

**Digitalization
of Healthcare Services.
Backstage Communication
Channels at HUS**

Master of Arts Thesis

by Valeriya Azovskaya

Collaborative and Industrial Design Degree Program

Aalto University School of Arts, Design and Architecture

Supervisor Tuuli Mattelmäki

Advisor Jarkko Kurronen

2017

Helsinki, Finland

I would like to thank my supervisor Tuuli Mattelmäki for the professional guidance and support. I would like to thank Aapo Toivola and Jarkko Kurronen for their help and advice throughout the writing process.

I would like to express my gratitude to all doctors who found time to participate in the survey and contributed to the research.

I would like to thank my HUS case team, tutors and HUS representatives for inspiration and attention to the project.

Finally, I would like to thank my dear friends, Marina and Janne for their care.

Abstract

Digital technology has been transforming the way services are created, delivered and consumed. They support the everyday processes of organizations and have become a valuable asset in the competitive global economy.

Public healthcare has a lot of challenges in adopting new technologies that are not directly related to patient care. The most puzzling dilemma is the distribution of limited resources. Public healthcare backstage — the part that supports the frontstage operations but is not visible from the outside — is in an urgent need of transformation.

This master's thesis observes and suggests possible ways to overcome this challenge. It presents the complexity of public healthcare service, studies the reasons for digitalizing the internal communication channels that are part of public healthcare service backstage. Next, the thesis explores the processes that might support digital transformation of public healthcare services and assumes the challenges and opportunities for digitalization for stakeholders of public healthcare service.

The master thesis is supported by a case that was a study project in Aalto University School of Business. The project was a joint effort of Aalto University students and professors, representatives of Fjord and Accenture, and the clients from the Finnish public sector. The case for this thesis presents the project in collaboration with HUS (the Hospital District of Helsinki and Uusimaa).

Service design methodologies and tools were used as a framework for the thesis. The author tries to clarify how service design methodology and its tools are able to help in the digital transformation of public healthcare services and, especially, the backstage part of those services.

Author **Valeriya Azovskaya**

Master of Arts Thesis: **Digitalization of Healthcare Services. Backstage Communication Channels at HUS**

Aalto University School of Arts, Design and Architecture, Department of Design, Collaborative and Industrial Design Degree Program

Supervisor **Tuuli Mattelmäki**, Advisor **Jarkko Kurronen**

Year: **2017**, Number of pages: **94**, Language: **English**

Keywords: digitalization, healthcare, communication, backstage, service design methods, trends

ABSTRACT	5
Introduction	10
1. Service and designing for services	14
Service and the service design process	14
Shift from product to service-oriented economy	14
DESIGNING FOR SERVICES	16
Designing for public healthcare services	17
<i>Employees involvement in design process</i>	17
SERVICE DESIGN METHODS AND TOOLS	19
Research and data collection	19
<i>Observation</i>	19
<i>Interview</i>	20
<i>Benchmarking</i>	20
Methods for data analysis	21
<i>Service blueprint</i>	21
<i>Customer journey mapping</i>	21
DESIGN OF A SERVICE SYSTEM	22
Components of a service system	23
<i>Touchpoints</i>	23
<i>Communication channels</i>	25
TRENDS AND TRANSFORMATION OF PUBLIC SERVICES	25
<i>Collaboration and co-creation</i>	25
<i>User-centricity</i>	26

<i>Digitalization</i>	27
Public services transformation challenges	28
<i>Policies that support design for service development</i>	29
<i>Future and innovation in public healthcare</i>	29
2. Public healthcare: digitalization and trends	32
DIGITALIZATION	32
The components of digitalization	32
Public healthcare stakeholders and digitalization	32
PUBLIC HEALTHCARE TRENDS	34
Patient-oriented services	34
Digital healthcare	35
Mobile technology	36
CHALLENGES FOR PUBLIC HEALTHCARE SERVICES	36
Public healthcare services and digitalization	37
Digitalization of public healthcare in Finland	38
BENCHMARKING OF INTERNAL HEALTHCARE COMMUNICATION SOFTWARE	39
RADU	40
Apotti	40
Other software	41
Summary	42

3. HUS case	44
HUS INTRODUCTION	44
CASE INTRODUCTION	44
Reflections on the task and HUS values	45
CASE PROCESS	46
Team building	46
Preliminary research	48
<i>Ethnographic research: observation and interviews review</i>	48
<i>Benchmarking</i>	51
<i>Summary</i>	51
Hackathon 3-day intensive workshop	52
<i>Software network</i>	52
<i>Summary of interviews with HUS representatives during the hackathon</i>	53
<i>Ideation phase</i>	54
<i>Rapid prototyping</i>	55
<i>Summary of the workshop</i>	58
<i>Further development</i>	58
<i>Summary of the hackathon</i>	59
Final concept: 'first step' solution	60
Concept presentation and feedback	61
<i>Feedback from HUS representatives</i>	61
4. Analysis of the methodology and further development	64

CASE ANALYSIS	64
Tools used in the case	64
<i>Interview</i>	64
<i>Observation</i>	64
<i>Blueprint</i>	65
<i>Workshop</i>	65
Analysis of internal communication components	66
<i>Touchpoints</i>	66
<i>Communication channels</i>	66
Discussion: connecting objectives and the case	67
ASSUMPTIONS VALIDATION	70
Reasons for additional study	70
Interviews and survey summary	70
5. Conclusion	74
AGENTS OF CHANGE	74
Value of service design methods for digitalization of healthcare services	74
Stakeholders of public healthcare backstage development	75
SUMMARY, LIMITATION OF THE THESIS AND FUTURE RESEARCH	77
Limitation of the study and future research	77
Summary	78
REFERENCES	80
IMAGE SOURCES	86
APPENDICES	88

This thesis work observes and analyzes digitalization of healthcare services. With the focus on public healthcare system I aim to research internal components of public healthcare communication and study how service design tools can be applied to its digital transformation. The digitalization of healthcare communications, its implementation and development is a very important topic for the Finnish healthcare industry, considered a central tool for improving the efficiency and quality of the public service.

The idea for exploring the digitalization of public healthcare services, its internal communication channels and touch-points initially developed from the study project in Aalto University School of Business. All information gathered during this project and the concept proposal are forming the case for this thesis, described in chapter 3.

In general, the topics related to healthcare, digitalization and service transformation of businesses are very interesting but also complex. Hospital employees are experts of their work and very well familiar with the system and internal processes from within. This familiarity is very difficult to gain in a short period of time, hence, many insights for this work will come from the hospital staff, industry reports, articles, and interviews.

The main objective of the thesis is to investigate the process of digitalization for the public healthcare service, with focus on internal communication. Those studies include: understanding the reasons for digitalizing of internal communication in public healthcare; the processes that might support digital transformation of internal communication; and possible benefits and challenges of the digital transformation in healthcare for stakeholders of public healthcare, such as patients, medical personnel and other healthcare employees.

The research questions I would like to answer with my thesis are supporting the thesis objective. First of all, I would like to discover what are the possible benefits and drawbacks for developing digital channels of public healthcare internal communication. Then, I will examine challenges that could delay success of digitalization of the internal communication from the employees' perspective and suggest ways to conquer them.

Additionally, the contribution of service design with its methods and tools to the transformation of public healthcare communication towards a digital platform will be observed to support my findings.

Current thesis work consists of five chapters. First chapter 'Services and designing for services' presents literature findings on services, designing for services as well as trends and drivers for public service development. A big part of the chapter is dedicated to the service design tools and methodologies that are used for research and analysis in the thesis.

Second chapter 'Public healthcare: digitalization and trends' focuses on digitalization of services and opportunities it creates for the development of public healthcare. In addition, various opinions around the need for the communication channels development in public healthcare are inspected and summarized. Finally, a comparative benchmarking of solutions for internal communication in public healthcare is presented.

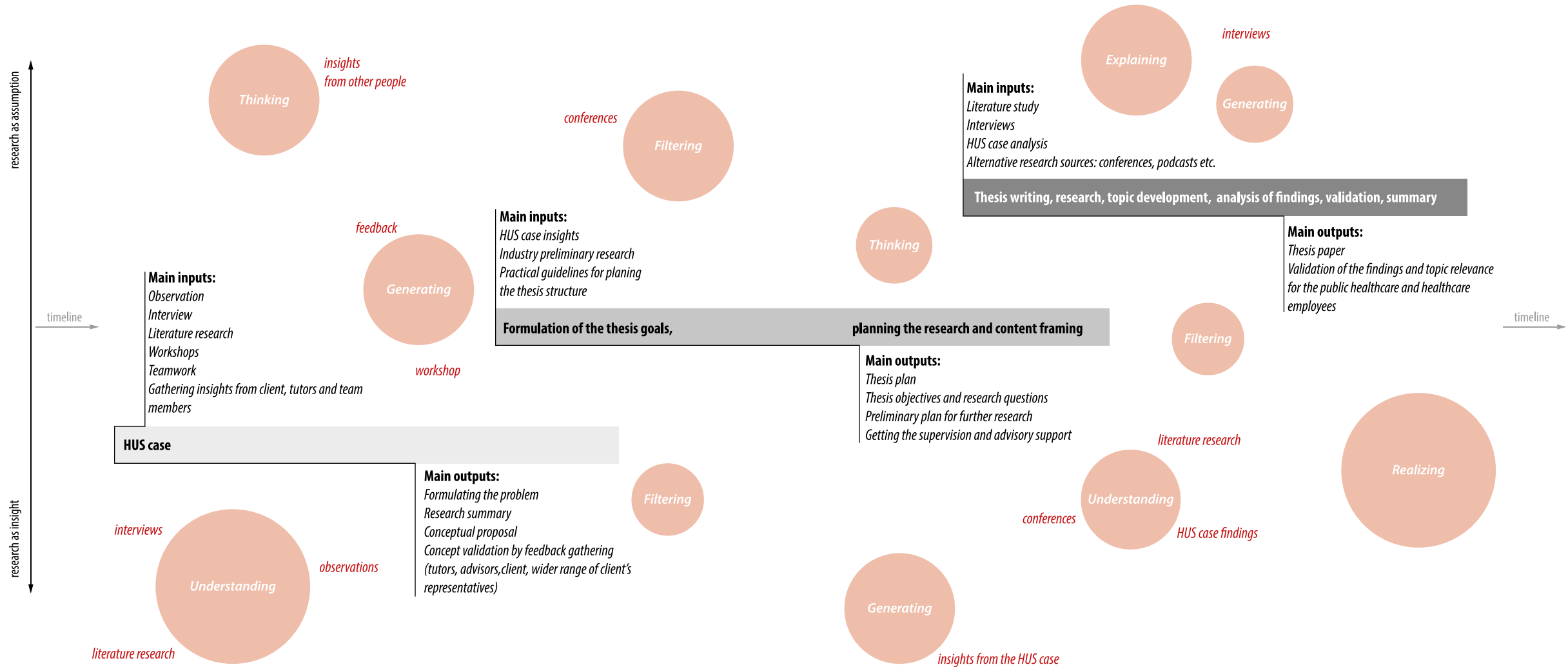
Third chapter 'HUS case' is dedicated to the HUS project. Therefore, the chapter starts with an introduction of our client, the Hospital District of Helsinki and Uusimaa (HUS) and a presentation of the brief. The following sections describe the project process with an emphasis on the service design tools that were used during the project.

Fourth chapter 'Analyzes of methodology and further development' is aiming to analyze the materials gained during the HUS case and the literature study, to reflect on them and to summarize the findings. The objective of the thesis is reviewed again in order to form the structure for evaluation. Additional research is initiated to support the thesis findings.

Finally, the fifth chapter 'Conclusion' is closing the thesis by evaluating the objectives and the research questions. Also, some possibilities for further exploration of the topic are proposed.

Additionally, the thesis includes the reference list of sources that were used for this work and number of appendices, that contain additional materials and support the main text.

The thesis process, and the materials that were gathered could be presented visually with the following graph:



Graph 1: Thesis design process

As it is seen from the Graph 1, some materials were collected during the HUS case, whereas some of the other sources are not quite usual for the academic work. The main reason for choosing such unusual sources as attending conferences and listening audio podcasts is to gain insights on current developments of the healthcare industry and public services, and to familiar-

ize myself with the practical approaches in service design. Those sources helped me to understand the current trends in healthcare, service design and public services. Also, participation in conferences, summits and festivals gave me supplementary understanding of the direction those industries are developing, and helped me to form my objectives and research questions.

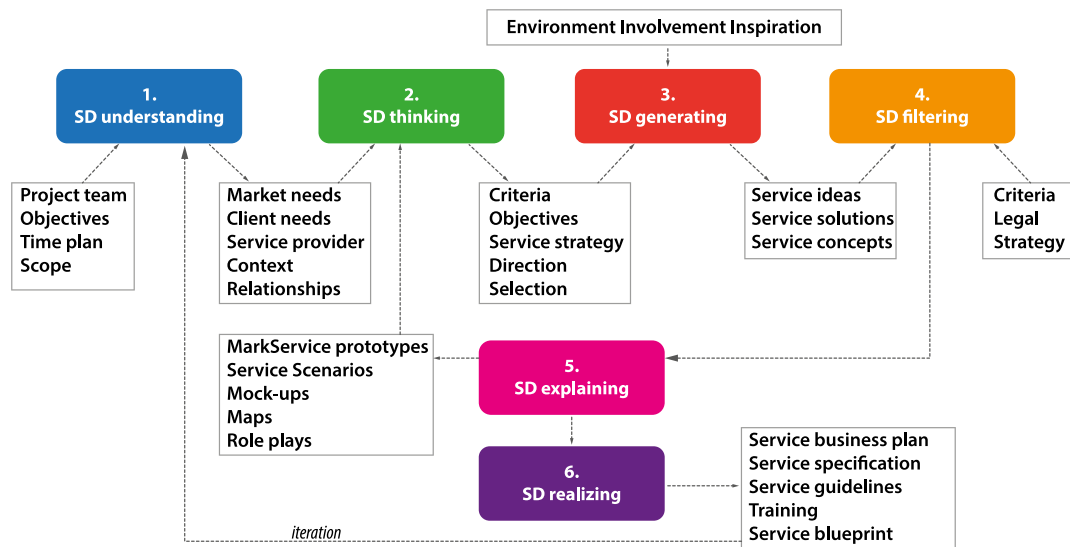
1. Service and designing for services

Service and the service design process

According to Polaine, Lovlie, and Reason (2013) the essential distinction of a service is that it creates value while being used. In addition, the authors are stating that any service should provide a value, in any combination and proportions: care, access and response. For example, a public healthcare service's core value is providing the care. Likewise, Shostack (1982) interprets service as something that has an immaterial nature and cannot be stored or owned, so service processes exist in time only. People are the central component of a service as collaborators and contributors.

Service design can be described as a very diverse or multifarious discipline. Moritz (2005) defines service design as a multi-disciplinary approach that focuses on "overall experience of a service as well as the design of the process and strategy that helps to provide the service" (p.39).

The service design process can be described in many different ways and the iterative nature of service design processes can be easily seen. For example, Moritz (2005) emphasizes six general categories that form a service design process and continuous iteration: understanding, thinking, generating, filtering, explaining and realizing:



Graph 2: Service design process introduced by Moritz (2005) in 'Service Design: practical access to an evolving field'

Shift from product to service-oriented economy

Till the very last decade the economies of many countries were mostly product-oriented. That means that the products had very small or nonexistent service components in them. Mont

(2002) reflects on the development of a service economy in contrary with a product-oriented one and states that "there are an increasing number of businesses that, driven by economic opportunity and innovative ideas, are shifting from a reliance on selling products towards the provision of services" (p. 89), that resulted in reduction of the environmental impact of manufacturing and forced companies to collaborate with other actors and to form alliances.

The main reason for this shift is the competitive advantage of providing the customer more satisfying experience, so, companies create new value proposition for existing customers and potential markets for the products.

In her work Mont observes the drivers and barriers for companies that could provoke the reorientation towards service-focused business models. The external drivers are about looking for new business development opportunities or survival options in case of tightening the legislation in the field of work. Improvement of performance, efficiency of resources and restructuring of organizational channels are the most common internal drivers for the development of a service business model.

According to Frantsi (2016), private and public sectors support the idea that the shift towards service and digitalization is an important asset for the future success of almost any business. Also, as it was mentioned in the forum report (Frantsi, 2016), the necessity of implementing a digital service oriented business model and shifting to a digital world in general is very well understood among the business society (Haukkovaara, CEO of IBM, opening words). Also, speakers of the forum mentioned the importance of commitment from the entire organization to implement digital shifts in practice (Miettinen, Director, Marketing and e-commerce, VR Group), the real need of collaboration among companies and industries (Koskelin, CIO, SVP, KONE, and Collin, Technology Manager, Sonera), and, finally, taking care of security issues while exchanging the data (Bernier, Minister of Transport and Communications, Finland).

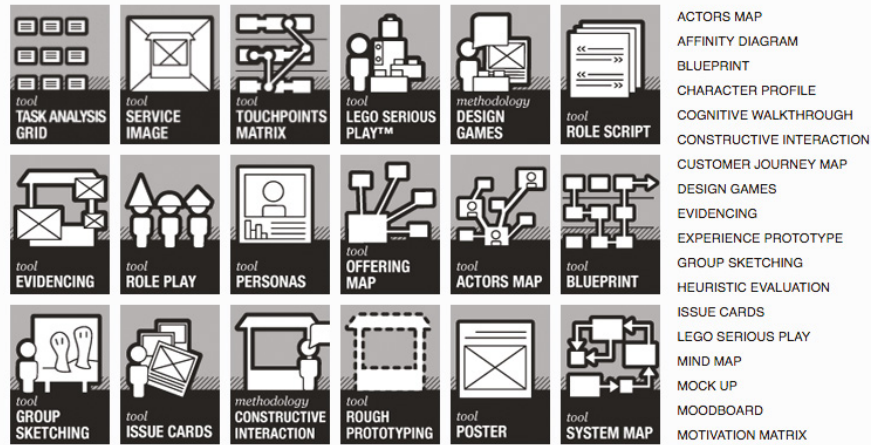
Service design practitioners are declaring the service revolution and the end of the industrial era monopoly (Thackara, 2005). Thackara claims that rapid service development is a natural process for economy and is in its premature phase. Services became one more tool that could help to differentiate the brand and product. Moritz (2005) connects it with the improved life quality in developed countries and general product saturation on the market and sees it as a part of company's survival strategy. He suggests that another driver for service economy is technology itself as service development relies on a "wide range of technological changes" (Moritz, 2016, p.26). Article by Karmarkar (2004) observes the struggles of a modern service economy and foreseeing even more cardinal changes. He suggests the investment in reorganizing strategies, processes and people for even more personalized-service oriented products and reconnecting to the future will be next step that no company can avoid.

DESIGNING FOR SERVICES

Meroni and Sangiorgi (2011) in their book 'Designing for Services' state that design for services as a process should develop a framework and a number of tools than can be used by service stakeholders to create value. While introducing 'Designing for Services', Manzini focuses on the emerging service economy and its strong social grounds. He claims that it is driven by the dynamics of social innovation and development of social networks that in its turn focuses on systemic interactions between different services and allows changes and initiatives come from the peripheral rather than from centers of decision-making. According to Meroni and Sangiorgi (2011) services are never complete and are constantly changing. A service is always a process, a dynamic combination of objects, people, and interactions between them. Despite the fact that service design is still an emerging discipline based on informal knowledge and assumptions (Kimbell and Seidel, 2008; Kimbell, 2009) it has developed a lot of tools to deal with diverse challenges in public and private sectors.

The authors of 'Designing for Services' suggest that in order to understand the problem, the user's need and context, a service designer's research should be based on tools that help to evaluate existing or imaginary future interactions, such as interviews, observations, shadowing, and emotional mapping. In addition, to achieve transparency and the ability to communicate, ideate and anticipate, designers should use "different kinds of visualizations and prototypes to make ideas tangible and let people explore possible future experiences and be involved in co-designing by using such tools as service blueprint, customer journey mapping, touchpoints matrix, experience prototype" (Meroni and Sangiorgi, 2011, p. 41-43). In his turn Moritz (2005) suggests that such tools as personas, focus groups, SWOT analysis, and card sorting could be used to group ideas, to proceed with the solutions, and to evaluate and test the concepts. The variety of options allows the designer to choose the most suitable tools for the project:

TOOLS



Graph 3: Some of the tools used in service design. Source: www.servicedesigntools.org

Designing for public healthcare services

Designing for public services is relatively unusual practice and require certain expertize, structural support from government, organizations, personnel and end-users. In Finland stakeholders of public healthcare are participating by bringing design in the regular agenda for public service transformation. Such organizations as Sitra (Finnish Innovation Fund), Forum Virium Helsinki are offering their support and involved in public services development. Academia is another very valuable contributor for promoting and support design research initiatives within public sector: Aalto University's constant collaboration with local municipalities and stakeholders of public services creates a pool of knowledge that is affecting future of public services. In recent publication 'Designing for wellbeing' (Keinonen, Vaajakallio and Honkonen, 2013) authors state that "design for wellbeing requires to be seen as a broad umbrella of activities that identify issues in systems and find technical solutions and practices" (p. 9). Designing for wellbeing and healthcare require the ability to step out from traditional disciplinary borders and participate in cross-disciplinary practices that quite often cannot be identified as a design.

