of new ideas	Widened to co-creation of new ways of innovation with the employees
Purpose of change varies among the levels of; - customer experiences - organizational practices and culture - collaboration networks - new values and culture in the society	- Creating new service experiences for patients - Embedding a patient-centered innovation approach	- Effective use of a digital tool - Re-designing innovation practices - Transforming organizational culture to innovation, from tech-oriented to human-oriented
Scope of design varies; - service touchpoints and interactions - organizational processes and tools - cross-organizational work models - service concepts and business models	- Spatial arrangement and touch points in a future hospital - Service interactions and patient journey	- New ways of utilizing the tool - New processes & tools that support innovation - Service system that supports the front end of the innovation process
Category 2: Participants		
Diversity in knowledge for successful co-creation can be achieved when the participants; - together possess all the requisite knowledge of what to design - bring together into co-creation effort the practice-based knowledge of all identified stakeholders	- Hospital staff: medical and care process knowledge - Patients: patient experiences - Architects: architectural knowledge - Design researchers: co-design knowledge	- Company R&D management: management agenda - Company employees in different fields, positions and geographic locations - University researchers: knowledge on process innovation and co-design
Differences in interests by different stakeholders are often complex. It is important to identify the possible conflicts and complexity and take them into account when designing the co-creation activities	- Hospital staff: designing an effective work environment - Patients: expressing their needs - Architects: understanding client needs & design ideas - Design researchers: experimenting new co-design methods	- R&D management: renewing innovation processes - Employees who see the project intent as an opportunity or a threat - University researchers: experimenting new co-creation method
Distribution of power could result from different organizational and knowledge levels, interests and roles.	Power differences between hospital staff and patients, and between architects and other participants, influencing the choice of methods: pictures for sensitizing and expressing; full-scale prototyping as a shared language	Power differences between managers and employees, influencing the choice of methods: visual and storytelling methods (personas, scenarios and idea cards) for articulating employees' needs and roles
Category 3: Co-creation events		
Types of co-creation activities consist of step-by-step activities for: - articulating experiences - building a mutual understanding - generating future ideas together	- Storytelling with pictures - Collaborative mapping of a patient journey - Full-scale prototyping of a future hospital and care models	- Process simulation workshops for a shared understanding of the current status and the project aims - Co-design exercises with hands-on materials (persona building and idea cards)
Setting for co-creation should be a deliberate strategy for effective power distribution and idea co-creation.	Full-scale cardboard prototyping in a TV production studio to provide a fresh environment yet with hospital metaphors	- Cafeteria-like seat arrangement to diffuse division - Visual process model on a large screen for a holistic view - Setting up workshops to an environment inspiring for creativity and collaboration
Category 4: Project results		
Outputs of the project are immediate results and deliverables; - new ideas about concrete changes - new service concepts - future strategies	- Compilation of insights and new design ideas with visualizations - Method descriptions	- Improvement ideas for the tool and the innovation system - Strategies for the system - 5-year future roadmap
Outcomes of the project can be analyzed for important information about project success.	Planting patient-centered culture in the hospital	Wider-scale organizational transformation process