Involvement of the variety of stakeholders, direct and indirect contributors in the designing for public healthcare services could help to tackle more broad field of issues than 'just a design' can process: as it described in the article included in the book, the administration, the healthcare providers, organizations, policy makers, local developers, people directly engaged with the healthcare service on a regular basis, are those who should be involved and contribute to the designing for public healthcare.

Employees involvement in design process

Heskett (1987) in his article for Harvard Business Review 'Lessons in the service sector' states the importance of the shared values among employees of a service organization. He introduced the 'Quality 'wheel' that is representing major factors that affect the success of the service and claims that "designing jobs that will motivates the employees will give a service providers higher visibility in dealing with customers, and build a peer group to foster teamwork and instill a sense of pride" (Heskett, 1987):



Graph 4: Quality 'wheel' by Heskett (1987). Source: <https://hbr.org/1987/03/lessons-in-the-service-sector>

At the same time regulations and strict policies very often could feel as dominating setup for healthcare professionals. The deep-rooted dogma that public healthcare service is not for experimenting and require strict protocol can block service improvements. Also, some of the healthcare practitioners mentioned that they do not feel the ability to contribute something to the service development and would like to focus on their job and treat the patients (Interviews conducted in 2017). The skepticism of healthcare professionals is quite understandable: they used to the established procedures that 'flow' from the top-down and so forth are forming 'proved to be safe environment' to work. For them, it is difficult to take design methods seriously and see the direct benefits from their direct involvement.

In their report, regarding the development of nursing internal communication Accenture (Dare, Lennon and Sanders, 2013, p. 14) presented a model of "key members" that could become ambassadors of change, support and help to develop digital platforms from inside of an organization. Those roles are:

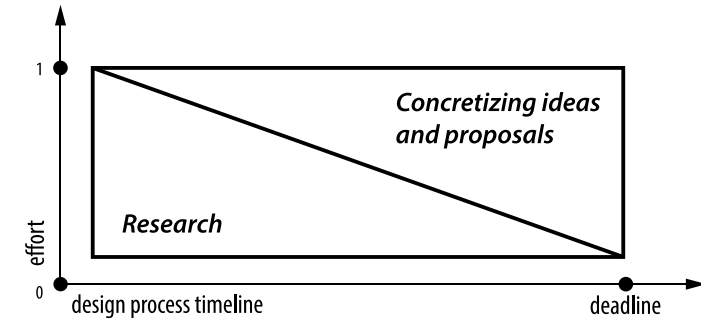
- Chief Staff officer, who is working close to the medical personnel, educating them on the digital practices, help to formulate the requests to further improvements;
- Chief Information Officer, who is responsible for linking the requests coming from the Chief Staff Officer to the IT department. This post should be also responsible for tracking policies and practices for the technology that should be banned and be proactive in searching for new opportunities and combination of the digital tools;
- Chief Executive Officer connecting the first two people responsible for the evaluation of digital environment to the business plans and budgeting: the financial impact and improved statistical goals should help to build the business case to prove the benefits of digitalization and restructuring the communication channels.

The report also mentions the importance to have both staff and management on board for successful communication improvement. Presented positions are connecting all hospitals internal communicational clusters that are fragmented and lacking unity.

Unfortunately, design is still a controversial tool for healthcare practitioners and healthcare management: both of them would like to see the solid evidence that will proof the ability of design positively influence on the public healthcare service development before contributing their own time and effort in any design research activity. Designers should be accepted as useful and trusted collaborators of the transformation, that are able to create value for various stakeholders, first of all for patients of public healthcare, medical professionals, and future economy. At the moment, taking design on board of public healthcare services is still considered as a risk, due to the novelty of this approach and not always a clear evaluation of the outcome. This thought can lead to the emerging need of popularization the design methods and democratizing design thinking and user-centric design practices for wider public and various fields and industries. One of the main goals is bring using of design methods in agenda of policy makers.

SERVICE DESIGN METHODS AND TOOLS

As a project is developing over time, the amount of information that is collected might change. However, design research barely stops at the certain point of the project. It continues after the observation phase and helps with the ideation, prototyping and other phases of design process:



Graph 5: Proportion of a research and a conceptual proposals, from author's lecture notes

Research and data collection

Many tools that designers use today for their design research practices are originated in social sciences and ethnography. As it stated by Millen (2000), such tools as shadowing, observation, videotaping and taking notes are driven by interpretation approach for data analysis.

It is also useful to distinguish the research approaches in design. According to authors 'Design research through practice' (Koskinen, Zimmerman, Binder, Redstrom and Wensveen, 2011) there are a few research approaches to take into account: user-centered design research (customer journey, persona profile), empathetic design research (probes, step into the user's shoes), practice-led design research (self-observation, learning by doing), material design research (exploration of materials through the experimentation and prototyping with intuition), ethnographic research (observation, interviews). Many of those research methods require a role of a collaborative researcher from the designer and can be handled differently, depending on project's need and types of collaboration.

The research methods described below, were used during the HUS case as well during the development of methodology for analysis of the case. These methods are: observation, interview and benchmarking

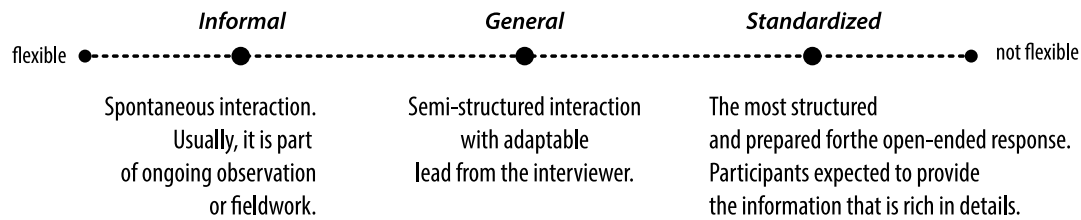
Observation

Observation of user or certain action in a real environment could be defined as a qualitative research that allows to have a "vaguely research question" (Marshall and Rossman, 2011, pp. 1-2) and follow the object of observation operating on theoretical frameworks and preliminary assumptions. Later on, additional request to collect more specific data could be added to the research agenda (Taylor, Bogdan, and DeVault, 2016). Thus, researches cannot know what would be the result of the observation, but the focus of research, the environment where the research

is conducting as well as the way of documentation are usually fixed. Depends on ways to document the research findings the researcher might need to have an agreement of the object to be observed. For example, in order to observe some part of the healthcare service, the researcher should have an access to the hospital and agreement with the doctors, patients and so on.

Interview

Interviewing is another very common research method that is widely used in service design practices. In literature three forms of interview design were suggested by Gall, Gall, and Borg (2003):



Graph 6: Types of interviews by Gall, Gall and Borg (2003). Source: Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Qualitative inquiry & research design: Choosing among five approaches*, 2nd edition. Thousand Oaks, CA: Sage.

As we can see from the graph above, the interview can have a different approach in preparing and conducting it. According to the Turner (2010), in order to conduct the efficient interview, the researcher could follow a certain framework that would help him to prepare for the interview, formulate the research questions and finally conduct the interview. Also, the interviewer should allow a certain flexibility for the interviewee and keep in mind that some of the questions can stay unanswered or misunderstood.

Benchmarking

Maire, Bronet, and Pillet (2005) suggest that benchmarking can be considered as one of the most effective approaches that can help company to improve the performance. Benchmarking is a comparative analysis of the performances between companies (Maire and Büyükközkán, 1998) and by definition suggested by Camp (1989), benchmarking is a research of the most powerful methods for a given activity, allowing to secure a superiority. This definition is quite broad and indeed, it is possible to benchmark anything, comparing all possible processes, services or products. Benchmarking is usually executed to understand what can be improved in the company, and adopt successful practices from outside.

The article 'Benchmarking: a general reading for management practitioners' (Fong, Cheng, and Ho, 1998), suggests the classification of benchmarking based on nature of the object (internal, industry, generic, competitor), content (process, functional or performance) and purpose (strategic, competitive and collaborative). Benchmarking reviewed as a common and regular practice for the company that could significantly improve company's position in benchmarked direction.

Methods for data analysis

Service blueprint

According to Bitner, Ostrom, and Morhan (2007), service blueprint can be used on many levels of the service developing and analysis. By defining services as a dynamic and mostly co-produced in real time by customers, employees, technology and various static physical properties, authors are stating that service blueprint is the tool that actually can illustrate all sort of relationships and processes of the service interactions between different parties, onstage and backstage components.

Service design practitioners Miller and Flowers (2016) refer to the service blueprint as a tool that brings clarity to the defining of the ongoing processes in the organization: "The fundamental value a blueprint provides is an objective picture, based in the reality of how your organization delivers, what they deliver, and the end-to-end view of how it is orchestrated" (Miller and Flowers, 2016. Blog post 'The Difference between a journey map and a service blueprint.'). Authors are suggesting that a service blueprint is not a direct tool that capturing customer experience as it does customer journey, but, it rather focuses on the customer's actions that are the first and the very important component of a service blueprint. Bitner, Ostrom, and Morhan (2007) support this definition and suggest "the essential components of service blueprint: onstage, backstage and support processes and finally, the physical evidence of the services that customers come in contact with while going through the process of the service offering" (Bitner, Ostrom, and Morhan, 2007. p. 6).

Customer journey mapping

Customer journey helps to understand customer's point of view, to formulate the challenges that client is facing during different stages of the service, and as a result, to create value and improve the service offerings. (Debruyne, 2014) Moreover, Debruyne (2014) is specifying that prioritization of the customers is not only the responsibility of the frontstage providers, but rather a rule for the whole system, including the backstage.

According to Kalbach (2016) a simple customer journey map can include a few rows: actions of the customer, state of mind and feeling of the customer, desired outcome for the customer and pain points. It is also considered as a road map for improvements and developing the service or product (Johnston and Kong, 2011).

The internal communication channels cannot directly affect the customer's satisfaction and positive patient's experience as there is no direct interaction between a patient and the backstage of the service. The literature and case studies that would explore the importance of backstage processes for the customer's satisfaction are numbered and backstage channels and processes are not the primary focus for many design agencies while developing the service (Zomerdiijk and Voss, 2011).

Service Blueprint and Customer Journey can be used to develop different dimensions of the service. The article that is exploring the difference between a service blueprint and a customer

journey suggests to consider a journey mapping “for mapping the emotional experiences of your internal actors in order to understand organizational pain, challenges, and opportunities for improvement” (Miller and Flowers, 2016). According to authors, a service blueprint is another tool that should be used for planning the internal structure of the service. Authors suggest to pay attention to the backstage of the service and not focus all the efforts only on direct customer’s experience. The service blueprint is a right tool that can help to see the exact components that require attention and can support the evolution of customer experience.

DESIGN OF A SERVICE SYSTEM

Public institutions and services usually are not flexible when it comes to the adoption of new technologies and structural transformation. Hyvärinen, Lee, and Mattelmäki (2015) state that public services need transformational changes to be able to sustain their complex eco-systems. At the same time, the authors agree that required transformations could be achieved only by long-term collaboration and commitment of the public sector stakeholders together with a shift from a tactical planning to the open-end development.

As it mentioned in the article ‘Participatory design and democratizing innovation’, design activities are able to support the creation of settings in which collaboration, experimentation, and development can happen, and create a wireframe for the feasible and viable services. (Björgvinsson, Ehn, and Hillgren, 2010). Public organizations should see the changes as a continuous process that requires the commitment from all levels of the organization: management, employees and even other stakeholders. Together, they should support the changes in order to tune the components of the service over time. The democratization of service design tools and methods for the company workforce, the co-creation of the service elements, and involvement of the different stakeholders in the collaborative designing activities can help to create the sense of the ownership and belonging to the result of the transformation and, by that, the commitment to a change.

However, the lack of resources, a slow decision-making routine in the public service organizations can be considered a barrier for the fruitful collaboration. Hyvärinen, Lee, and Mattelmäki (2015) are pointing out another challenge for changes, that is connected to the tendency of public sector employees to defend the established procedures of their work. Authors advocate that educating stakeholders and letting them participate in the development from the very beginning, will help to widen their perspective and positively affect the transformation.

It is almost impossible to set up the common rules and the research procedures to be able to apply it to the all cases of services transformation. Every project has its own unique issues, struggles, insights. The tools might be the same, but a designer should know, remember and understand them as tools, but not as a ready-made recipe that can be followed without an experiment, an iteration and an attempts to affect the system from the different directions. Lee (2014) in her article ‘The True Benefits of Designing Design Methods’ talks about empathic design: “The

open-ended, designerly nature of empathic design methods allows designers to re-create a variety of methods for different projects. The process of making and contextualizing empathic design methods is essential to their functionality” (pp. 5.1-5.12). In addition to the previously mentioned articles, this paper supports the idea of the flexible approach and attentive use of the resources that service design methodology could offer for the public services developing.

Components of a service system

Authors of ‘Fundamentals of Service Systems’ present the definition of word ‘service’ as “a process or activity between two economic units which changes the condition of the first economic unit, the customer and creates value for him”. (Cardoso, Studer and Weinhardt, 2015, p.10). A different number of stakeholders, facilities, tools and amount of materials could be involved in order to proceed with the service request. All those elements organized in certain structure, are interacting with each other and following some rules and procedures to achieve a certain goal together create a service system.

In case of a healthcare service, it is a complex service network that consists of both ways customer-provider relationship, that is the core of the service and its operations. In this kind of systems, the patient (end-user) has one more role as a provider by sharing information with other players inside the system (Cardoso, Studer and Weinhardt, 2015).

All interactions between different parts of public healthcare service system are happening over the established communication channels and touchpoints that allow to share and access the data between the approved components of a system. Touchpoints, in this case, are designed to direct the right information through the required channels and support safe and protected connection for both the receiver and contributor of the data.

Touchpoints

The term ‘touchpoint’ is widely used for marking a physical object, place or digital platform where two or more parties of the service can interact, influence and communicate with each other. Clatworthy (2011) adopted this term to explain the link that has been formed between the service provider and the customer. Author considered touchpoints as the element that is central to the customer experience, among the other elements of service system. The same touchpoints could be used to create the connections between different stakeholders of organization, such as customers, users, personnel, founders, collaborators, governmental institutions. Touchpoints should be organized in order to support the fluency of the service offerings, communications, logistics and provide the access to different parts of the service for different users.

Today the physical touchpoints are being replaced with the digital ones. This ongoing transformation is bringing more complexity to the service system architecture, especially for public healthcare. It is important to say that touchpoints of public healthcare services should be designed and supported in a certain way in order to serve its purpose, be useful and feasible already during the transitioning phase, in other words, the delivery of the service should continue. The inoperative components of the transitioning service could cause a confusion and

disorientation of the users, partners and decline of mutual trust.

The shift from physical interaction between employees to a digital one is a great challenge for the public healthcare industry all over the world. Digitalization as a tool proved to have both positive and negative effect on the service functioning, procedures and employee's perception of their workplace and ecosystem they belong. Digitalization in public healthcare is able to accelerate some processes and make the service more manageable while it comes to the quantity aspect, but it might deliver some disadvantage when it comes to the quality and anywhere the human touch is required.

Clatworthy (2011) mentioned that in case of digitalization services, innovation of a touchpoint does not have to be the invention of a new touchpoint. Now it is quite common to transfer the physical touchpoints to the digital context in order to structure the internal systems according to the industry needs as it described in the same article. The author states the importance of the touchpoints arrangement and forming the relations between them over time.



Graph 7: Visualization of physical and digital touchpoints in healthcare. Source: [https://ukhealthcare.uky.edu/uploadedImages/about/leadership/strategic-plan\(1\)/images-pdfs/patientcentered-rev-chart.jpg](https://ukhealthcare.uky.edu/uploadedImages/about/leadership/strategic-plan(1)/images-pdfs/patientcentered-rev-chart.jpg)

The integration of digital touchpoints into the healthcare industry will continue. Both patient's and doctor's experience will be different in a few years from now. Touchpoint's digital assistance has its limits, but, at the same time, they can manage the routine requests and proceed with the standardized tasks. The maintenance of those systems is economically feasible, especially in a long-term. Thus, the touchpoints that are designed to collect, structure and analyze the data are more and more transformed to digital ones.

Communication channels

The most observed communication channels in the literature are so called 'marketing channels'. According to Kotler and Keller (2015) communication channels are one of the three types of marketing channels of organization and used "to deliver and receive the message from target buyers and include newspapers, magazines, radio, television, mail, telephone, smart phone, posters, and the Internet" (p. 30). Authors mention few transformative forces that are shaping the future markets and communication channels: technology, globalization, and social responsibility. In case of public sector, it would be possible to add to this list the law and governmental protocols or policy as a fourth force that creates both opportunities and boundaries for communication development. The development of technology, managing personal data together with the privacy policy and safety regulations create a lot of challenges for the healthcare industry. Therefore, the communication tools that can be used in healthcare are limited and quite often designed specifically for the internal use of the certain hospital. This could potentially lead to the relatively safe internal environment for the patient's data, but at the same time complicates the information exchange with organizations from the outside of this closed system.

The development of the healthcare service backstage, its communication channels, and touchpoints are no less challenging tasks than the design of the customer on-stage experience. Its complexity mainly comes from the specific requirements and processes that are hiding behind the actions that users can see. Those specifics make it more difficult to understand the problems and look for the effective solutions that might work for the public healthcare system.

TRENDS AND TRANSFORMATION OF PUBLIC SERVICES

It is well known that public services might have difficulties with adopting new technologies, fostering prompt innovations and in general might feel insensitive to environment and user's demands. Decision-making process might become quite heavy bureaucratic procedure. Some of the technology innovative solutions, especially in healthcare, couldn't be adopted as they are due to financial limitations or privacy concerns. Trend report 'Changes of Tomorrow' (2015) published by Hyper Island claims that the changing model of consumption and owning things start playing an important role in many world economies and many countries support those initiatives and business models also for public services development.

Collaboration and co-creation

Collaboration supports service economy and is becoming a valuable asset for many companies. Co-creating, co-owning, and co-working attitudes are helping to create a fertile ground for service innovations and developing a service eco-systems with various stakeholders, supporting each other with their specific expertise. The former head of the global education practice at McKinsey and expert on global educational reform and implementation of large-scale system change Barber (2007) sees it as a side-effect of the globalization of the world economy as well

as merging the boundaries between private, public and non-profit sectors. Buchholz and Shah (2017) are pointing out that this opportunity could be especially useful for the public sector, as bringing IT and Business experts together will help to stimulate technology acceleration for reducing the cost of the service for the taxpayers. They are claiming that role of IT in companies have changed and by developing the digital, analytics, data and cloud computing IT departments are fueling innovation and creating a space for more service-oriented business models (Buchholz and Shah, 2015).

Digital consultancies are involved in solving their client's challenges and help to develop new services or rethink existing structures. For succeeding in this role they should innovate their own way of working in order to create a cooperation between different units of organization and their own specialists. For example, digital consultancy 'Futurice' is developing a toolkit, called 'Lean Service Creation' (Lean Service Creation guide, 2016), that is a combination of design thinking methods with user-centered design tools, agile software development process and available for testing. Co-creation trend is especially recognized in Northern Europe. S. Andersson (Service Design Podcast, 02.03.2016), a strategic designer from Sweden notices that co-creation and bringing on board both top management and staff were one of the main methods that helped their agency to succeed with solving their client's problems related to the structural and cultural change in public service. Their project for Swedish employment agency in 2016 won the service design award for systemic and cultural change in the public sector.

User-centricity

The private sector is becoming more agile and competitive due to more flexible approach and the ability to react faster to the evolving needs of the society. Developing of co-creation and collaborative practices lead to transformation of the users to the co-creators, and promotes the development of new service business models. One of the obvious examples of it could be social medias, such as YouTube or Instagram, where users are the content creators and even the trendsetters. Already in 2007 McKinsey in their trends report (Barber, Levy and Mendonca, 2007) was talking about the importance of transforming and reformation of the public institutions on many levels: starting from the frontline operations and interaction with citizens and paying attention to the operating environment as well as fostering the competition between public, private and nonprofit providers of the same kind of services. Authors stated the fact of increased demand of the service quality from the users of the public sector. One way to react to such a service demand could be the implementation of a digital tools that could democratize the public service and make it more accessible and transparent for people.

The report 'Future of Public Sector Outsourcing' (2014) is fully supporting those findings in the connection with the public healthcare. Authors are adding, that the only way for public healthcare services to compete and to survive on the market is to invest in technologies and innovations in order to improve the internal processes, external connections, and, as a result, improve the outcome and satisfaction of the patients.

Digitalization

The digitalization is a generic term, including a great number of activities, such as the development of the Internet of Things (IoT), data analytics, mobilizing the service platforms, software developing. Buchholz and Shah (2015) present the possible future benefits of the digitalizing services, especially in the public domain. They notice that democratizing the public services and engaging with the citizens, making services more available and transparent, more functional and adaptable, could foster competitiveness and create new market opportunities for public services (Buchholz and Shah, 2015).

Public and private healthcare sectors are not an exception. These services are experiencing the tremendous shifts towards digitalization and democratizing their platforms for their patients. Personalized gadgets are getting more attention in the press: wearables, data tracking devices, and sensors are allowing the users to collect the data and share it with the trusted stakeholders if it is needed. Customizable and channeled personal data allows users to share their status with the doctor or health consultant remotely and get the professional consultancy.

Moving from treating the illness to preventive healthcare, as well as empowering the users by delegating them partial responsibility for their own wellbeing led to the developing of personalized mobile application with the information available on user's or doctor's demand. Mobility and availability of information and services, as well demand for a better and faster services, opened up the opportunity for the Amplified Intelligence of digital services to develop the automated routines for regular procedures. The good example of such a service could be a software Noona (www.noona.com/) that empowers patients who are going through the cancer rehabilitation treatment procedures, by letting them to report their symptoms via software installed on their home tablet or computer. The nurses or doctor are stepping in the process, only if they see the alerting indication of the patient's status and could provide the professional support and assessment on demand. The automation of the assessment routines, the symbiosis of a human guidance and an artificial intelligence could be very beneficial for the public healthcare services and its stakeholders, as they are able to deliver the desired outcome with less investments.

While pointing out the improvements of public services towards the escalation of the user's expectations and need for the satisfactory experience, it is worth to mention the backstage processes that are arranged in order to support the flow of any service. Even though, the backstage processes are difficult to research from the outside, it is still possible to point out a few directions for their development.

The digitalization of a service backstage processes is one of the main issues and challenges for the public services. In order to produce a quality content and positive experience for its users, backstage service components should be harmonized with the frontstage components in order to deliver the expected result. In practice, the weak point of the backstage service can be anywhere: the methods of data collection, way, how data is analyzed, delivery of the data to the operators for its further use and exchange between the organization and stakeholders. The comfort of the employees, improvement of the service efficiency, and automation of routine tasks are very valuable reasons for the digitalization of the backstage services.

Data analytics and specialized software development is a sub-trend that is very important

in healthcare and public sector. As it described in the article by Raghupathi (2014), the electronic health data sets are so complex and big, so it is nearly impossible to manage them with a traditional software or data management tools and methods. Considering the non-profit nature of the public healthcare services, the development of the digital backstage components of the service is a very challenging tasks. The collaboration and the boundaries blend between commercial and public healthcare systems might be beneficial for the healthcare industry and society in general.

Public services transformation challenges

The recent research of IT system is developing in Finnish public healthcare (Martikainen, Viitanen, Korpela, and Lääveri, 2012), shows that currently IT development of internal communications in healthcare does not start from the beginning, but “take place as ongoing improvements to existing systems” (p.111). The report notices that most of the participatory development methods that claimed to be very effective in taking user’s perspective into the service development are designed for first-time development. The ongoing practice in sending feedback about problems appeared in the system to the IT support leaves medical personnel dissatisfied as it can’t result in the timely development and respond from the IT units. Authors suggest to develop a participatory methodology that would contribute to the projects, that are experiencing the ongoing constant challenges.

Transformation of public services is a very challenging task for the society and at the same time the step that no public sector is able to avoid. Article ‘Design and Organizational Change in the Public Sector’ observes this phenomenon and states that most obvious for public organizations to adopt methods from the private sector and rationalizing the budget would not help in a long-term. (Deserti and Rizzo, 2015). In other words, those methods are not working with the public services that are facing the reorganization towards digital, more transparent and customer oriented approach and should not be borrowed from the private sector as they are. Authors talk not only about transforming service offers and make the public organization more efficient, but rather transforming the organizational culture and the way how system is responding to a change on a deeper level. While creating the modern, often digitalized interaction platform to provide a satisfactory user experience and increase the service performance, it is crucial to push the back-stage components together with the on-stage ones. This is a very difficult task, that requires a lot of efforts and changes that are hardly visible from the outsider perspective, but are essential and cost-effective for the whole service in a long-run. The fact that backstage is invisible for the customer, should not make it a lower priority for the improvement. The gap in information communication is able to affect the whole process of a service delivery. If the development teams would avoid dealing with such a problems and challenges, the service transformation will have only a temporary and a visual character, that would not be the intended result of the transformation at all.

At the same time, radical and sudden changes are not the best possible solution for any organization to aim for. For example, in his work Treacy (2004, p.29) claims that ‘radical changes

get beaten by the slow and steady approach of the incremental innovation’. Other authors agree with this statement and are adding that “acute radical innovation is the last attempt to survive on a very limited resources, so it is important to develop a routine for continuous adaptation and change” (Hamel and Valikangas, 2003, p.52). The balance between the routine operations and innovative approach in development of a better service (by adding digital component, for example) should be established individually for every organization and become an accustomed procedure for the organization.

Policies that support design for service development

The design policies and standards promoted by governmental organizations like Nesta and Design Council in the UK, could help to popularize the tools and methods of collaborative practices in design. People-centered and co-creative approaches, that are very common for design practices on a smaller scale, should be widely introduced to the public services. Many significant players on the public service market and builders of policies are starting to recognize the usefulness of design for the societal changes and pushing the democratization of its tools and methods forward. Such organizations and programs as Design for Europe (<http://designforeurope.eu/>) under the supervision of UK Design Council (<http://www.designcouncil.org.uk/>) and Danish Design Center (<http://danskdesigncenter.dk/>) are helping to promote design-led practices. And still, as it was claimed by the Commission of the European communities (2009) lack of awareness and understanding of the potential of design among policy makers is taking place. Luckily, many initiatives are emerging on a different level and collaboration of government, public sectors and private consultancies (Live I Work, Thinkpublic, IDEO) are taking place.

The case studies, presented in the article by Deserti and Rizzo (2015), certainly define the need for a change management plan and development of new policies, and the understanding that “change is not a mechanic process”. The authors support the popularization of the service design tools and methods and definitely find it useful and important for their practices. At the same time, they say that “the introduction of user-centered perspective per se does not seem to be enough to establish adequate new practices” (Deserti and Rizzo (2015), p. 93). Only a motivation is not enough for the change, because, many organizations have a tendency to preserve their way of working and oppose any changes, even if they can agree on its importance. So, it is important to work simultaneously in both directions: outside in and from inside out. This concept was supported in work ‘Transformative services and transformation Design’ by Sangiorgi (2010). The paper suggests to bring the multidisciplinary approach to tackle such a complex problems and states that this initiative should be acknowledged and supported on many levels, from employees of a service and private consultancies to the government.

Future and innovations in public healthcare

Omachonu and Einspruch (2010) in their article related to innovation in healthcare describe innovation as a driving force for the quality and cost balancing in healthcare. Another research is stating that innovation is becoming a crucial practice for the healthcare organizations especially in the domain of new services developing, restructuring of the work flow and implementation of new technologies (Lansialmi, Kivimaki, Aalto, and Ruoranen. 2006). In his turn, Gupta (2008) refers to technology and digitalization as the key drivers for the healthcare innovation in future

and adds that the healthcare policy makers should focus their attention on the developing networks and communication solutions as those are designed in an insufficient way.

The global shortage of healthcare practitioners will continue and it is becoming another a very valuable driver for digitalization of the healthcare and the reason for the internal and external hospital communications development. At the moment, the current development of healthcare technologies and digital platforms does not leave a chance for the person without a medical knowledge and appropriate training to access, manage and interpret the data. Clinical perspective is still dominating in medical UI development. In research paper by Ballegaard, Hansenand, and Kyng (2008) authors are pointing out the importance of designing healthcare technology in 'close collaboration with different user groups in order to understand its future use', before moving medical technologies to the everyday life of the citizens. Authors claim that citizens should become an 'advanced patients' in order to be able to follow the doctor's recommendations, to track their own everyday health condition and to interpret the data. The citizen's current role as a patient might not fit well to the future of the healthcare realities. Technology can play a major role in the connecting of the missing components and create platforms for addressing different user's needs. Also, developers should shift their focus from technology designed specifically for professional clinical use to more open approach that would allow more responsible users to take actions and influence their own health.

According to the Omachonu and Einspruch (2010), it is possible to define the key stakeholders of the healthcare innovation process that are the essential components for the change. Those stakeholders are: front-line medical employees, patients, organizations, innovators companies and policy makers. Besides stakeholders' involvement, Berwick (2003) mentioned critical factors that directly influence success of innovation in healthcare, such as trust, leading example for a change, resources for a change and popularizing the activity of the innovators. And yet, it is impossible to avoid certain risks and a failure. Establishment of the collaborative and cross-disciplinary practices for research and development might help the innovators, designers and the health services researchers and practitioners create a fertile ground for the valuable innovation (Lehoux, Williams-Jones, Miller, Urbach and Tailliez. 2008). Then, as it mentioned in guide of participatory design for the public services (Nesta, IDEO, Design for Europe, 2017) and some business studies (Smith and Fingar, 2003), the involvement of the personnel (medical practitioners, IT staff) and offer them a voice in decision making process, will help them to commit to the development and the rethinking of the existing service structure without strings attached to the former way of working.

“The ongoing change from an industrial society to a service economy is getting stronger and affects the design world as well. ... Service design is created in response to this megatrend and it elevates the capabilities of designers to a strategic level. Designers are expected to understand how services operate, even if they only design products. Service design—developed during the past 30 years—is still new and not without growing pains, but interest in its utilization is booming as tangible results start stacking up”.

*J. Kronqvist (2015), Service Designer
Blog article in Medium “This is not Service Design”*

2. Public healthcare: digitalization and trends

DIGITALIZATION

Digitalization is a process that transforms the way how we accessing, storing, creating and using information, products and services. Digitalization changes the way how businesses operate and manage their processes with a different kind of data available for gathering and analyzing. Without data collection and organizing the information in a certain order the digitalization of services and businesses is impossible.

The components of digitalization

In order to understand the processes behind the phenomenon of digitalization, the components of digitalization should be explored. The digitalization is only making sense when people could use the data to create a value for themselves, businesses and society. The digitalization requires the specific components and knowledge. According to Verhulst (2002) digitalization is only possible with the gadgets that can process digital signals and the established ecosystem that connects all those devices to each other. The information presented in digital signal can be understood, transmitted and manipulated by almost any digital device, that is why the method of storing the data in digital form is more universal. For example, as it was stated by Pool (1984) "one system created for transportation digital signals may carry services that in the past were provided in separate ways" (Pool, 1984, p. 23), as video, audio or text.

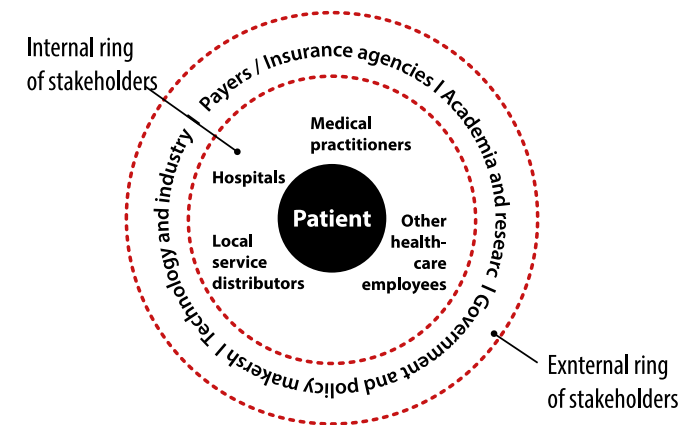
The first component of digitalization that ordinary people are dealing in their everyday life is a tangible object that people can own or rent and interact with (for example, smartphone, smart wear). Vetelino and Reghu (2011) suggest that it can be any kind of sensor that "either relate directly to the individual or exist on local, state, national and global levels" (Vetelino and Reghu (2011), p. 1). They continued with stating the second component of digitalization, – a network that connects the great number of devices together, as digitalization is not possible without the established eco-system. The third component that makes the digitalization possible is the cloud computing technology that is used for storing and managing the data that are produced by various digital devices and delivered to the cloud by the network. Intelligent cloud platforms help its users to manage their data with the support of integrated AI (artificial intelligence). The cloud enables the process of gathering the data and later on use this data for different purposes. Cloud computing is an essential component of digitalization.

Public healthcare stakeholders and digitalization

Digitalization is one of the triggers for service economy that let companies obtain access to the customer's data and analyze it to deliver a better product. According to Scheer (2017) digitalization is the driver for sharing economy, it allows users get access to products and services

without owning it, but 'renting' it for certain period of time, so as sharing the service with other users, making the service and product more approachable and convenient for the wider audience. The process of digitalization and connecting different stakeholders, products, services in one big massive cloud or as it called 'Internet of Everything', created the field of knowledge and possibilities that we never had before.

In their book Ma, Jain, and Anderson (2014) present range of healthcare stakeholders that could be identified according to their position in the healthcare digitalized system. According to the publication "one person can represent more than one stakeholder as healthcare is a complex service system and combines medical and operational processes that are delivered by people; enabled by technology and facilities across different organizations within a policy framework" (p.113). Another study by Nash and Goldfarb (2006) introduce more simplified structure where the key healthcare stakeholders are: patients, providers or employers, employees, government, and payers. Graph 8 synthesizes those schemes:



Graph 8: Stakeholders of public healthcare. Based on works introduced in text above by Ma, Jain, and Anderson (2014) and Nash and Goldfarb (2006)

Thuemmier and Bai (2017) in their book 'Health 4.0' notice that the division of power and information flow in the healthcare industry should change, because of new technology and digitalization and its long-lasting effect on the healthcare. Authors pointing out that digitalization opens up new opportunities and the biggest one is the opportunity to rethink the healthcare eco-system, start new partnerships and to improve the existing connections.

Today healthcare service providers understand the importance of the fulfilling experience for their clients and see digitalization as a tool to achieve this goal. Another opportunity that digitalization creates - is a possibility for healthcare providers to restructure the whole service process,

develop new platforms for service delivering, extend its network as well as the collaborative aspect of the service. Finally, the digitalization is an opportunity for the healthcare professionals to have the better and more efficient tools to proceed with their everyday tasks, better and faster access to information and improve the productivity of their work in both qualitative and quantitative aspects.

Already today we can experience a number of private healthcare services that are designed to meet user expectations and provide a unique assistance that was not possible before. Although digitalization of the internal public healthcare system is not that visible for the end user, it is as much important for the service functional capability. The strategic approach to digitalization of the whole healthcare industry is not quite here, the market is fragmented. As it is said in McKinsey's article on healthcare digital future 'players in the healthcare industry struggled to successfully manage the myriad stakeholders, regulations, and privacy concerns required to build a fully integrated healthcare IT system' (Biesdorf and Niedermann, 2014). Nevertheless, the digitalization is still seen as a competitive advantage and promising asset for the healthcare organizations.

PUBLIC HEALTHCARE TRENDS

Public healthcare is changing quite a lot, and still, as it said by Bate and Robert (2007), "existing healthcare systems and processes in their present form are not going to deliver all of what is required for the future" (p. 3). The demands of the future would require a faster pace of adoption for new technology, reformation of policies and healthcare systems as well as invest a lot of efforts in creating the services around and with the end-user of the public healthcare. Current trends that are influencing the services around the world are affecting the public healthcare services as well.

Patient oriented services

Market trends are framing the organization and its level of competitiveness and relevance for modern society. Even public institutions can no longer rely on the loyalty of the citizens as customers per se. The positive patient experience is becoming a very important asset both for private and public healthcare. Basically, that means that the patient could expect a set of services that provides an easy access to the necessary treatments and its planning (self-service, electronic appointment scheduling). Also, public healthcare services are expected to be affordable, provide a well-timed diagnosis in order to serve a patient with prompt but flexible treatment plan. Cost savings, effectiveness and relevance of the treatment, centralization and creating better connection and cooperation between primary and secondary health care is the direct investment to the competitiveness of the hospital and its future. Digitalization and technology orientation of the service with the strong lead in patient-oriented service processes should be considered as a crucial element for the public healthcare hospitals development, alongside with maintaining the quality of the service. Without remodeling their processes according to the

previous statement public healthcare can find itself in a situation when its services are no longer relevant for the people.

At the same time, public healthcare organizations as HUS (Finland) are commonly known as an institutional and research centers that work in a close collaboration with academia on developing new methods for preventing and treating severe and rare illnesses, educate young professionals and encourage the knowledge exchange among the industry on the international level. It is important to maintain this institution and make sure that it has the possibility to grow and develop its services.

Healthcare industry, from its side, provides another challenges and opportunities in development the up-to-date services at the public hospital units. The strong shift from organization-centric to patient-oriented service processes are taking place all over the industry. Together with the increasing demand for the services due to population growth and its aging, awareness of the health issues and developing of the treatment procedures, the need for flexible and easily accessible public services are just some of the challenges that industry should be able to solve in a near future. The amount of patients and data collected from the patients, together with the pace planned for the treatment procedures, make it very difficult if not impossible to treat each patient well and with enough attention to the individual details. The public healthcare industry in an urgent need for modernizing its service systems and procedures and digitalization is the way that can assist with it.

Digital healthcare

The service digitalization and enterprise's virtual presence became a trend in last decade, also in public service. It is possible to see the digital services evolving in many different areas: banking and financing, transportation and even such sensitive area as a healthcare and wellbeing. In annual trend report, published by Fjord and Accenture (2015), the rise of mobile devices and smartphones was mentioned as one of the trends that would shape and accelerate digitalization. Technology became more accessible and advanced at the same time, the rise of the smartphones and apps as a new model of mobile software ecosystem became a new phenomenon that is adopted by many industries. As a result, more and more businesses, especially service oriented, are developing their own digital platforms as an integral part of their service package and business strategy (Bharadwaj, Sawy, Pavlou, and Venkatraman, 2013).

There were a diverse attempts to use the technology in healthcare communication: for example, before the wide availability of mobile phones, healthcare professionals mainly used pagers to connect with each other (Burdette, Herchline and Oehler, 2008). Nowadays, as it claims in the article reviewing the use of mobile in healthcare industry, smartphone's medical applications are commonly used for the disease diagnostics, a drug reference and specific medical calculations (Mosa, Yoo and Sheets, 2012). Secondly, they used for the clinical communication and a medical training as well as accessing the hospital information system via the client applications.

Mobile technology

Developing of technology in healthcare can affect the communications between doctors, other personnel, and help practitioners get easy and immediate access to the information they need to serve the patient and make a right decision in a real time (Burdette, Herchline, and Oehler, 2008). Mosa, Yoo, and Scheets (2012) present the article that provides a clear picture what applications are developed. Also, they are analyzing users of those applications. The study outlines the benefits of using the mobile technology, especially for communication among the healthcare professionals in critical care or reaching the distant physician from another hospital.

The benefits of using smartphone as a tool in the healthcare practices is quite clear. Smartphones can play an important role in the connecting doctors between each other. From the researcher's point of view these benefits are strongly related to the lower the cost of the healthcare services in general, and especially in case of remote healthcare advisory practice and tele-medicine (Noel, Vogel, Erdos, Cornwall, and Levin, 2005).

However, despite all the benefits, the challenges of smartphone-based healthcare such as erroneous data input, breaches of data privacy and security concerns are quite worrying and recognized by the group of researchers (Mosa, Yoo, and Scheets, 2012) as a factors that limit those benefits. However, the authors are confident about popularization of smartphones and software applications for healthcare, for both public and private use in a near future.