(a) Involving stakeholders with diverse knowledge leads to a more open-ended brief
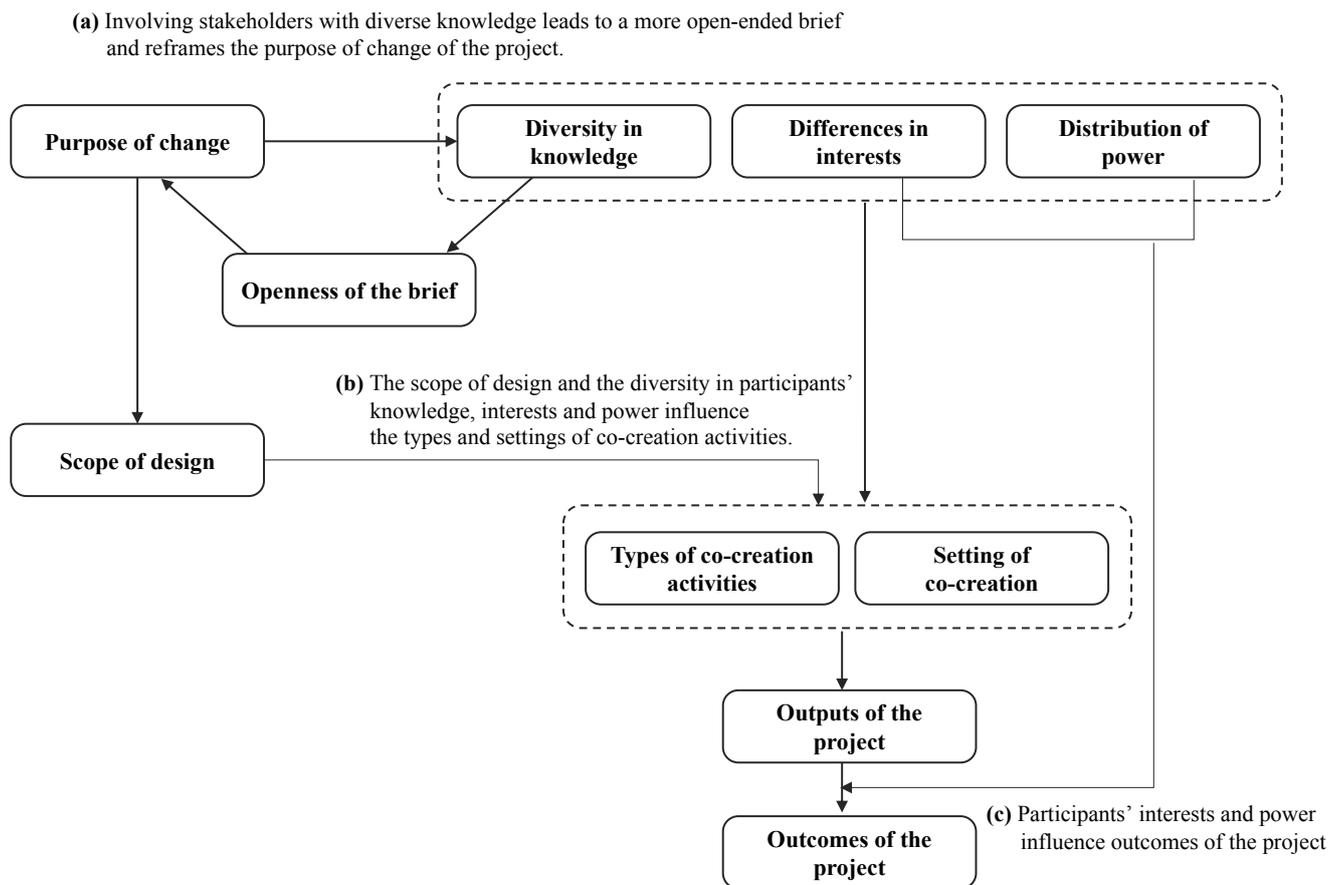and reframes the purpose of change of the project.

Figure 6. Influential relations of the design choices.

A similar inter-relationship was found in Case 2. The original purpose of change was to improve the innovation process by using a new digital tool based on the formal innovation model. In the early phase of the project, the research group interviewed the employees and recognized limitations in the formal innovation model. This finding drastically widened the brief of the project in order to co-create new ways of innovation with the employees and to transform the organizational culture to innovation from tech-oriented to human-oriented.

Scope of Design and Participants Influencing Co-creation Events

The design of co-creation activities and settings was importantly influenced by the scope of design and the dynamics of the participants. In Case 1, the scope of design was about new space and touch points as well as service interactions and patient journey in a new cancer center. This led to the use of full-scale participatory prototyping techniques to simultaneously model the space, the equipment and interactions. In addition, the differences in knowledge, interests and power among the participants had an important effect on the decision regarding co-creation activities and settings. Hands-on creation and bodily experiences with visual and tangible materials were chosen to encourage

the hospital staff, patients and architects to collaborate beyond their own professional domain and societal roles. Realizing the prototyping workshop in a TV production studio was the design researchers' experiment to diffuse power distance and help the participants think out of the box.