CHALLENGES FOR PUBLIC HEALTHCARE SERVICES

As it said in article presented by Burdette, Herchline and Oehler (2008), users and hospitals must still consider many facets such as affordability, variety of platforms, software, IT support, before purchasing smartphones or considering the common use of some applications for the personnel and patients of the clinic. Nevertheless, the future of mobile communication in the healthcare industry is mostly positive: Bacigalupe (2011) observes how the developing technology, digitalization and its growing accessibility are transforming the way patients, healthcare professionals and society see healthcare services. He claims that the ICT (Information Communication Technologies) tools are accelerating the ability of all stakeholders to communicate and collaborate despite obstacles of time and space. And, even though the aspect of collaborative technologies in a healthcare still raise a lot of concerns, there are a lot of benefits for all participants.

Moreover, according to Boulos, Wheeler, Tavares and Jones (2011), many researchers and commentators suggest the natural progression for the healthcare is to go mobile. At the same time, another study declares the difficulty to assess the impact of MED (mobile electronic devices) on health outcomes when the MED is used as an adjunct to other interventions and services, for example text messaging in addition to the physician appointments (Free et al., 2010).

Public healthcare services and digitalization

Greger and Hatami (2013, p. 127) in their article included in the book 'Designing for Wellbeing' detect certain stakeholders that are actively involved in use of digital services in public healthcare:

- Healthcare system, represented by administration that is taking care of financial feasibility, practicality of the public services for society and responsible for setting rules and goals that would support the functioning of the system;
- Front-line healthcare personnel;
- Citizens as patients or clients.

Designers in that case considered as external experts with certain skills in co-creative design practice but with little knowledge in the healthcare system. According to presented study, the IT tools and back-line digital solutions are developed on administrative system level and not considered 'interface-friendly' by medical personnel or end-users, who anyway have no other choice but use the arranged software. The solution to overcome restrictions of inflexible IT system was found in bringing additional touchpoints that would connect front-line personnel and the patients, help them to reduce the amount of 'no-show' appointments. This example shows how designers able to influence the system that is quite specific, complex and driven by many rules. In this case, design is the tool that helped to improve the performance of the staff as well as loyalty of the customers without major restructuring of the system itself.

According to the 'Design in Tech Report 2017' (Maeda, Xu, Gilboa, Sayarath, and Kabba, 2017), 'the future of design is digital' and designer's mindset, range of methods and tools used in many design disciplines are going to shape the future of digital environment. Services are leaning towards digital platforms and virtual environment.

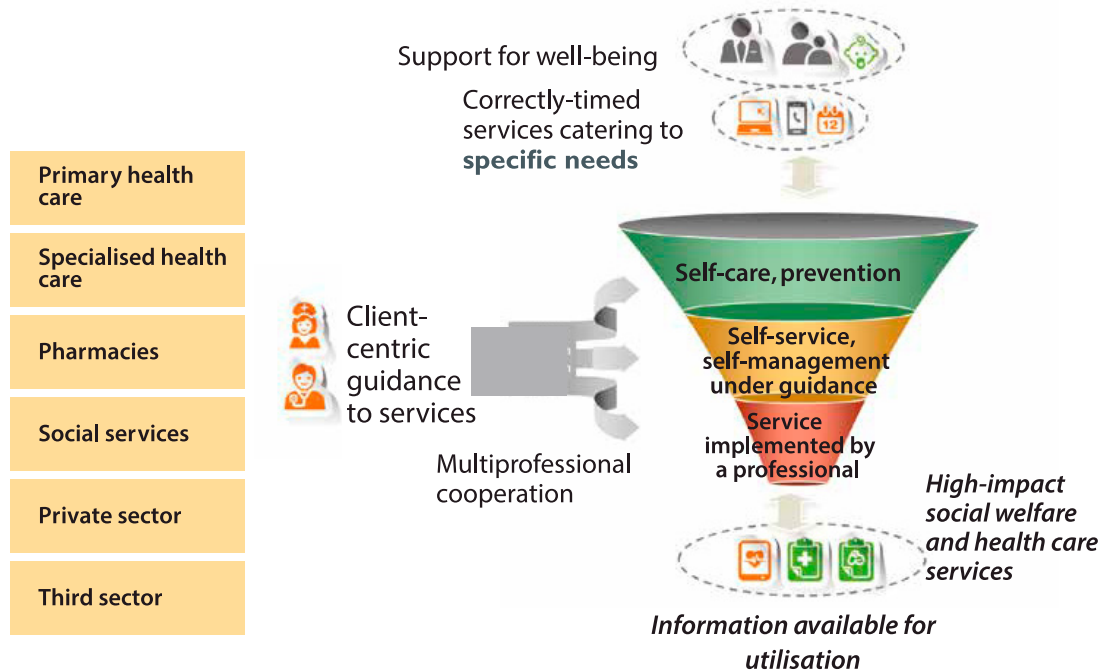
Another case study, developed by Accenture on improving nursing communications in US hospitals showing that definitely communication challenges is directly related to "increased money spending on a treatment of a patient in terms of lost productivity, insufficient time with patients and longer length of stay or appointment" (Dare, Lennon, and Sanders, 2013, p. 3, 13) The report supports the idea of digitalization of internal hospital communication, however stating that there is a danger of lacking consistency. Authors suggest that right orchestrations of technologies and process change could improve the communication flow and become a starting point for process and culture transformation.

Medical personnel definitely can benefit from digitalization and tools it can provide. The research report (Martikainen, Viitanen, Korpela, and Lääveri, 2012) conducted for a study regarding the involvement of physicians into the development of IT service components in public healthcare in Finland showed the clear need for such involvement from the physicians' point of view. The study also represented the distinct gap between needs of front-line operators of the internal healthcare service (doctors and nurses) and delivered IT structure.

Digitalization of public healthcare in Finland

In Finland digitalization considered as a tool for the social and health reform (SOTE), which goal is to improve the accessibility and equality of the service. Article by Korhonen (2016) suggests that by developing digitalization of healthcare services government is aiming to promote responsible healthcare and facilitate changes that will affect both service providers and end-users as well as help to proceed with the reform's plan. SOTE Project director Tuomas Pöysti (Ministry of Social Affairs and Health, 2016) supports the importance of fluent communication and collaboration among healthcare practitioners: 'multi-professional cooperation is now expected even more, and specialists in social matters and health matters will be collaborating to find solutions to clients' problems'. restructuring the healthcare service and social service system, unifying the efforts of separate parties and delegate the responsibilities the reform is planning to deliver the high-quality and equal healthcare and social public services to its citizens' (Ministry of Social Affairs and Health, 2016. Interview with Tuomas Pöysti, retrieved from http://alueuudistus.fi/en/artikkeli/-/asset_publisher/1271139/onko-sote-lakiluonnoksissa-perustuslakipulmia- , 20.02.2017).

According to the report published by Sitra (Teperi, Porter, Vuorenkoski and Baron, 2009), even though Finnish healthcare services delivered mostly by publicly owned and operated providers funded mainly through general taxation, it is more decentralized and mixed in its funding than in other Nordic countries. Private healthcare services are taking relatively small part of total healthcare coverage (about 5%) and usually observed separately from the public healthcare. Authors hope that digitalization and ICT-solutions promoted in the new reform, hopefully will unite all healthcare units allowing players to coordinate their actions in one informational field:



Graph 9: Representation of ICT support vision for healthcare services in Finland in 2020 by Ministry of Social Affairs and Health report, 2013

Furthermore, experts (Teperi, Porter, Vuorenkoski, and Baron, 2009) are noticing that the uniqueness of Finnish healthcare system is that "reforms have typically not replaced existing structures, instead, parallel solutions have been introduced to co-exist with the earlier system" (p. 39). Then, "due to decentralized efforts, hospitals and healthcare units might have the different software programs that are managing the patient's information flow and other digital data, and, as a result, are not quite compatible with each other" (p. 83). Also, authors notice that relative lack of physician doctors, especially in northern regions, can negatively affect the development of Finnish healthcare (Teperi, Porter, Vuorenkoski, and Baron, 2009).

In this light, the introducing new methods and approach of managing the time of physicians, appointment's arrangement and tools for treating non-acute patients such as telemedicine could solve and improve the overall quality of public healthcare in Finland. Authors also stated that system urgently needs new information technology standards. The authors of the report see the great opportunity in development ICT for public healthcare in Finland and suggest that if will create value both for individuals and society. Teperi, Porter, Vuorenkoski and Baron assume that in order to maximize value for the users, the healthcare process should seem seamless from the patient's perspective. The authors see the insufficient coordination between primary and secondary care as a major challenge for digitalization of public healthcare communication channels, and believe that by better access to the data, the efficient use of communication channels and the support of telemedicine, public healthcare can improve the efficiency of medical personnel.

As much as professionalism of the staff and its competence, right tools and methods are playing a crucial role in maintaining national healthcare on a convenient quality level and creating perfect ground for satisfying experience both for medical personnel and patients.

BENCHMARKING OF INTERNAL HEALTHCARE COMMUNICATION SOFTWARE

Healthcare services in Finland, especially public healthcare backstage are difficult to research from the outside. Finnish citizens can access the databases of the public healthcare to see their health history, drug prescriptions, results of the lab tests through Kanta service that is available through using personal identification code (www.kanta.fi). To book the appointment in the public healthcare, they should contact the hospital info desk that most likely would first assign the appointment with nurse or physician. All those actions and decisions are part of the service and used to be carried by healthcare personnel.

Modern technology allows users to take more active role in managing their own health and keep an eye on the symptoms. The mobile technology allows the remote communication between trusted stakeholders and the data cloud where the information about patient and treatment is stored. Medical and self-diagnostics applications are quite specific and focused on educating as well as imitating different tools for measuring and monitoring. Also, medical applications can be used for the educating the healthcare practitioners and allow them to get an access to the bigger database for their research.

Communication applications for providing healthcare services for the end-users remotely are numbered and help to connect the user with the nurse or the doctor on his demand.

Benchmarking of the solutions for the internal hospital communication in Finland is quite challenging process as this type of services are B2B (Business-to-Business) oriented and most of the time designed on demand, specifically for the in-house systems of the hospital. Global market for the internal healthcare communication solutions might seem more saturated as it can be observed from the outside.

RADU (referral software used in HUS)

RADU was developed specifically for HUS and it is not a ready-package open IT solution for hospital communication and data storage. The software developed and supported by the L-Force OY, private Finnish software company specialized in applications and software solutions for healthcare. Also, according to their website RADU HUS was merged into HUS systems at the end of 2013 and at that time it was in regular use for almost 5000 healthcare professionals (L-Force, 2013). RADU was designed specifically for the improving communication channels between general doctors, radiology department and patients, allow all of them to access the same data in real time. The history of RADU and its remodeling to the state as it is now briefly described at the company website as well (L-Force, 2016). As it is mentioned there, the reason why HUS didn't make a decision of purchasing ready-made solution for the internal communication was familiarity with the old system, the existed and formed database that should be transferred to the improved system without any problems and breaks.

Apotti

Apotti's website in English claims that Apotti is 'the information and operations management system that is trying to combine all data systems that are in use in the Helsinki Metropolitan area and connect them to each other' (Apotti, 2015). The ongoing project with aim 'to build a regionally cohesive social services and healthcare system that enables developing the operations and increasing their quality.' HUS is investing its resources to the development and realization of the program and has the biggest ownership share that is 46%.

According to their website, Apotti system would unite all software systems as RADU under Apotti umbrella, as well as involve all users of the healthcare services in Finland by providing them tools for booking an appointment and accessing their own health history.

There is no clear information about communication channels among the hospitals and hospital personnel and the way they are going to be managed and what tools will be available through the Apotti. So, even though the short presentation on the website looks very promising, it is difficult to say, whether it will meet the doctor's needs in instant communication and feedback or not.

Other software

By introducing Skype for Business to meet the needs of the health industry, Microsoft enriched it with a few web-based tools that are part of Office 365. At the first glance, it has all the tools that would allow the doctors and other medical personnel to communicate, to share the information in real time and to seek the feedback from the peers (Microsoft in Health, video, 2015). However, there were a lot of questions regarding the security and the way Skype will treat the confidential private patient data (VideoCentric, 2016). Those debates are more relevant for the US healthcare industry, but concerns of the protection and secure the patient's data are relevant for the healthcare industry all over the world.

There are plenty of other software solutions that are aiming to solve the communication problems between healthcare practitioners: LuxSci SecureChat and SecureVideo in US (www.luxsci.com/extranet/secure-chat.html), VideoCentric's Virtual Meeting Rooms for the Healthcare Sector in UK (www.videocentric.co.uk/whitepaper/videocentric-pro-health-virtual-meeting-rooms/), Vocera (<https://www.vocera.com>) and SnapComms (www.snapcomms.com/case-studies/hospital-internal-communication) are just some of them.

In Finland the specialized communication software solutions are a bit difficult to benchmark. One of the interesting example can be a Carecode. It is a platform that organizes secure communication between the healthcare professionals or between a doctor and a patient. According to Carecode website, the company has a few clients that are use their service: DoMedi, Koski-Klinikka, Finla työterveys, Lohja.

Subject	Arrived	Participants
Lump on left side of neck	2016-05-23 17:13	Paul Lindberg
Moving is difficult, right hand is shaky	2016-05-23 17:12	Konsta Pulkkinen
Irritated eyes	2016-05-23 17:03	Hely Manninen
Urinary tract infection	2016-05-23 17:02	Ilkka Lahti
Difficulties sleeping	2016-05-23 17:01	Eemeli Nyberg
Birth control implant and irregular bleeding	2016-05-23 17:01	Hiikka Peltonen
Back pain multiple times a year	2016-05-23 16:59	Helka Leinonen
Warfarin and upcoming trip	2016-05-23 16:59	Aila Saastamoinen
Thyroxine medication	2016-05-23 16:56	Eira Piirainen
High blood pressure	2016-05-23 16:56	Aija Haavisto
Injured knee	2016-05-23 16:55	Jaakko Vuorinen
Clogged ear	2016-05-23 16:55	Jalmari Määttä
Swollen ankles	2016-05-23 16:45	Ilkka Lahti

Graph 10: Carecode, interface prototype. Source: www.carecode.fi, 15.03.2017

Summary

In general, the Finnish public healthcare system need for the internal healthcare communication and its improvement, as well as importance of the accessible information channels and the touchpoints development, were recognized by decision makers on local and national levels. According to the report published in 2015 by National Institute of Health and Welfare, the constant improvement of Finnish public and private healthcare digital assets since 1990 led to the significant improvements of information flows and exchange in communications (Hyppönen, 2015). However, there are still some issues that have to be solved within relatively short time. The need of acceleration of digitalization of healthcare services is the consequence of many global and local changes in the society, economy and foreseeing prospects of the future. In concordance with the report, main problematic areas for digital healthcare in Finland are:

- different standards for data exchange and partial incompatibility of the data;
- poor or below average satisfaction of using EPR (Electronic Patient Record) and other digital tools among physicians. According to the report, ease of use, usability of key functionalities and accessibility of the data were considered main pain-points for software, digital platforms and communication channels both for private and public Finnish healthcare;
- the gap between some specific additional medical data systems and main EPR is another problem. It was noticed that the system linkage is not established equally for all internal databases even in one particular hospital.

The internal communication systems for healthcare in Finland continue their development. The systems overall look quite confusing, as there are so many players, software and unorganized channels that some of the users are not aware of. To develop and make a progress with digitalization and implementation of eHealth practices in Finland some developing initiatives are observed by the report (Hyppönen, 2015):

- regular national surveys and also log and register data analysis is planned for 2017;
- more digital tools are used for education healthcare practitioners on the matters related to privacy and data security, patient security, procedures, and radiation safety;
- IT support mostly is available for medical professionals during regular office hours, that was considered as a plus by many of them;
- Developing of digital platforms (like Apotti) that would unite the efforts of public and private healthcare and make the information flow more manageable is concerning many industries that could also benefit from such improvement.

“No matter how innovative new ways of engaging customers are, the key principle is that software has become the product. It needs to be complex in nature, though simple for users. If it fulfills the requirement of feeling personal, provides content-first user experience, is deliverable across all devices, is data rich and easily integrated, then it can be the glue that holds everything together. Only when the product is used does its value exist. Same applies for any internal communication platform.”

Cristian Grossmann, Beekkeeper, 2017

3. HUS case

HUS INTRODUCTION

HUS — the Hospital District of Helsinki and Uusimaa — is a joint authority formed by 24 municipalities. HUS is divided into several hospital areas.



- 22 000 professionals, 56% of them are nursing personnel and 13% are physicians;
- Healthcare services for the nearly 1.6 million residents;
- Half a million patients are treated yearly;
- 23 HUS hospitals;
- HUS's annual turnover is about EUR 2 billions.

HUS annual report, 2015

Graph 11: HUS map of municipalities and hospitals. Source: http://www.hus.fi/hus-tietoa/hallinto-ja-paatokseteko/PublishingImages/HUS_aluekartta_SU4_tekstit%20mustalla_netsti.jpg

The main HUS values are top-level care and people: their personnel and patients (HUS annual report, 2015). The healthcare services at HUS are financed mostly out of tax revenue, so financial efficiency, wise allocation of budget funds and financial predictability are very important and crucial to maintain. According to the HUS report (2014b), HUS is developing new and promoting up-to-date approaches for its activities: lean processes are taking a big role in the reorganization of HUS services and units such as HUSLAB, HUS-imaging, and Jorvi emergency department (HUS, 2014a). Finally, patients are the priority number one for HUS; they aim to provide timely and high-quality service, care and support. The HUS Lean model focuses on taking the feasibility of the concepts as one of the priorities for the research and development of new services and their components (HUS report, 2015).

CASE INTRODUCTION

The HUS case is a study project that was run in collaboration with the imaging unit in Hyvinkää hospital and with the support of Accenture, Fjord, and tutors from Aalto University School of Business. The HUS medical imaging center serves both secondary and primary health care, annually performing about 1 million radiological studies (data from the course introduction material). The imaging center has world-class medical expertise and knowledge in radiology. At the same time, the unit is lacking radiologists due to increased demand for the examinations. The brief that HUS Hyvinkää imaging unit challenged our team with was aiming to reduce

the errors in the referrals for the imaging examinations. Also, HUS representatives suggested that the overall communication and information flow between different departments might be an area that they want us to focus on. In their opinion, misinterpretation of the data leads to mistakes and misunderstanding between distant hospital units.

According to the brief, there were several complications that were expected to be solved during the project, leading to further improvement of the overall service:

- Lack of experience in referring patients to the imaging unit among physicians. This is very common especially in primary healthcare because there are hundreds of different examinations to apply for and no external help with picking the right one or give advice on the directions;
- There are no clear rules for describing the examination and the problem in a referral. If the physician is not clear about the question in referral, the reporting radiologist does not necessarily know what to look for;
- No opportunity to give feedback on the referral quality. There is no systematic way to give feedback from radiologist to physician to help to select the right study. This feedback would prevent the clinician from making the same mistake again;
- Sometimes the imaging study requires additional information even if the picked study is right and the question for the study is well formulated. Ideally, there should be a way for the radiologist to ask for clarification from the physician by contacting the physician during the examination.

So, the challenge for our team was related to the communication and data transfer issues between the imaging unit and physicians in primary and secondary care. HUS asked us to think how communication of those parties could be improved in order to create an easy means for the physician to ask for help when it is needed in selection of the right study; create the feedback channel and develop daily co-operation between primary healthcare physicians and radiologists; think how they can collect findings and use them as a basis for creating generic education for physicians. They also asked us to focus on the referral system as it is one that they think could benefit the most from our project.

The data collected during the hackathon project in collaboration with HUS during the spring semester 2016 in Aalto University School of Business will illustrate and support my analysis by showcasing the challenges public healthcare services are dealing with during the digital transformation of services that aim to replace the existing outdated alternatives.

Reflections on the task and HUS values

HUS sees digitalization of healthcare as a core activity for transforming its services and connects it to the new role of the patient in the healthcare industry (HUS report, 2015). They also

specify the importance of data sharing and creating a seamless informational flow among the HUS units: 'With a shared IT system, patient details are much more easily accessible. Previously, the details had to be re-entered whenever a patient moved from one care facility to another.'

Next, in the same report, we can see that HUS is very well aware of the communication issues and sees the development of communication channels as one of the methods to improve the cost efficiency and minimize the mistakes during the doctor's assessment and diagnosis.

If the research question in the referral is unclear or very broad, the doctor performing the examination has to use the appointment time for interviewing the patient and for performing a clinical examination to further specify the question in the referral, and yet sometimes it is not enough. As a result, the resources of the hospital (doctor's time) get wasted, and the patient cannot be diagnosed in time and should go back again after another doctor's assessment.

CASE PROCESS

This chapter is introducing the hackathon course project and the way it was structured. The deliverables, working process, and planning the implementation of the concept will be observed. In the following chapter with discussion and analysis, I would like to analyze the steps we have done and evaluate some of them, focusing mostly on the service design methods and ways to proceed with the brief.

Team building

After the group was formed we were guided to go through the 3-hour workshop organized by Fjord's service design team. The tasks during the workshop were pushing us to think about the brief and express our interest in the topic to teammates.

Such service design tools as persona profile, journey map, conceptual poster, and scenario building were used as a warm-up exercise.

Mainly, our team was focused on the problems with referrals: their consistency, feedback, and overall quality. Our preliminary solutions were focused on creating the seamless information flow between radiologists back to physicians, implementing the digital assistance that would help to understand referral better, and sending referrals to the radiologists via voice message instead of a filled paper or digital text document. During the exercise, we learned that referrals are the official documents that stay in the system and are a part of the documentation of the treatment procedures performed by the hospital. In this case, voice referrals can be problematic to review, analyze or use for qualitative analysis and data gathering. At the same time, establishing the channel where the radiologist can access the physician in real time can be beneficial but hardly possible, due to the difference in work shifts and types of examinations.

In the end, we were presenting our ideas to the client and tutors. Based on our proposals we were discussing our client's wishes and hopes for the project. This set of exercises helped HUS members understand better the direction that our team would like to take for the further investigation. That is why during the feedback session they pointed out the importance of reality

"The way in which the question is formulated in the referral has a huge impact on effectiveness. For example, for an ENMG (electroneuromyography examinations) it is crucial. This expensive procedure is not a quick overview of the nervous system; it is an examination used to answer a specific, focused question. The better delimited the question is, the more effective the examination will be. The effectiveness study revealed among other things that in about 30% of the referrals the questions were too broadly formulated."

HUS report, 2015, p.23

"There is a clear need for guidance and further development of the communication between doctors."

Erica Kirveskari, head of clinical neurophysiology

HUS report, 2015, p.39

checks from the very beginning, and asked us to proceed with more 'down-to-earth' solutions that they could try on as a pilot in a near future. Also, once again they emphasized the budget nature of the HUS organization and public healthcare in Finland.

Preliminary research

Before the next session, we were assigned to conduct initial research. Our research had two main parts in it: ethnographic studies as well as benchmarking based on the solutions for the internal communication in different industries. I was volunteering to conduct the ethnographic research for the case.

Ethnographic research: observation and interviews review

Ethnographic studies are a widely used practice in service design. Depending on the brief and the particular task, ethnography research can focus on users, environment, operators of the service, clients, and other potential stakeholders. In our case, it was important to focus on the environment and the tools doctors are using to communicate with each other, to understand how different doctors are using different tools, to observe the doctors as well as the nurses in their work environment, and possibly to interview some of them after the observations.

First of all, I set up a goal for the visit and the observations. The goal for this visit was to understand the regular procedure of the examination of a patient in the ultrasound room. Secondly, it was important to see how the doctor and nurses are managing the referral system (RADU) and how they are writing the report. Thirdly, I had to understand the interface and functionality of the RADU software, and how the information is collected. Another important target was the referral as a part of the RADU system and as an independent document. I had to find out how it looks, inspect its functionality, investigate the potentially problematic parts where the doctor and the nurse are lacking information and where this information was supposed to come from. Finally, I decided that the result of my visit should be documented as a service blueprint where we can observe all the parties involved in the ultrasound procedure as well as the main background processes that are happening simultaneously with help of the digital devices. In general, I hoped to understand the procedures better and to be able to explain in detail to my team members the way the ultrasound room is operating. I also hoped to see what are the bottlenecks in the internal communication system and processes and how the doctor is trying to solve them.

I visited the Hyvinkää Hospital, radiology unit on 21.01.2016. The doctor working in the ultrasound room was the main contact for this visit and he kindly walked me through the unit and explained the basic procedures. The visit length was about 4 hours. I was observing a doctor and two nurses in the ultrasound room performing their everyday tasks and examining the patients. Later on, they were interviewed. I also interviewed a doctor from the CT room to see the difference between the patient's flow and the ways of working on the referrals in different units of the radiology department.

The ethnographic methods I used for our research were:

- Observations/Following: I observed how the doctor and nurses are working, communi-

cating with each other and the patients. I documented the way doctor and nurses were using computers and RADU system to get the information that would be helpful for the examination. Then, I observed the nurse's and doctor's working environment to understand how they are using it in order to simplify the operations;

- Sketching: I sketched the interior and the room's equipment as well as the nurse's table where there were a lot of the information in a paper form. Mostly this info conducted the info about emergencies of a different kind, as well as phone numbers of hospital units and its departments. Those papers also had some information about dosage, possible allergies and other practical notes related to the examining the patient and reporting the result;
- Interviews and follow-up questions: I interviewed doctor from the ultrasound room. Also, I had a chance to speak with the nurse, but in my case, it was not possible to construct the fluent dialog, due to my lack of Finnish language proficiency. Finally, I interviewed the doctor who was specializing in the CT examination. The process of the referring in CT room looked rather different, due to the difference of the procedure and the preparation for the examination. It was very interesting and beneficial to see how different units handling the RADU and referrals in their own way.

My observation in hospital resulted in reporting, and was presented to my project team. It contained the most important findings as well the sketches of the referral and RADU structure, and blueprint of the appointment. The most important findings during my visit are:

- Nurses are communicating a lot with other departments during the day and helping to prepare and examine the patient. Doctors are usually extremely busy and should focus on the examination, making a diagnosis as well as describing the result of the procedure and document it properly. Ideally, one nurse should help the doctor to examine the patient and another one should be responsible for the monitoring the devices, working with the referral, checking lab results, contacting other departments if it is needed;
- The process is quite digitalized already. There are three computers in the room, one of them serves the examination room and connects with a monitor where the radiologist can follow the examination in real time. Another computer is for the nurse, and the last one is for the radiologist to look at the pictures once again, dictate or type the result of the examination and manage the referrals. Doctors and nurses have their own mobile phones;
- RADU is the referral system that contains information about patient, appointment, and unit inside the hospital or another hospital that sent a patient to the examination as well as other important details. RADU provides access to the referral that made by another doctor;
- The results of the examination are stored in internal imaging software, where radiologist is describing the result of the study and claims the result of a study. Radiologist should submit the evaluation to make it available for the referring doctor. That doctor can see the result immediately after submitting it by radiologist through the RADU system only if he is using the same RADU;

- Usual schedule for the ultrasound room is 30-40 patients per day, so there is no time left for anything but examination and reporting. Nurses take care of all the supporting processes while the doctor is examining the patient and writes the conclusion. Nurses are always in touch with other nurses of the hospital via mobile phone, taking care of the patients' flow, the data written in the referral and looking for the missing info while the doctor is busy with the patient. There is no connection with nurses from the other hospitals or primary care;
- The misleading information in the referral can compromise the patients' flow, and the schedule can go out of hand. As it stated in Markkanen's report (Markkanen, J., 2015), about 9% of the referrals in 2015 were inadequate, 5% are completely useless and 10% are questionable. In practice that means that the resources are wasted: doctors spend more time on examining the patient and trying to understand the referral, the day schedule got stretched and delayed, other patients should wait longer. As a result, the final examination is becoming at least two times more expensive for the hospital and radiology department. Moreover, the delay in the diagnosing might negatively affect the wellbeing of a patient;
- The way to apply for the examination allows a physician to fill the referral with mini-mum information. It can be just a patient SSN and the code for the examination with no explanation in a text box. "Actual question in the referral text is the key to the right procedure and examination", said the radiology doctor. "One short referral sentence with a request for examination is more important than code or title for examination that we can see in the RADU system because that one can be written wrong";
- The radiologist regularly meets doctors from other departments to discuss interesting and special cases. Because those meetings are quite short and there are a lot of interesting cases to talk about, the practical arrangement of the information flow is usually left behind the schedule. Many doctors are aware of this problem and would like to improve the situation but cannot find enough time to contribute.

RADU structure

booked time or time when referral was written	colour code for patient	patient social security number	name of the patient	allergies and restrictions	title for examination (referral title)	number in the internal system	which unit sent the patient to the examination	urgency of the examination	unit in imaging department for the examination

Graph 12: RADU layout

RADU is a referral system that contains information about patients (name, SSN, and restrictions for examinations, for example allergies), appointments (booked time for examination or date when referral was assigned), contact information (unit inside the hospital or another hospital that sent a patient to an examination, hopefully the name and phone of the doctor who sent the patient) and other issues. Each row contains information about one particular patient and

the referral for the examination. By clicking the row, the doctor can get access to the referral.

Referral structure

A referral is a document that is provided by the physician and supports the examination with guidance. The referral contains the research question for the examination and all necessary information about the patient. It can be delivered to the radiologist in a digital or printed form. The referral might contain information about the background of the patient's problem, the current state of the treatment/disease, and the referral question that led to the request for a certain examination. The digital document contains fields that the physician can leave empty.

Service Blueprint

The service blueprint (Appendix 1) represents the normal examination process in the ultrasound room. P (patient), N1 & N2 (nurses) and D (doctor) communicate with each other quite a lot during the examination. Nurses use RADU before and during the examination. The doctor might use the internal imaging program only, but if there is some issue that the nurse cannot solve, then the doctor can open RADU and help the nurse.

Benchmarking

For the benchmarking, my team member decided to focus on the services that could provide a protected online channel for communication via messaging and calls. Also, she was looking for the services that initially did not have the communication tools but adopted them in order to improve the information flow between different stakeholders.

To address the problem with inadequate referral structure and to compare it with similar problems that other businesses can face with, the example of Amazon Audible was discovered. The main reason for this example was the process of ordering that is designed in such a way that it is impossible to place the order without giving the information needed to fulfill the order. So, we believe, this is the way the referrals process should also be done. The structure of the referral should have compulsory sections in it.

Summary

The main feeling from the observation was that the personnel of a hospital cannot spend their time on trying to understand how new software works and exploring its functionality. In addition, many doctors and nurses would like to provide a high-quality result, be efficient and treat patients with care and respect to their time. Also, there is a clear gap in information flow between primary and secondary healthcare, private and public hospitals. Not all of them have access to RADU system to see the referral status in time it submitted to the system.

At the same time, I assumed the potential in exploring the non-digital ways to deal with the problem. The regular meetings and some printed letters delivered by post might be a good solution to raise the awareness among healthcare professionals and make them attentive to the details that matter a lot for the radiology examination, especially the ultrasound examination.

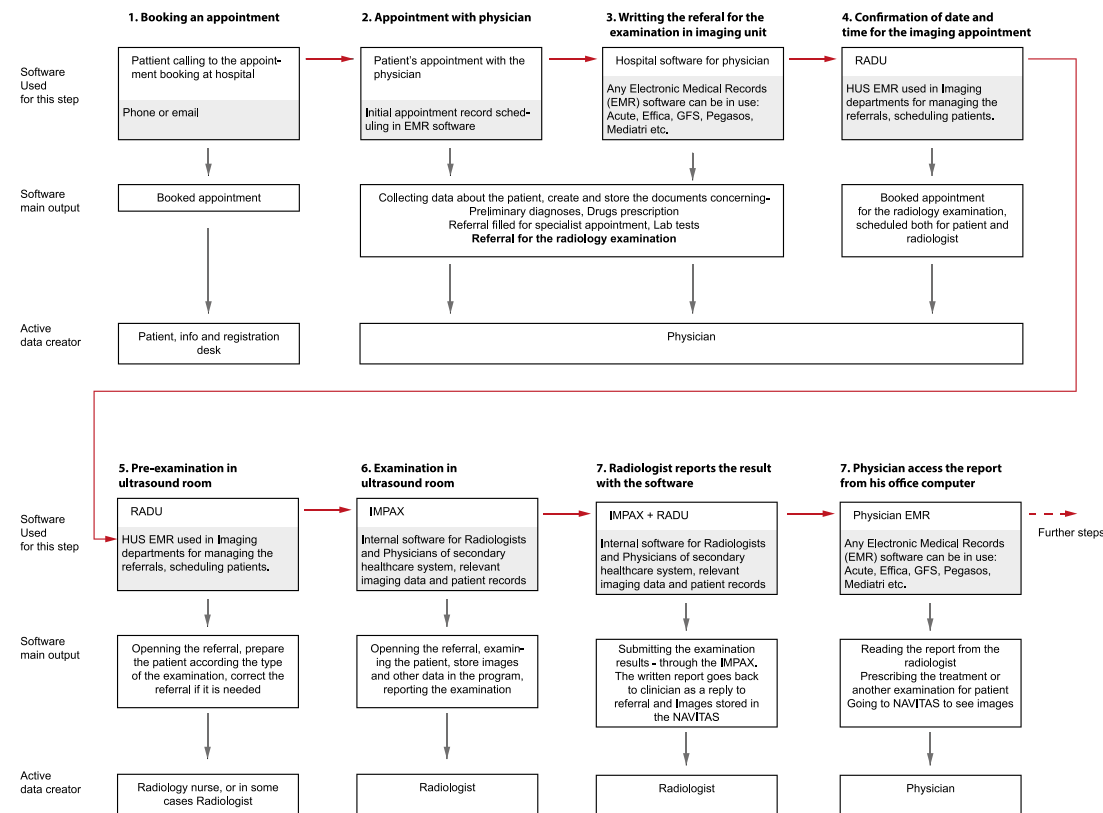
Hackathon 3-day intensive workshop

The 3-day hackathon is not a common activity for study projects. Usually, a hackathon is a few-days-long sprint that combines ideation, information gathering, testing, prototyping, and pitching. During those days our team was working together and followed the agenda presented by Aalto tutors. Below I will point out the most interesting events that took place during our hackathon.

Software network

Together with HUS representatives, we mapped the internal and external communication channels that are available for doctors in order to have a clearer idea about the connections those channels are forming with each other.

Communication graph for the primary and secondary healthcare software.



Graph 13: The visualization of the connected communication software and informational systems, both for primary and secondary healthcare in HUS

At the moment the number of medical professionals using RADU for their work is about 5000 people. RADU is linked to the IMPAX (internal imaging software installed on Imaging machine

as well on the computer that used for imaging reporting). The RADU support IMPAX with the patient's scheduling list and the time table of an upcoming patient for the current shift.

IMPAX is used primary in Imaging departments and linked to the RADU as well as NAVITAS (images database). Report submitted by the radiologist in IMPAX goes to physician's software where they can access the report. If the physician wants to see the images he or she should go to NAVITAS.

There are varies software available for the physicians. All of them can be used to manage the patient's flow and data. The way a physician is experiencing the information flow and the amount of information available can be different depending on many factors: the interface of the software they are using, the type of subscription, and belonging to a certain unit or department in primary or secondary healthcare.

Summary of interviews with HUS representatives during the hackathon

Along with building the common understanding of the software system architecture and the connections between different programs, we talked to our tutors and HUS representatives in order to collect more information about the work at the imaging department and why the referral protocol is such as an important part of the process:

- The average time for the ultrasound examination is 15 minutes; about 2 minutes from it should be spent on reading the referral and understand the referral question, and 3-5 of them on writing the report and submitting it to the system;
- The radiologist in the ultrasound room examines about 30-40 patients per one working day;
- The approximate cost of one examination in the ultrasound room is 70 euros; in the X-ray room it is 40 euros;
- It's not possible to decline or reject the examination because of an inadequate referral. The examination should be done anyway;
- If the referral is useless or contains a questionable request, in most cases the radiologist cannot reach the physician right away. Even though in the report the radiologist asks to specify the referral, he or she cannot be sure that the clinician will read it and will be able to improve the referral next time;
- There is no time to look for the right contact to call. Other channels, such as email, cannot provide the instant access to the physician either;
- Most likely the physician would not read emails that are not directly related to the patient's diagnosis, so even if the radiologist will explain the way the referral should be done, this information might never reach the physician and the same mistake would be done again and again;
- Each imaging examination has its own structure: the way referrals, the patient flow, and reporting are managed can be very different;
- We interviewed HUS representatives and asked about ways communication channels are used in their work. The result is presented in Appendix 2.

senting the virtual AI that helps to fill the referral and takes care of providing relevant information in real time. In case of vague assumptions regarding the case, the doctor can still write his own text in the referral text box. In this case, the system would recognize it and will make sure that the doctor's contact details are listed in the referral.

Form 1 (Left):

- Date of the issued referral
- Unit that assigned the referral
- Patient's number
- Booked time for the examination
- what is the code for examination?
- Notes related to examination (filled by nurse)
- Referral text
 - Describe the problem.
 - Describe the patient's situation.
 - Describe the reasons for radiology examination.
 - What is your main referral question?
- Please, write your name and unit (choose from the list)
- Please, provide your contact details (automated fill with the name)
- Report on the referral (filled by radiologist)

Form 2 (Right):

- Date of the issued referral
- Unit that assigned the referral
- Patient's number
- Booked time for the examination: CV. 560.34.21.4
- Notes related to examination (filled by nurse)
- Referral text: Cervical Vertebrae, C5-7
- 1. Use Visual analyser to point out the body part; 2. Specify in the box above; 3. Automatically set the code for examining; 4. Specify the problem with the referral text.
- Doctor that assigning the referral
- Contact details of this doctor
- Report on the referral (filled by radiologist)

Graph 16: Visualization of referrals

Blueprint 2 'instant communication channel'

The service blueprint presented in a Graph 17 has been developed around a radiologist who is the user of the service. The concept outlines the problematic or non-existing components of the system that are working against the system and the doctor's efficiency. Our aim was to see how we can minimize the tension between the software, the doctors, and the primary and secondary healthcare departments, and improve the information channels for all of them, while keep our focus on the imaging unit.

In this prototype, we focused on the process of the examination in the imaging department, so the referral is no longer the primary object for this blueprint. Instead, we were focusing on communication channels for the radiologist to receive, send and exchange the information in real time as well as for future use. Our main question for this blueprint was: 'How can the radiologist reach the physician during the examination in real time?'. We were also considering the way the radiologist can give feedback on the referral quality in a precise, timely and efficient manner.



Graph 17: Blueprint 2, 'instant communication channel'

Taking into account the preliminary research for this project, we suggested to keep the nurse in a very central position in the communication structure. Nurses, as it said before, are very important specialists that keep the processes running and, in many cases, they are indispensable. Nurses are 'the secret power' of any department.

Taking into account the preliminary research for this project, we suggested to keep the nurse in a very central position in the communication structure. Nurses, as it was said before, are very important specialists that keep the processes running and, in many cases, are indispensable. Nurses are 'the secret power' of any department.

So, according to our scenario, the radiologist has a problem to understand the purpose of the referral he got and the reason for the ultrasound examination. Most likely there was a discrepancy between the referral text and the referral code or there was not any referral question that would specify the physician's concern. To solve this problem, the radiologist asks the nurse to contact the physician via the 'hot line' using the online communication software. The nurse could find the contact of the clinician in the referral contact's link and can call straight from her computer and try to connect with the clinician. Then, when the nurse establishes the contact and makes sure she is talking with the right doctor, she can pass the call on to the radiologist or take it herself and ask the physician to specify the referral while the radiologist is preparing the patient for the procedure, typing in the preliminary report, etc. In case the physician could not be reached in real time, the nurse can send an SMS to his work phone where she can request to improve the particular referral. Of course, in this case, the resources of the imaging department will still be wasted, but the physician will have a chance to improve his referral for the next time and avoid this mistake again.

In the end of the procedure, while writing the report, the radiologist could fill the form that provides generic feedback about the referral for the current examination. By rating the referral, he can rank its usefulness, the quality of the question in the referral, and overall quality. He can also write his own suggestion if he thinks it is important. Physician in his turn will be able to see the overall ranking of his referrals that were submitted by different departments and analyze the potential weak areas that he needs to improve. He will be able to see the referrals that were marked as problematic or doubtful and work on them. If the overall percentage of the problematic referrals goes too high, the physician might be advised to improve the referrals' quality and be assigned for the extra guidance from the rating departments.