In Case 2, the researchers chose to combine hands-on co-design workshops with process simulation when the scope of design widened from innovation in the formal process to new ideas for the whole digitally supported innovation system. Because the workshop participants were from different levels of the company, including managers and subordinate employees, power distribution was also an important dimension in choosing the activities and settings for co-creation. Visual and storytelling methods such as personas, scenarios and idea cards helped to articulate both managers' and employees' needs and to build a shared understanding of the roles innovation entailed in the company.

Participants' Interests and Power Influencing Outcomes of the Project

Another finding from analyzing Case 1 and Case 2 using the design choices framework is that the participant's interests influence the implementation and impacts of the project results, i.e., the

outcomes of the project. In Case 1, the project management team from the hospital had an interest in new approaches to involving the patients' experiences in innovation in addition to new ideas for hospital design. After the project, they were very active in promoting the co-design methods used in the project inside and outside the hospital, seeing the hospital become known as progressive in co-creation approaches involving patients. In Case 2, the company's R&D team initiated a wide-scale organizational transformation process following the end of the project. This was possible because they had enough power to implement the outputs of the project and leverage them.

We would like to note that it is not our aim to generalize these findings into some kind of formula of relationships among design choices. Our aim, instead, is to demonstrate how the design choices framework enables us to understand the dynamic and progressive formation of co-creation projects in particular project contexts. In doing so, the design choices also provide us with a framework and vocabularies to compare different co-creation projects and to understand their underlying similarities and differences.

Design Choices Framework beyond Methods Matrix

As explained earlier, co-creation projects are often built with a project brief that is open-ended and exploratory. This means that procedures and participating stakeholders might change along the way due to various contingencies that emerge. Problem areas and stakeholder relationships in recent co-creation projects are more complex than those in traditional product development. The impact of changes is also interrelated in a complex network. These characteristics inherent in co-creation projects make it challenging to plan and systematically analyze co-creation projects.

Traditional product development or user-centered design projects have been formalized and executed on types of methods that are used in different phases (e.g., see Laurel, 2003). During the cross-case analysis in this paper, however, we realized that creating a method-phase matrix for a co-creation project is fairly difficult and sometimes invalid. Instead of suggesting which methods to choose in certain phases, the design choices framework was developed to inform what variables and alternatives to consider in order to choose and apply more relevant methods. In this way, decision-making about the approaches can respond to various and changing contingencies around the projects.

As we demonstrated earlier, each design choice is not an independent entity, but relates dynamically to other choices. By "dynamically", we mean that the way different design choices are interrelated is not predefined but depends on the contingencies that emerge as the project unfolds. The design choices framework helps us plan a co-creation project so that it can adjust to changes and contingencies more flexibly. In other words, not only can the design choices framework help the designers and researchers systematically plan, understand and evaluate a co-creation project, it can also help them respond flexibly to the dynamic context of the project.

Conclusion and Future Research

The design choices framework can be used in practice when planning and evaluating co-creation projects. The framework gives the various dimensions that need to be considered, from setting the project preconditions and identifying relevant stakeholders to designing co-design activities and expecting the project results. In addition, by understanding the dynamic relations of different design choices, the designers and researchers of the co-creation projects can form a more flexible strategy to cope with project contingencies.

This study is the first step towards integrating knowledge and practices from different disciplines to create a holistic understanding of co-creation projects. The resulting design choices framework is based on the multi-disciplinary research from 13 co-creation projects. In this paper, we provide detailed analysis of only two of the cases. In future research, we will analyze the design choices and their dynamics in the remaining cases more deeply to further validate our framework. Future research can continue by looking closer at each design choice to identify the variety of alternatives within each choice situation and the dynamic relationships between the design choices in changing project contexts.

Acknowledgments

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