Summary of the workshop

During the blueprint session, more questions were discovered. Most of them were related to the recourses that HUS can allocate for the project; the doctor's motivation to use the new systems, to write and read feedbacks; security concerns of the communication software; and ethical or professional aspects of the situation when the doctor is seeking the consultation with another doctor while examining the patient. As a result, we proposed a number of further actions to proceed with:

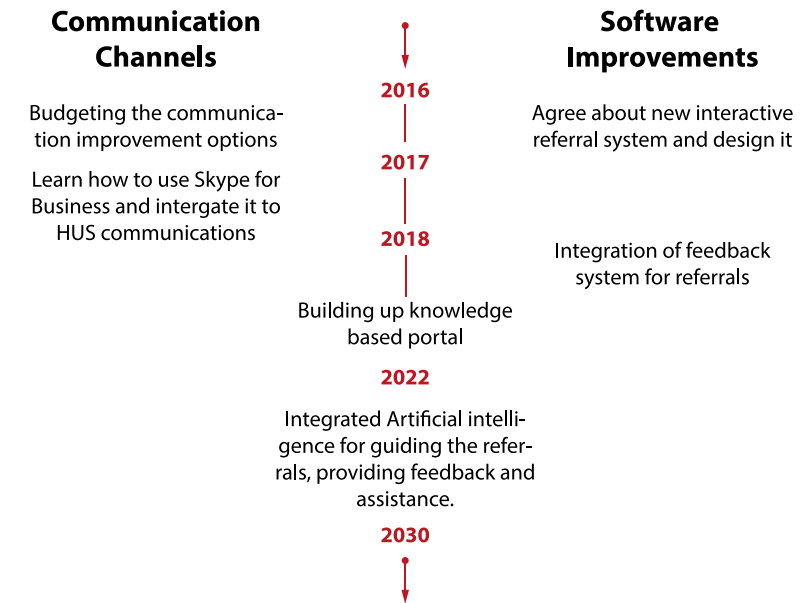
- Prototype the new channels: imagine how the physician can get help from the radiologist when forming the referral and how the radiologist can reach the physician when the referral is questionable or incorrect;
- Prototype a new generation of the referral: think what are the small but important details that can affect and improve the quality of the referral;
- Prototype a feedback system: assume how physicians can get the motivation to learn the new referral procedures and how the radiologist can be sure that the physician reads and understands the feedback;
- Take into account the resources and the personnel of the hospital during the prototyping.

Our client asked us to think about the communication channels as the primary objects for our project and to eliminate complex futuristic ideas that could not be implemented in a short time. They suggested to move away from the idea of digital assistance and focus on communication channels between doctors. Also, there were a few comments regarding the scenarios overall:

- Help (from doctor to doctor) should be available on request and it should work both for the physicians and radiologists;
- Communication channels are badly managed at the moment, so figuring out what can be done with them could be a very good thing to do;
- The project should be interesting to implement from the financial perspective too, so take into account the people who are making the decision. You need to sell your idea to them too.

Further development

To explain the bigger picture, the strategy chart (Graph 18) was presented. The chart explains our vision for developing the communication and software systems and their integration in the near future:



Graph 18: The conceptual future proposal of communication and related software development in HUS

The focus of our final proposal was the next two years of HUS internal communication strategy development (Graph 18). To explain the idea in a more tangible way we created the presentation that contained a storyboard in addition to the conceptual future proposal. The second blueprint was taken as a base for our storyboard and was refined according to the feedback and insights that we gained during the previous presentation and the feedback session.

Summary of the hackathon

The three days of working hand in hand with the client's representatives and being able to hear their feedback were very helpful and inspiring. The support from the Aalto University tutors, Fjord, Accenture, and HUS gave us the solid frameworks for the ideation, prototyping and pitching proposals. Despite some personal concerns and willingness to take the project to a slightly different direction, it was clear that scheduling and being strict about deliverables during those days were working pretty well and the team was able to produce a lot of materials for analysis and further use.

Thus, for the next few sessions, the team was focused on evaluating the concept, investigating the possibilities and finding the relevant information that would support the concept. From

the end of the hackathon the concept was fixed and the team got to focus on it. The current interpretation of the case is intending to describe mostly the concept and the methods we used for the project development and analyze it from the service design perspective, so I will not describe the pitching and presentation coaching process in details. Even though it was a big part of the project, it is not a main focus of this thesis.

There were a few areas the team had to examine, analyze and work on during the project:

- Service design methods;
- Process mapping: business concepts and cases;
- Project management and change management;
- Presentation technique and pitching.

We had a few sessions with mid-term presentations after each: the first one was focused on concept overview and the technical aspects and feasibility of our concept. The second was focused on the managerial aspects of the project and presented the development plan for the concept as well as the methods that would help the changes to happen and to be adopted by the users. During the second presentation, we were discussing the feasibility and viability of the concept from technology, business, and user's perspectives, and made a few proposals that would help to successfully incorporate the concept into doctors' everyday work. Finally, our last presentation was a short pitch where we were trained to sell our ideas for the client and convince them to start a trial. During this presentation the desirability and timeline of the project components were checked and discussed. The final deliverables were prepared for the end of April and consisted of the final report and pitching.

Final concept: 'first step' solution

Establishing a communication channel that would simply help doctors to communicate was the first goal for our concept. Our team realized that in order to succeed with the realization of the changes in the internal communication system of the hospital, the changes must be easy to implement. As there were few resources that could be allocated to this project, it was suggested that the concept should explore the existing HUS communication system. We started to look for opportunities in the existing communication channels that are not in use for some reason.

One of the main restrictions for communication channels is the confidentiality of the patient data and the health-related personal information. Another obstacle is a limitation of the resources that the hospital could spend on improving the existing communication channels. Those two limits forced our team to narrow down the focus to the communication channels that already were accepted among HUS employees. To do so we contacted the ICT department by e-mail and asked them to pick some channels from the list of that could be used for this specific purpose: communication between a doctor at a primary healthcare and a radiologist.

Based on the reply from Mikko Rotonen (IT Development Director at HUS IT) we assumed that Skype for Business was an accepted software for communication between doctors. HUS was able to use this software from their own Azure cloud service and there were no technical or

patient confidentiality restrictions to start using Skype for Business software among the doctors.

According to our research, the Skype for Business (SfB) solution was already licensed for each HUS user and free of any additional charge. Each of the municipalities that co-operate with HUS has the Skype for Business software as part of Microsoft Office 365 that should be already installed on each HUS computer.

SfB is a desktop application but also available for smartphones. Also, audio and video messaging is available and easy to use. Other users that have their logins in SfB can be found by typing their name (or login) on the specific box on screen or by using the search feature. Also, there is a possibility to share a document, a video or your desktop view in real time with another SfB user or a group of users. It is possible to arrange virtual meetings via SfB, which is very useful for providing feedback and establishing connection between doctors that are far away from each other. The HD resolution webcams, internal microphones, and loudspeakers could be used during the video and conference session, especially if taken into account that most laptops are equipped with those functions already. Finally, It is possible to track the status of an SfB user and see if he or she is available. The history of the user's chats and other communications are stored in the system and could be used also after the consultation.

Concept presentation and feedback

In order to support our findings and boost the discussion about the implementation of the project we have done, our team presented the plan that could possibly help HUS to adopt 'Skype for Business' and assume its practical benefits for the personnel. The plan had an advisory nature and was focused on pointing out what could be done by HUS internally, taking into account the limited resources of the organization.

Our first proposal was a pilot that could help to review the possible bottlenecks of the SfB solution in a real environment and support the development of the concept.

Then, we advised HUS to agree on a certain budget and the employees' involvement in the project and stated the fact that it's not possible to run the pilot with no resources spent.

Also, we introduced the steps for realization of the HUS communication strategy and presented the roadmap of this process.

Finally, we added a few examples of small promotional campaigns that potentially could help HUS to move forward with the realization of the communication strategy. One example was a postcard that would be received by the physician. The postcard might contain a greeting, as well as different information related to the referrals for and communication with the imaging unit, or just positive feedback about the doctor's input in the patient's treatment.

Feedback from HUS representatives

We presented our recommendations to the meeting board at Hyvinkää hospital, on April 15, 2016. The presentation was followed by the discussion with HUS representatives from different departments: Anne Krivtsova (production manager), Jyrki Putkonen (CE), Timo Mertanen (medi-

cal superintendent / Hyvinkää hospital röntgen), Jonte Markkanen (resident doctor / Hyvinkää hospital röntgen), Päivi Kiiskinen (service designer), and Jukka Kovanen (ICT manager). Also, the representatives from the imaging department and the local secondary healthcare stations were present: Susanna Satuli-Autere (medical superintendent at Hyvinkää Health Care Center), Satu Räikkä-Laine (Hyvinkää Health Care Center), Sirpa Salinto (Development Manager from Hyvinkää hospital), and Kristian Koivisto (physician from Järvenpää healthcare station).

During the feedback session, the greatest concern of our client was the safety of the patient information and the software reliability. Also, discussion was initiated regarding the data saving, storing and using in the patient's medical report. An interesting fact was that Hyvinkää hospital representatives were not aware at all about practicalities regarding Skype for Business and its availability for every doctor even though the Office 365 is installed on every doctor's and nurse's computers. They stated that if the development of the project will continue, the proper investigation regarding SfB should be included in the business proposal for the implementation plan.

After the discussion, Hyvinkää healthcare station and Järvenpää healthcare station stated their interest to take part in the pilot and the implementation of Skype for Business solution according to the initial plan we presented. However, the project did not go any further due to budget limits and the lack of resources. HUS management pointed out the long-perspective nature of the project but at the same time specified that they would like to see a more feasible and detailed plan of the project implementation in order to be able to allocate the resources, even for the concept pilot. In other words, at this current state the proposal seemed to be too risky and vague for the decision makers to invest in it. From our side, we specified that the final deliverables were supposed to present the concept and visualize the possible solution for the HUS internal communication problem. The more critical analysis of the resources and the implementation strategy is the first part of our strategy proposal for the realization of the project and should be handled internally at HUS with support from the side consultants.

“Studies over the past several decades have all drawn the similar conclusion that over 80% of system (service) errors can be traced back to a failure in the design of the service. It stands to reason as a practical matter that an IT organization considering implementing the processes of the Service Design phase of the IT Service Management Lifecycle consider bolting on a planning and support process and adopting a standard design methodology.”

David Nichols, President of ITSM Solutions LLC, 2010

4. Analysis of the methodology and further development

This chapter analyzes the tools used during the HUS case and presents the case findings. Then, the research questions and objectives of this thesis work will be discussed. An additional framework to validate the findings and to support the development of the research questions and objectives will be proposed and followed by the concluding chapter.

HUS CASE ANALYSIS

Tools used in the case

The project wireframe was developed by responsible Aalto University tutors and their collaborators from Fjord and Accenture. This course combined various teaching, coaching and learning approaches. My personal goal was to use service design tools and methodologies to proceed with the project goals. Below I will evaluate the methods that were used during the HUS case.

Interview

The interviews that were conducted for the HUS case had an informal nature. In fact, there was no time for a detailed research before the first interviews. Most of the questions were formulated while visiting the imaging facilities in Hyvinkää hospital, observing the software in use and appointments with patients. Later on, after gathering and analyzing the data, another, more structured interviews were conducted with the IT department and the doctors. Both types of interviews served their purpose. In the first interview, I gathered initial data, while the following interviews were prepared by the whole team and had more specific questions regarding different aspects of the service and its components. Finally, interviews conducted during spring 2017 for the thesis evaluation focused on doctors' experience with the digital tools they are using for their internal communications, and the challenges and future needs of the medical personnel.

Observation

Observation was very useful in the beginning of the project. However, it would be not that useful if I would not be able to combine it with an interview right after that. Many details of the environment, the interface and purpose of the software, and the procedures of the imaging hospital unit were too specific to interpret without additional comments from the personnel. Looking back, I could say that observations would be very beneficial for further case development, especially if we could access the primary care facilities.

Blueprint

As I was the only student from my team executing observation and interviews in a hospital for the initial research, it was very important to make the results understandable for my team. That is why, in addition to the basic report, my findings were visualized using the service blueprint method. The team's feedback on that method of delivering information was positive. Also, from my perspective, I definitely see the benefit of using the service blueprint method: it helped to structure the report, to create a common understanding within the team and to proceed with the ideation. Also, the appointment blueprint was very useful during workshop sessions with our client, as it was easier to refer to the certain touch-point or particular moments of the appointment using the visualization.

Workshop

During our 3-day session that involved our team-members, tutors and client representatives, we went through the process of preparing the concept and presenting it from scratch. The most interesting and memorable activities I would like to mention are: brainstorming sessions, both group and individual, that resulted in creating an affinity diagram of ideas; rapid prototyping using the service blueprint that was part of the course assignment; and the concept presentation via a storyboard.

There are different ways a team can approach an ideation session. In our case, individual ideation and brainstorming was necessary at the beginning, as our team was formed in the very first day of the hackathon. The new members had to take their time to form their own thoughts about the brief after familiarizing themselves with initial research data. The group brainstorming was used as a method for bringing our team together and to find the common ground to move forward with the project. The affinity diagram helped to structure our ideas, cluster them, and discuss the more promising directions to proceed.

According to 'The SAGE Encyclopedia of Quality and the Service Economy' (Dahlgaard-Park, 2015) the traditional service blueprint consists of five components. The service blueprint that we used had more components in them: user's actions, user's thoughts and emotions, touch-point, onstage provider, backstage provider, support processes and systems and stakeholders. Some components, as a user's thoughts and emotions, were more difficult to proceed with, and some of them required additional research. The creation of the service blueprint helped us to form questions that we were able to address to client's representatives, so their presence and involvement in our discussion was very helpful as there was no time to research the topic and without it the concept would be based mostly on our guesses.

Finally, storyboard and role playing as ways to present a concept helped to involve the evaluators in the conversation and enhance their feedback. Since we had a visual representation of our concept, it was easier to create an 'anchor' for the evaluators and us to proceed with discussion on the intangible components and service processes.

Analysis of internal communication components

Touchpoints

The touchpoints that we explored during the initial research phase could be divided into two groups: digital and physical touchpoints. However, some touchpoints are difficult to consider as digital only. For example, referral in its digital form can be printed and carried to a different department to seek for a consultancy or printed version can be used to support reporting after examination is performed, as it is happening in the CT (computerized tomography) room.

The software is quite complex and not intuitive. Doctors mentioned that not all software is in use on a regular basis and some of the programs have quite confusing authentication procedures, that make them difficult to use.

RADU (referral software) allows the possibility of human errors and it depends on the doctor's experience and established routines. RADU allows the radiologist to see the referral, but cannot control its quality.

There is no touchpoint that could be responsible for sending feedback to the physician or other referring specialists. Based on HUS case findings, there are very few options for the radiologist or another specialist to send the feedback message to the primary care physician: it can be done by direct email, or feedback could be included in the report text, which is not a common practice at all. Nevertheless, in both cases it is not clear if the message will be received, processed and taken into account by its recipient.

Then, there are potential touchpoints that are not in use. One of them is Skype for business. Our research showed that all doctors potentially were able to use this messaging platform to connect with each other in real time. The interesting fact was that no one knew about this opportunity and such functionality wasn't considered by HUS management as an option.

Communication channels

Research on internal hospital communication is showing a continuous scholarly interest in this area. Authors claim e.g. that 'effective information transfer requires a solid foundation in communication skills. While these skills have received much attention in the medical literature, scholarship has focused on physician-to-patient, not physician-to-physician, communication. Little formal attention or education is available to reinforce this vital link in the continuity of patient care' (Solet, Norvell, Rutan and Frankel, 2005, pp.1094-1099). The authors see a clear benefit in doctor-to-doctor communication as well as in standardized procedures for establishing communication channels that would help to overcome the communication barriers.

The information gathered during the HUS case partially proves this point of view: doctors agreed that it would be very helpful to get in touch with another specialist to ask for advice during the appointment, but at the same time, it does not seem probable. Each doctor has his or her own agenda for the day and patients to take care of. As a result, they cannot spend time on consulting on someone else's patients. Standardizing the communication procedures and familiarity with options to communicate with other specialists could help to improve the situation.

Another important thing to mention is the digitalized environment and various pieces of soft-

ware available for the doctors to assess the patient's data and medical history, referrals, records of other doctors, and drug prescriptions. Our interviewees mentioned that functionality of the software is limited, sometimes confusing. According to them, they need tools that help to create two-sided communication channels between doctors and connect this channel with the referral and other medical data.

The communication channels that are not part of the internal software, for example Skype for Business, might feel suspicious to the personnel. Also, there is no clear data to support its safety: research on Skype use within healthcare departments is very controversial and mostly performed in the US market that has quite specific regulations and rules.

Finally, most of the staff is able to use mobile phones for calls during the work shift, but not all of them have smartphones. Emails are used mostly when it's possible to access the computer.

To summarize, I can say that communication channels should be supported by the internal software and make two-way communication of the primary and secondary healthcare personnel possible. Skype for Business as a concept looks very interesting, but at the same time its suitability for the internal hospital communications is controversial.

Discussion: connecting objectives and the HUS case

The digitalization of public healthcare is an ongoing process in many countries and one of the most important prospects of social welfare.

Digitalization was considered a tool that might help society and industries to become ready for future challenges. The following challenges can be considered as main reasons for digitalization in public healthcare:

- Aging population;
- Lack of medical professionals, especially physicians or general doctors;
- Limited resources in the public healthcare;
- Increased demand for individualized public services and their quality;
- Increased demand for affordable public healthcare;
- Need for information exchange between healthcare professionals;
- Involvement of healthcare industry in collaboration with other social services.

Digitalization of public healthcare backstage is affecting all other systems involved in the healthcare process. The processes and actions that can support successful digitalization of internal communication in public healthcare in the long run can be considered as drivers for digital transformation of the public healthcare in general:

- Technological progress, development of mobile platforms, and progressive data management;

- Government involvement in the process of creating standards for healthcare functions and operations;
- Overall development of digital services for healthcare. The service economy evolution, novel business models, and types of collaboration in private and public sectors could contribute to the development of public healthcare services;
- Co-creational practices among stakeholders of public healthcare as well as involvement of medical personnel and support of the hospital staff during the digital transformation and development of the service;
- Popularization of service design tools and reasons for digitalization, letting stakeholders see the big picture.

The studied literature observes certain practices in healthcare that could support and encourage development of the internal communication channels in public healthcare:

- Involvement of the medical personnel in the research and development of the digital tools from very early stage;
- Promoting the existing tools and platform among doctors, especially young professionals;
- Establishing a continuous dialog between IT support and medical professionals;
- Educating doctors about the importance of generating clear and structured information for internal use, and developing tools and methodologies that would support it.

Public healthcare is a very complex system that includes many stakeholders, processes, constantly transforming internal structure, policies and methodologies. It is an extremely rich and interesting environment for applying digital tools and methods that might enrich the potential of the system. On the other hand, public healthcare is still somewhat slow in adopting innovative digital solutions, considering the privacy of personal data and patient safety as its primary concerns.

In order to form the answers to research questions I would like to propose the possible outcome of the thesis and proceed with the conclusion. The assumptions proposed for discussion will be formed in groups according to the research questions.

Benefits of digital transformation of public healthcare for its stakeholders:

- From the patient's perspective, digitalization of healthcare services could possibly improve their accessibility and make them more affordable. It also will create new opportunities for people to choose their healthcare provider with less attachment to the geographical location. At the same time, new technology and its democratization would help people to track their health conditions with no constant face-to-face control of the doctor, but using the support of digital assistance;

- Healthcare employees might experience a lot of pressure while trying to operate in a constantly transforming environment. At the same time, most of them agree that those changes are necessary. Digitalization is supposed to support doctors with more relevant information about the patient's condition and treatment options available, as well as to assist on many other matters;
- Finally, benefits of digitalization are directly linked to the collaborative aspects of service economy and the future of public services. Today we see the transformation of fragmented data into one solid and unified infrastructure. Service providers should understand the benefits of collaboration practices and form alliances with each other. At the moment, public healthcare services in Finland are leaning towards creating a common database that would simplify and automate many operations, saving time and money.

Employees' perspective on the most challenging obstacles in digitalization of public healthcare internal communication:

- Too much software to handle: medical personnel do not need one more tool to manage information flow, but they would rather need a working one. Collaboration with IT staff and on internal software issues might help and improve the current situation;
- Now enough resources: public healthcare does not have enough resources to accelerate the digitalization of the backstage structures, as the main focus should be on the patient and their experience. Internal support systems seem quite decentralized and confusing in its complexity;
- Incompatibility of software between different hospitals, primary and secondary healthcare as well as private and public healthcare: in most cases, it is very difficult to exchange the digital data with other hospitals as they have different software and data encryption systems;
- Access to all data and its exchange during an appointment with the patient: healthcare needs a unified two-way communication channel that allows doctors to transfer the data freely and to keep in touch with each other. At the moment, most of communication channels support one-way data transfer.

How service design methodology can contribute to the successful digital transformation of public healthcare communication?

- A hired service consultancy might be able to create a very sharp and attractive strategy for future of internal communications for public healthcare, helping to convince policy makers of its importance and financial sustainability. Nevertheless, the project might not have a chance to be realized without internal components that would support its development from within on the regular basis and promote the change. Service design tools could help to empower personnel and support their initiatives internally;
- Service design tools can be used for conceptual testing and evaluation in a small scale by

engaging different stakeholders in the process, co-creating the environment to share the ideas and concerns;

- Finally, the service design methodology could be used to connect internal components of the system and improve their facilitation.

ASSUMPTIONS VALIDATION

Reasons for additional study

While forming the assumptions and evaluating the HUS case I realized that additional research to support my hypothesis should be conducted. The main reason for that was lack of information from the direct users of internal healthcare communication systems – doctors and nurses.

For that, I would like to create a discussion with the doctors that currently are working in public healthcare in Finland. The list of questions will form the base for the survey that will help to conclude my findings.

The initial idea to have a discussion and even a meeting with all of those doctors together and to arrange a workshop was turned down due to conflicting schedules of participants. As a result, some of the participants agreed for an interview and some of them had to take a survey.

The data that I gathered through the interviews was richer and more responsive as some topics around survey questions were discussed and explored in addition. The survey's questions are presented in the Appendix 3.

Interviews and survey summary

In total five doctors were contributing to the survey. Two of the doctors agreed to an additional interview by Skype. All of the doctors are working in secondary public healthcare, but some of them had experience working in primary care too. Below I will outline the most interesting findings from those interviews with quotes from the interviews.

All interviewees stated the value of doctor-to-doctor communication in their everyday work. At the same time, some of them mentioned that they do not want to disturb their colleagues and that is why a phone call might not be a great idea to communicate.

Three of the doctors claimed to have a satisfactory information flow among themselves and their colleagues, and one doctor even was sure that it is possible to find all necessary information in the system. At the same time, most of the doctors mentioned problems with referrals coming from the primary care, especially from the private sector or distant hospitals.

Referrals were marked overall as an extremely valuable source of information, as well as the

EPR (Electronic Patient Records). Email was considered as a less valuable channel for communication in general. Phone calls were considered to be useful, but again the concern of taking another doctor's time was quite dominating.

“When I was working at the primary care feedback was crucial to me and my professional development, as I was the doctor who would send my patient to specialists, assuming particular diagnosis. Those feedbacks on my referrals and their quality would help me to become a better doctor.”

(Neurologist doctor, interview, March 2017)

Doctors seemed to have different expectation from internal software they are using. Most of the doctors claimed that they value simplicity and intuitive interface architecture that the current system is lacking. Also, the importance of the software functionality was considered as an important asset. Almost all of the doctors would like to understand if their message was delivered and processed by the recipient. Additionally, interviewees valued consultation with colleagues and the ability to get feedback on their report or referral from other specialists, involved in the treatment process of a patient. None of the doctors considered the availability of software for multiple devices as an important asset. This might be because they have pretty strict work shifts and their work is located mostly in one building, so there is no habit or need for remote communication.

Most of the doctors said that they would gladly educate new colleagues how to work with internal hospital digital tools and the way to make a good referral for the specialists. Regular meeting with IT units were considered to be as much valuable as the supervision of the newcomers. Not many people saw value in involving side consultancy on solving internal problems by using external communication channels; they would rather trust people with some practical experience from within or from industry. At the same time doctors agreed that the development of internal communication channels should be on the priority list of decision makers and involve the direct users of the system (doctors and nurses) in the decision making process.

“The Image archiving and viewing software I use (my main tool), has very good chat-option for internal consultations. Unfortunately, it works only between radiologists.”

(Radiology doctor, interview, February 2017)

Most of the doctors had a difficult time with understanding service design methods and practices. Definitely, some common language should be developed to explain the value and the purpose of those methods. Interestingly, after finding a right analogy from the medical practice to explain the method, doctors could easily evaluate the feasibility of it in their perspective.

Three of the doctors stated that benchmarking and co-creation activity would be very helpful for development of organizational digital culture. Then, simulating the service process during the meeting with IT and other stakeholders of internal hospital communication would help to set the common goals and arrange the work flow. But most of the tools were quite novel, so they did not want to comment on them much.

The interviews were really productive and generated a lot of insights for finalizing and future work. Personally for me, it was very important to talk with medical practitioners and hear about the internal communication challenges that doctors in Finnish public healthcare are dealing with in their work. The study proves the relevance of the topic and validates the thesis findings. The following chapter will summarize my findings and conclude the thesis.

“None of us was involved in improving software with this methods, but we use some of them in our work.”

Neurology and Pediatric doctors, interviews, March 2017

“We (doctors) treat the same patients in primary and secondary care but digital communication is a problem. We can use program Navitas but it is most user-non friendly software I saw. It is slow, you should use different password, and it is very difficult to find any information in general. But I have heard that Kanta update is coming and it will be linked with ‘Miranda’ (another software), so I hope, that would make things easier. Also, I have quite a big expectations from future Apotti software.”

Neurology doctor, interviews, March 2017

5. Conclusion

Public healthcare services, as well as other public services, should be able to create value for many different user groups, while commercial services can focus on just one group of users. Also, public services are expected to contribute to the wellbeing of society, national economic growth and stakeholders' agenda.

Development of the backstage of the public service is crucial to the service users and employees' experience, therefore it should go hand in hand with the improvement of the frontstage components.

AGENTS OF CHANGE

A few studies support that "decoupling the backstage from the frontstage to maximize efficiency or operational excellence is likely to cause coordination problems and may harm the frontstage experience" (Larsson, Rikard, and Bowen, 1989, pp. 213-233; Metters and Vargas, 2000, pp. 663-682). Several strategies were suggested to improve the connection of the backstage with the frontstage part of services and to enhance the experience (Chase, and Hayes, 1991). Those strategies include: mix employees (backstage and frontstage) together in one physical place and let them interact during work time; focus the backstage capacities on a specific frontstage task; and finally, challenge the backstage to perform some frontstage parts of the service and to interact with the client. In case of healthcare services, it is possible to suggest alternative activities that can help stakeholders to exchange their knowledge and to understand each others' challenges. The established service design practice has a number of tools that could support this approach.

Value of service design methods for digitalization of healthcare services

According to Bate and Robert (2007), design methods and collaboration of different stakeholders in order to bring together their unique expert knowledge and experiences could help to improve healthcare services and the satisfaction of all players. Indeed, there is a global awareness that 'public healthcare as it is will not be able to deliver what is required in future' (p. 3), so many countries understand that some 'radical and sustainable changes are needed' (p. 4). Connecting it with Alben's work (1996), the authors brought up the importance of "designing experiences, not services" (p. 11), which means improving "how well people understand the service, how they feel why they are using it, how well the system serves its purpose and how it fits in the context of using it" (pp. 11-15) and seeing design as one of the tools that could help to solve the evolving problems in future healthcare. They state that an experience-led design methodology should be used in developing the aesthetics of the service, which is directly related to the interface's usability and utility and, through that, directly correlates and influences other two important elements of design - functionality and safety, which very often are prioritized in healthcare services.

There are three trends that the authors interpret as very important for improving healthcare services and moving forward to more satisfying experiences both for the patients and doctors. First of it is the trend of democratizing user-centered innovation. This is about helping people to understand that improvements of their own working space (in our case, doctors) can start from their own initiatives. Second one is the user involvement in the forming of his or her own experience, and the last one is the trend of innovating user communities that can support each other and consolidate their efforts in achieving the common goals. Finally, they conclude that "users' participation in service development and shaping of their own experience is crucial for successful innovation" (Bate, and Robert, 2007, p. 187, 192).

Design thinking and designing for services are novel approaches for the public service system, but as it is proven by examples from the private sector, it "can lead to significant changes in both policy design and service delivery" (Nesta, IDEO, Design for Europe, 2017, p. 5). The report states that design thinking and service design tools should be considered for public services use and development in order to expand "portfolio of methodologies for public services development" (Nesta, IDEO, Design for Europe, 2017, p. 6).

Working in the public sector, especially in healthcare services, is very valuable for most of its employees and most of them would like to see positive changes in society and to deliver good quality service to improve people's life and wellbeing. Service design methodology helps to connect those people to the process of changing the service and gives them a chance to influence the future of public services.

Below I would like to propose a list of stakeholders, whose input is very important for developing internal communication channels in public healthcare.

Stakeholders of public healthcare backstage development

Policy makers: governing structures and public initiatives

Traditionally, government and policy makers are responsible for the change of the public services strategy. They look at the big picture and develop their initiatives based on quantitative data. But, as stakeholders they have less healthcare service experience than citizens or medical professionals (Nesta, IDEO, Design for Europe, 2007).

Healthcare management

Their main agenda is to make the hospitals work and to balance its cost with the quality of the services. They are a very important chain that translate the policy maker's voice, and they are responsible for the implementation of the initiatives.

Medical professionals

The group that is influenced more directly by the development of healthcare's internal

communication systems. Many doctors would be happy to be part of developing the internal systems of the hospital and see a great value in bringing their expertise on board before introducing software to the wide pools of users.

ICT medical hospital units

Due to digitalization, IT-driven expertise has become a very crucial component of any service and its internal structure. Those service structures should be more integrated into the everyday life of a hospital, its staff and visitors, to understand the challenges of the personnel and to help find timely solutions.

Patients

Patients are becoming the clients that have their own unique experiences along the service journey. Internal hospital communication channels are something that patients don't necessarily know exist, but those channels are part of the experience delivery system that helps to refer the patient to the certain specialist with no delay, and to proceed with diagnosis and treatments, tests and a recovery plan. Patients are experiencing the system as a whole, but nonetheless the improvement in internal communications can directly affect their health and even life.

Service design communities and consultancies

The community of design professionals has a set of skills and expertise to run and execute the development and improvement of various services in public and private sectors. Some of them are commercial-driven unions of professionals and others are motivated by democratizing and popularizing the service design methodologies among the private sector, government, public institutions and society in general. They might work in close collaboration with each other and be involved in similar research and development activities. They are very important components for developing, experimenting, sharing and practically contributing to the service design, proving its relevance for the future.

Academia

Universities and research groups around the world shape future professionals and help them to experiment with the tools and methods by prototyping the process of solving real challenges in the school environment. It creates a solid ground for future development of the methods and tools as well as supports the learning and exploratory nature of design activities.

Stakeholders contribution

All of those actors have their own goals and objectives to follow. In order to support the development of internal communication channels in public healthcare we need to unite their efforts and build supportive structures for the change. Fortunately, some changes are happening right now and in Finland policy makers seem to understand the importance of involving service design methodology and design thinking to the portfolio for public service development. Stakeholders' experiences are crucial for gaining the knowledge that is driving the power of change, whereas their commitment to the common goals is a very important factor to success. Below

I would suggest a few principles that might help with the development of internal healthcare communications:

- Get stakeholders interested in development and clarify the benefits of their involvement;
- Set up clear goals and a responsible enforcer. Be sure that all stakeholders are involved in development of the service and would benefit from its development;
- Encourage two-way initiative: top-down and bottom-up;
- Consider an in-house (in-hospital) unit responsible for communication innovations, with professional expertise in research, service design, lean management, agile development and medical competences;
- Use service design tools that can help minimize the risks of the trial, such as observation, interviews, service blueprint and customer journey mapping for rapid prototyping of a service components and scenarios.

SUMMARY, LIMITATION OF THE THESIS AND FUTURE RESEARCH

This thesis observes the digitalization of the public healthcare service backstage, and detects challenges and discovers opportunities for developing internal communication channels in public healthcare. As the work primary focuses on Finnish public healthcare, the research and the HUS case help to better understand the regional aspects of the Finnish healthcare system and its digital transformation.

Limitation of the study and future research

The limitations of this work are directly related to the topic and the object of the study. Public healthcare service has a very complex structure with great amount of components, cryptic networks and diverse stakeholders. Potentially, a comprehensive analysis of all those elements could be a great subject for a bigger study, and influence of all of the parties should be taken into account.

Then, the solid validation of the findings might require more participants. In addition to the employees of secondary public healthcare it would be extremely beneficial to evaluate the results of the study by an open discussion with other stakeholders, especially primary healthcare practitioners, communication software developers and the management of public healthcare. Additionally, collaborative service design practices incorporated in the final evaluation of the thesis might be beneficial for the outcome.

Summary

It is certain that the digitalization of public healthcare services is considered a necessary step towards its improving. Based on the thesis findings, the benefits of digitalization are:

- Faster and more complete access to information about a patient's medical history, available treatments, medicine dosage and services for support;
- Better information flow among different stakeholders and internal units;
- Minimizing risk of mistakes by increasing the accuracy of the data available for doctors and patients;
- Improved efficiency of certain processes, such as referring the patient to a specialist, booking an appointment, or following the treatment plan by self-inspecting and controlling a critical illness;
- Reducing the cost of medical care;
- Support of self-care and wellbeing initiatives.

At the same time, there are certain doubts about the methods that are forming the digital infrastructure in public healthcare services:

- Privacy and security of the patient's data are raising a lot of doubts among medical professional and policy makers;
- The gap between internal clinical system, administrative system and IT support, together with poor digital integration between primary and secondary public healthcare, create a lot of challenges for the doctors and decrease efficiency, doctor and patient satisfaction and commitment to the service itself;
- Building a feasible, sustainable and satisfactory digital system requires a lot of financial investments and strategical commitment. The public healthcare service is funded from the tax money and the budget distribution is a very challenging task;
- As it can be seen from the research, the development of digitalized internal network and communication systems in public healthcare requires to change the organizational culture and to allow close collaboration between units that are not necessarily sharing the same language and might have different goals for digitalizing the service. It is important to be aware of those differences, and to support initiatives among personnel and to involve users of the service in the development and decision making process.

The reasons for digitalizing of internal communication in public healthcare and healthcare in general are pretty clear. Most of those are connected to maintaining and improving the quality of public healthcare services, together with satisfying users' demands and preparing for future challenges.

So, what can be done to support the public healthcare service transformation and digitalization of internal communication channels? As it was suggested before, the involvement of primary and secondary healthcare professionals could positively affect the result of the transformation. In addition, a collaborative approach and combining the efforts of medical personnel and IT healthcare infrastructure might help to develop common goals and to understand the needs of doctors and nurses, and to match it with the available technology.

Bringing on-board design thinking, user-centered practices and service design methodologies could help to connect the separated parties and to discover the common language to share their insights. Healthcare as a practice should always be attentive to the people's needs, maintain certain attributes of care and commitment for the sake of the patient's safety and quality of the service. For this, changes should come as well from inside of the organization. I believe, that creating internal units or positions that would promote the culture of co-creation in public healthcare. Definitely, it can help different hospital units to find the common language and establish a constant dialogue, and that in its turn would be beneficial for the public healthcare system, its employees and every one of us.

LITERATURE REFERENCES

1. Alben, L. (1996). *Quality of experience: defining the criteria for effective interaction design*. Interactions. 3:3. pp.11-15.
2. Apotti (2015). Retrieved from <http://www.apotti.fi/en/what-is-apotti/>, 20.02.2017
3. Bacigalupe, G. (2011). *Is there a role for social technologies in collaborative healthcare?* Magazine 'Families, Systems and Health', 2011, Volume 29, Issue 1 (March). pp.. 1-14.
4. Ballegaard, S.A., Hansen, T.R., Kyng, M. (2008). *Healthcare in everyday life – Designing Healthcare Services for daily life*. CHI 2008 Proceedings - Personal Health. Florence Italy.
5. Barber, M., Levy, A., Mendonca, L. (2007). *Global trends affecting the public sector*. McKinsey & Company.
6. Bate, P., Robert, G. (2007). *Bringing user experience to healthcare improvement: the concepts, methods and practices of experience-based design*. New York: Radcliffe Publishing.
7. Berwick, D.M. (2003). *Disseminating Innovations in Health Care*. JAMA. 289: 1969-1975.
8. Bharadwaj, A., El Sawy, O.A., Pavlou, P.A., Venkatraman, N. (2013). *Digital Business strategy: toward a next generation of insights*. MIS Quarterly Vol. 37 No. 2, pp. 471-482.
9. Biesdorf, S., Niedermann, F. (2014). *Healthcare's digital future*. Retrieved from <http://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/healthcares-digital-future>, 04.03.2017
10. Bitner, M.J., Ostrom, A.L., Morhan, F.N. (2007). *Service Blueprinting: A Practical Technique for Service Innovation*. Center for Services Leadership, Arizona State University Working paper.
11. Björgvinsson, E., Ehn, P. and Hillgren, P. A. (2010). *Participatory design and democratizing innovation*. In proceedings of the 11th Biennial Participatory Design Conference, Roskilde, Denmark. New York: ACM, pp. 41–50.
12. Boulos, M.N.K., Wheeler, S., Tavares, C., Jones, R. (2011). *How smartphones are changing the face of mobile and participatory healthcare: an overview, with example from eCAALYX*. BioMedical Engineering OnLine 10:24. Retrieved from <http://biomedical-engineering-online.biomedcentral.com/articles/10.1186/1475-925X-10-24>, 15.05.2017.
13. Buchholz, S., Shah, S. (2015). *Trends 2015: a public sector perspective*. Retrieved from <https://www2.deloitte.com/us/en/pages/public-sector/articles/tech-trends-2015-public-sector-perspective.html#>.
14. Buchholz, S., Shah, S. (2017). *A government perspective: tech trends 2017*. Retrieved from <https://www2.deloitte.com/us/en/pages/public-sector/articles/government-tech-trends.html#>.
15. Burdette S.D., Herchline T.E., Oehler R. (2008). *Practicing medicine in a technological age: using smartphones in clinical practice*. Clin Infect Dis 1;47(1). pp.117–122.
16. Camp, R.C. (1989). *Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance*. Milwaukee, Wisconsin: Quality Press/ASQC.
17. Cardoso, J., Studer, R., Weinhardt, C. (2015). *Fundamentals of Service Systems*. Switzerland: Springer.
18. Chase, R.B., Hayes, R.H. (1991). *Beefing Up Operations in Service Firms*. Magazine 'Sloan Management Review'. 33:1. pp.15-26.
19. Clatworthy, S. (2011). *Service innovation through touch-points: Development of an innovation toolkit for the first stages of new service development*. International Journal of Design, 5(2), pp.15-28.
20. Commission of the European communities, report. 2009. Retrieved from <http://ec.europa.eu/DocsRoom/documents/2583/attachments/1/translations/en/renditions/native>, 20.03.2017.
21. Dahlgard-Park, S.M. (2015). *The SAGE Encyclopedia of Quality and the Service Economy*. SAGE Publications. pp.669-671
22. Dare, F., Lennon, K., Sanders, M.R. (2013). *A call to action: overcoming communication challenges in hospital*. Accenture. Retrieved from https://www.accenture.com/t20150523T040500__w_/us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Industries_11/Accenture-Overcoming-Communication-Challenges-in-Hospitals.pdf, 10.02.2017.
23. Debruyne, M. (2014). *Customer Innovation: Customer-centric Strategy for Enduring Growth*. US: Kogan Page Publishers.
24. Deserti, A., Rizzo, F. (2015). *Design and Organizational Change in the Public Sector*. Design Management Journal, 9:1. pp.85-97.
25. Design Council. (2007): *Eleven lessons: managing design in eleven global companies*. Retrieved from http://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_DeskResearchReport_0.pdf, 23.03.2017.
26. Fjord, Accenture (2015). *The Era of Living Services*. Retrieved from https://www.accenture.com/t20151012T100130__w_/fi-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Dualpub_22/The-Era-of-Living-Services-Accenture-Digital.pdf, 10.05.2016
27. Fong, S.W., Cheng, E.W.L., and Ho, D.C.K. (1998). *Benchmarking: a general reading for management practitioners*. Management Decision 36/6. pp. 407–418
28. Frantsi, A. (2016). *Digitalization is a fact but what does it mean for leaders?* Retrieved from <http://www.ixonos.com/blog/digitalisation-is-a-fact-but-what-does-it-mean-for-leaders>.
29. Free C., Phillips, G., Felix, L., Galli, L., Patel, V., Edwards, P. (2010). *The effectiveness of M-health technologies for improving health and health services: a systematic review protocol*. BMC Research Notes 2010, 3:250. Retrieved from <http://www.biomedcentral.com/1756-0500/3/250>, 22.02.2017
30. Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Qualitative inquiry & research design: Choosing among five approaches*. 2nd edition. Thousand Oaks, CA: Sage.
31. Gupta, A., (2008). *Prescription for Change*. The Wall Street Journal, October issue, 20.
32. Hamel G., Valikangas L. (2003). *The Quest for Resilience*. Harvard Business Review. Retrieved from <https://hbr.org/2003/09/the-quest-for-resilience>, 13.03.2017.
33. Heskett, J.L. (1987). *Lessons in the service sector*. Harvard Business Review, March Issue. Retrieved from <https://hbr.org/1987/03/lessons-in-the-service-sector>, 20.03.2017
34. HUS (2014). *HUS kehittää toimintaansa Lean-menetelmällä*. Retrieved from <http://www.hus.fi/hus-tietoa/uutishuone/Sivut/HUS-kehittaa-toimintaansa-Lean-menetelmalla.aspx>, 20.11.2016.
35. HUS annual report 2015. (2015). Retrieved from http://niinidigi.kopioniini.fi/hus_annual_report_2015/pubData/source/hus_annual_report_2015_.pdf, 20.11.2016.

36. HUS. (2014). Retrieved from http://www.hus.fi/en/about-hus/presentations-and-reports/presentation-material/Documents/HUS_delivers_health_across_lifespan.pdf, 20.10.2016.
37. Hyper Island. (2015). *Changes of tomorrow: trend report*. Retrieved from <http://knowledge.hyperisland.com/download/changes-of-tomorrow>, 20.06.2016.
38. Hyppönen, H. (2015). *Availability and Use of e-health in Finland*. Report by National Institute for Health and Welfare. Retrieved from https://www.julkari.fi/bitstream/handle/10024/129709/URN_ISBN_978-952-302-563-9.pdf?sequence=1, 15.03.2017.
39. Hyvärinen, J, Lee, JJ & Mattelmäki, T. (2015). *Fragile Liaisons: Challenges in Cross-organizational Service Networks and the Role of Design*. The Design Journal, 18:2, pp. 249-268
40. ISS Group and CIFS (Copenhagen Institute for Future Studies). (2014). *Report: Future of Public Sector Outsourcing*. Retrieved from http://www.publications.issworld.com/ISS/External/ISS/ISSWhiteBookTheFutureofPublicSectorOutsourcing/?page=15&__hstc=143142506.7d735f1e895163186cc5348985512105.1487244912652.1487244912652.1487318854788.2&__hssc=143142506.1.1487318854788&__hsfp=3611041228, 20.02.2016.
41. Johnston, R. and Kong, X. (2011). *The customer experience: a road-map for improvement*. Managing Service Quality, 21(1).
42. Kalbach, J. (2016). *Mapping Experiences: A Complete Guide to Creating Value through Journeys, Blueprints, and Diagrams*. Canada: O'Reilly Media Inc.
43. Karmarkar, U. (2004). *Will you survive the Service Revolution?* Harvard Business Review, June 2004 issue, retrieved from <https://hbr.org/2004/06/will-you-survive-the-services-revolution>.
44. Keinonen, T., Vaajakalli, K., Honkonen, J. (2013). *Designing for wellbeing*. Helsinki: Aalto Arts Books.
45. Kimbell, L. (2009). *The Turn to service design*. In *Design and Creativity: Policy, Management and Practice*. edited by J.Gulier and L.Moor. Oxford: Berg.
46. Kimbell, L. and Seidel, V. P. (eds). (2008). *Designing for Services in Science and Technology-based Enterprises*. Oxford: Saïd Business School.
47. Korhonen, M., (2016). *Digitalisaatio*. Retrieved from <http://alueuudistus.fi/soteuudistus/digitalisaatio>, 02.03.2017.
48. Koskinen, I., Zimmerman, J., Binder, T., Redstrom, J., Wensveen, S. (2011). *Design research through practice*. US: Elsevier.
49. Kotler, P., Keller, K.L. (2015). *A Framework for Marketing Management*. 6th edition. Global Edition.
50. Kronqvist, J. (2015). *This is not Service Design*. Retrieved from <https://medium.com/human-to-human-stories/this-is-not-service-design-7dc5ad22811a#.5yj5tu349>, 20.12.2016.
51. Lansisalmi, H., M. Kivimaki, P. Aalto, and R. Ruoranen. (2006). *Innovation in Healthcare: A Systematic Review of Recent Research*. Nursing Science Quarterly.19. pp.. 66-72.
52. Larsson, R., Bowen, D.E. (1989). *Organization and Customer: Managing Design and Coordination of Services*. Journal 'The Academy of Management Review'. 14:2. pp.. 213-233.;
53. Lee, JJ. (2014). *The True Benefits of Designing Design Methods*. Artifact, Volume III, Issue 2. pp.. 5.1-5.12.
54. Lehoux, P., B. Williams-Jones, F. Miller, D. Urbach, and S. Tailliez. (2008). *What leads to better health care innovation? Arguments for an integrated policy-oriented research agenda*. Journal of Health Services Research & policy, 4:13. pp.. 251-254.
55. L-Force, (2013). Retrieved from <http://www.lforce.fi/?p=215>, 20.12.2016
56. L-Force, (2016). Retrieved from <http://www.lforce.fi/?p=339>, 20.12.2016
57. Ma, M., Jain, L.C., and Anderson, P. (2014). *Virtual, Augmented Reality and Serious Games for Healthcare 1*. New York: Springer.
58. Maeda, J., Xu, L., Gilboa, A., Sayarath, J., Kabba, F. (2017). *Design in Tech Report 2017*. Retrieved from <https://designintechreport.wordpress.com/2017/03/11/design-in-tech-report-2017/>, 12.03.2017.
59. Maire, J.L. and Büyüközkan G. (1998). *Benchmarking Process Formalization and a Case Study*. MCB University Press, Benchmarking for Quality Management and Technology: An International Journal, Vol. 5, Issue 2, pp.. 101-125.
60. Maire, J.L., Bronet, V., Pillet, M. (2005). *A Typology of best practices for processes improvement*. Benchmarking: An International Journal. 2005 12 :1.
61. Markkanen, J. (2015). *Perusterveydenhuollon ultraäänilähetteiden arvio, huhtikuu 2015*. HUS Kuvantaminen, Hyvinkään sairaalan rtg.
62. Marshall, C., Rossman, G.B. (2011). *Designing Qualitative Research*. 6th edition. Singapore: SAGE Publications, Inc.
63. Martikainen, S., Viitanen, J., Korpela, M., Lääveri, T. (2012). *Physicians' experiences of participation in healthcare IT development in Finland: Willing but not able*. International Journal of Medical Informatics, 81: 2. pp.. 98-113.
64. Meroni, A., Sangiorgi, D. (2011). *Design for Services*. England: Gower Publishing Limited.
65. Metters, R., Vargas, V. (2000). *A typology of de-coupling strategies in mixed services*. Journal of Operations Management. 18:6. pp.. 663-682.
66. Microsoft Enterprise. (2015). *Fullerton Healthcare Group partners with Microsoft to improve delivery of healthcare in Asia Pacific*. Retrieved from <https://enterprise.microsoft.com/en-us/customer-story/industries/health/fullerton-healthcare-group-partners-microsoft-to-improve-delivery-of-healthcare-in-asia-pacific/>, 20.03.2017.
67. Microsoft in Heath video. (2015). Retrieved from <https://youtu.be/ki15XV3R3KM>, 18.03.2017.
68. Millen, D.R. (2000). *Rapid Ethnography: Time Deepening Strategies for HCI Field Research*, DIS '00, Brooklyn, New York. P.280 - 286. Retrieved from http://onemvweb.com/sources/ethnography/rapid_ethnography.pdf, 23.02.2017.
69. Miller, M.E., Flowers, E. (2016). *The Difference between a journey map and a service blueprint*. Retrieved from <https://blog.practicalservicedesign.com/the-difference-between-a-journey-map-and-a-service-blueprint-31a6e24c4a6c#.danp9uj03>, 10.01.2017.
70. Ministry of Social Affairs and Health. (2016). *Are there constitutional problem areas in the health and social services draft proposals?* Retrieved from http://alueuudistus.fi/en/artikkeli/-/asset_publisher/1271139/onko-sote-lakiluonnoksissa-perustuslakipulmia- .
71. Ministry of Social Affairs and Health (2013). *Report 'Information to support well-being and service renewal. eHealth and eSocial Strategy 2020'*. Printed by Edita Prima. Retrieved from http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/74459/URN_ISBN_978-952-00-3575-4.pdf?sequence=1.
72. Mont, O. (2002). *Drivers and barriers for shifting towards more service-oriented businesses: Analysis of the PSS field and contributions from Sweden*. The Journal of Sustainable Product Design 2: 89–103, 2002, p.89.

73. Moritz, S. (2005). *Service Design: practical access to an evolving field*. London.
74. Mosa, A.S.M., Yoo I. and Sheets, L. (2012). *A Systematic Review of Healthcare Applications for Smartphones*. BMC Medical Informatics and Decision Making, 2012 12:67.
75. Nash, D.B., Goldfarb, N.I. (2006). *The quality solution: the stakeholder's guide to improving health care*. Jones and Bartlett Learning.
76. Nesta, IDEO, Design for Europe. (2017). *Guide: design for public services*. Retrieved from http://www.nesta.org.uk/sites/default/files/nesta_ideo_guide_jan2017.pdf, 20.03.2017.
77. Noel, H.C., Vogel, D.C., Erdos, J.J., Cornwall, D., Levin. F. (2005). *Home Telehealth Reduces Healthcare Costs*. Telemedicine Journal and e-Health. January 2005, Volume: 10 Issue 2.
78. Omachonu, V.K., Einspruch, N.G. (2010). *Innovation in Healthcare Delivery Systems: A Conceptual Framework*. The Public Sector Innovation Journal, 15:1.
79. Polaine, A., Lovlie L. and Reason B. (2013). *Service Design: from insight to implementation*. New York: Rosenfeld Media.
80. Pool, I. de S. (1984). *Technologies of Freedom*. Harvard University Press.
81. Raghupathi, W. (2014). *Big data analytics in healthcare: promise and potential*. Springer Journal. Health Information Science and Systems 2014, 2:3.
82. Sangiorgi, D. (2010). *Transformative services and transformation design*. International Journal of Design: 5:1. pp.. 29-40.
83. Scheer, A.W. (2017). *Theses on Digitalization. Into Collections of essays 'The drivers of Digital Transformation: why there's no way around the cloud'*. Edited by F.Abolhassan, Springer, 2017, p.33-44.
84. Shostack, L.G. (1982). *How to Design a Service*. European Journal of Marketing 16:1, pp.. 49-63.
85. Smith, H., Fingar, P. (2003). *Business Process Management: the third wave*. Meghan-Kiffer Press.
86. Solet, D.J., Norvell, J.M., Rutan, G.H., Frankel, R.M. (2005). *Lost in Translation: Challenges and Opportunities in Physician-to-Physician Communication During Patient Handoffs*. Journal Academic Medicine: 2005 Dec; 80(12): 1094-9.
87. Taylor, S.J., Bogdan, R., DeVault, M.L. (2016). *Introduction to qualitative research methods: a guidebook and resource*. 4th edition. John, Wiley & Sons, Inc.
88. Teperi, J., Porter, M.E., Vuorenkoski, L., Baron, J.F. (2009). *The Finnish Health Care System: A Value-Based Perspective*. Sitra, Helsinki. Retrieved from http://www.hbs.edu/faculty/Publication%20Files/Finnish_Health_Care_System_SITRA2009_78584c8b-10c4-4206-9f9a-441bf-8be1a2c.pdf, 10.03.2017.
89. Thackara, J. (2005). *In the Bubble: designing in a complex world*. MIT Press.
90. Thuemmier, C., Bai, C. (2017). *Health 4.0: How Virtualization and Big Data are Revolutionizing Healthcare*. New York: Springer.
91. Treacy, M. (2004). *Innovation as a Last Resort*. Harvard Business Review. Retrieved from <https://hbr.org/product/innovation-as-a-last-resort/F0407E-PDF-ENG?referral=02749>, 20.03.2017.
92. Turner, D. W. (2010). *Qualitative Interview Design: A Practical Guide for Novice Investigators*. The Qualitative Report, 15(3), 754-760. Retrieved from <http://nsuworks.nova.edu/tqr/vol15/iss3/19>, p.757-758, 15.02.2017.
93. Verhulst, S. (2002). *About Scarcities and Intermediaries: The Regulatory paradigm shift of digital*

content reviewed. In L. A. Lievrouw & S. Livingstone (Eds.), *The Handbook of New Media* (pp. 432–447). London: Sage Publications.

94. Vetelino, J., Reghu, A. (2011). *Introduction to Sensors*. CRC Press, Taylor & Francis group.
95. VideoCentric. (2016). *Skype for healthcare: Secure? Reliable? What do experts say?* Retrieved from <http://www.videocentric.co.uk/skype-healthcare-experts-say/>, 28.02.2017.
96. Zomerdijk, L.G., C.A. Voss, C.A. (2011). *Service Design for Experience-Centric Services*. Journal of Service Research 13(1).

OTHER SOURCES, MENTIONED IN THE THESIS

Sources related to service design

- Dansk Design Center (<http://danskdesigncenter.dk/>)
- Design Council (<http://www.designcouncil.org.uk/>)
- Design for Europe program (<http://designforeurope.eu/>)
- Lean Service Creation guide by Futurice (2015). Retrieved from <https://leanservicecreation.com/>
- Service Design Podcast. The interview with Andersson, S. strategic designer at 'Transformator Design' agency in Sweden. Retrieved from https://overcast.fm/+HX_Du57qs, 10.03.2017
- Service Design Tools www.servicedesigntools.org

Sources related to hospital communications

- Apotti project, Finland / <http://www.apotti.fi/en/what-is-apotti/>
- Carecode, communication platform for healthcare, Finland / <https://carecode.fi/>
- LuxSci hospital communication platform, US / <https://luxsci.com/extranet/secure-chat.html>
- Noona healthcare, Finland / <http://www.noona.com/service>
- Snapcomms, internal communication hospital software / <http://www.snapcomms.com/>
- VideoCentric virtual meeting room for hospitals, UK / <http://www.videocentric.co.uk/whitepaper/videocentrics-pro-health-virtual-meeting-rooms/>
- Vocera, hospital communication software, global / <https://www.vocera.com>

IMAGE SOURCES

- **Graph 2:** *Service design process introduced by Moritz*. Source: Moritz, S. (2005). *Service Design: practical access to an evolving field*. London
- **Graph 3:** *Tools used in service design*. Source: www.servicedesigntools.org
- **Graph 4:** *Quality wheel*. Source: <https://hbr.org/1987/03/lessons-in-the-service-sector>
- **Graph 5:** *Proportion of research and conceptual proposals*. Source: *User-Inspired Design lectures*, 2012
- **Graph 6:** *Types of interviews by Gall, Gall and Borg (2003)*. Source: Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Qualitative inquiry & research design: Choosing among five approaches*, 2nd edition. Thousand Oaks, CA: Sage.
- **Graph 7:** *Visualization of physical and digital touchpoints in healthcare*. Source: [https://ukhealthcare.uky.edu/uploadedImages/about/leadership/strategic-plan\(1\)/images-pdfs/patientcentered-rev-chart.jpg](https://ukhealthcare.uky.edu/uploadedImages/about/leadership/strategic-plan(1)/images-pdfs/patientcentered-rev-chart.jpg)
- **Graph 8:** *Stakeholders of public healthcare. Based on studies done by Ma, Jain, and Anderson (2014) and Nash and Goldfarb (2006)*.
- **Graph 9:** *Representation of ICT support vision for healthcare services in Finland in 2020*. Source: Ministry of Social Affairs and Health report, 2013. http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/74459/URN_ISBN_978-952-00-3575-4.pdf?sequence=1.
- **Graph 10:** *Carecode, interface prototype*. Source: www.carecode.fi, 15.03.2017
- **Graph 11:** *HUS map of municipalities and hospitals*. Source: http://www.hus.fi/hus-tietoa/hallinto-ja-paatoksenteke/PublishingImages/HUS_aluekartta_SU4_tekstit%20mustalla_nettil.jpg

Other visualizations and photographs in the thesis without references to other sources are taken or designed by the author.

QUOTES

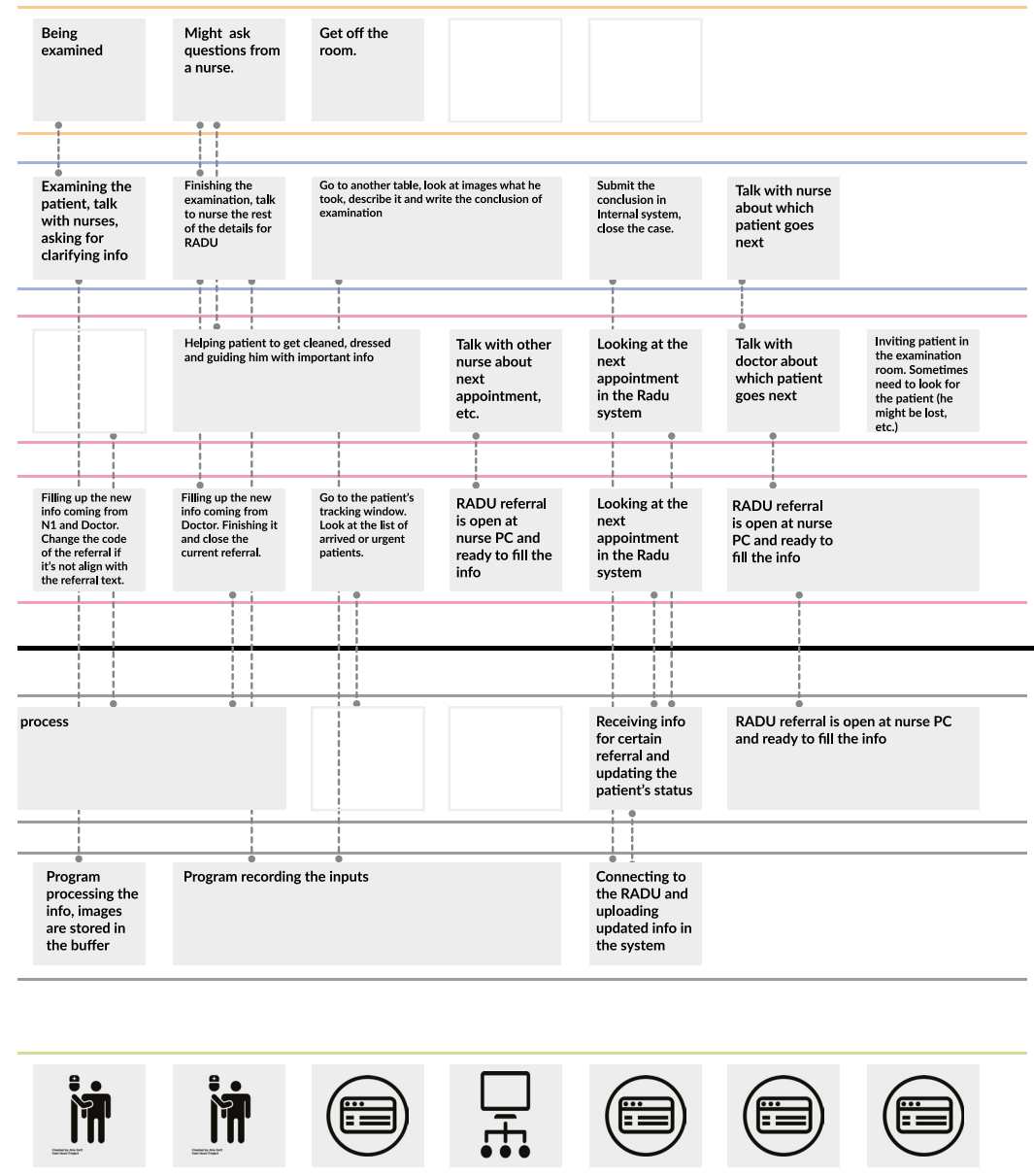
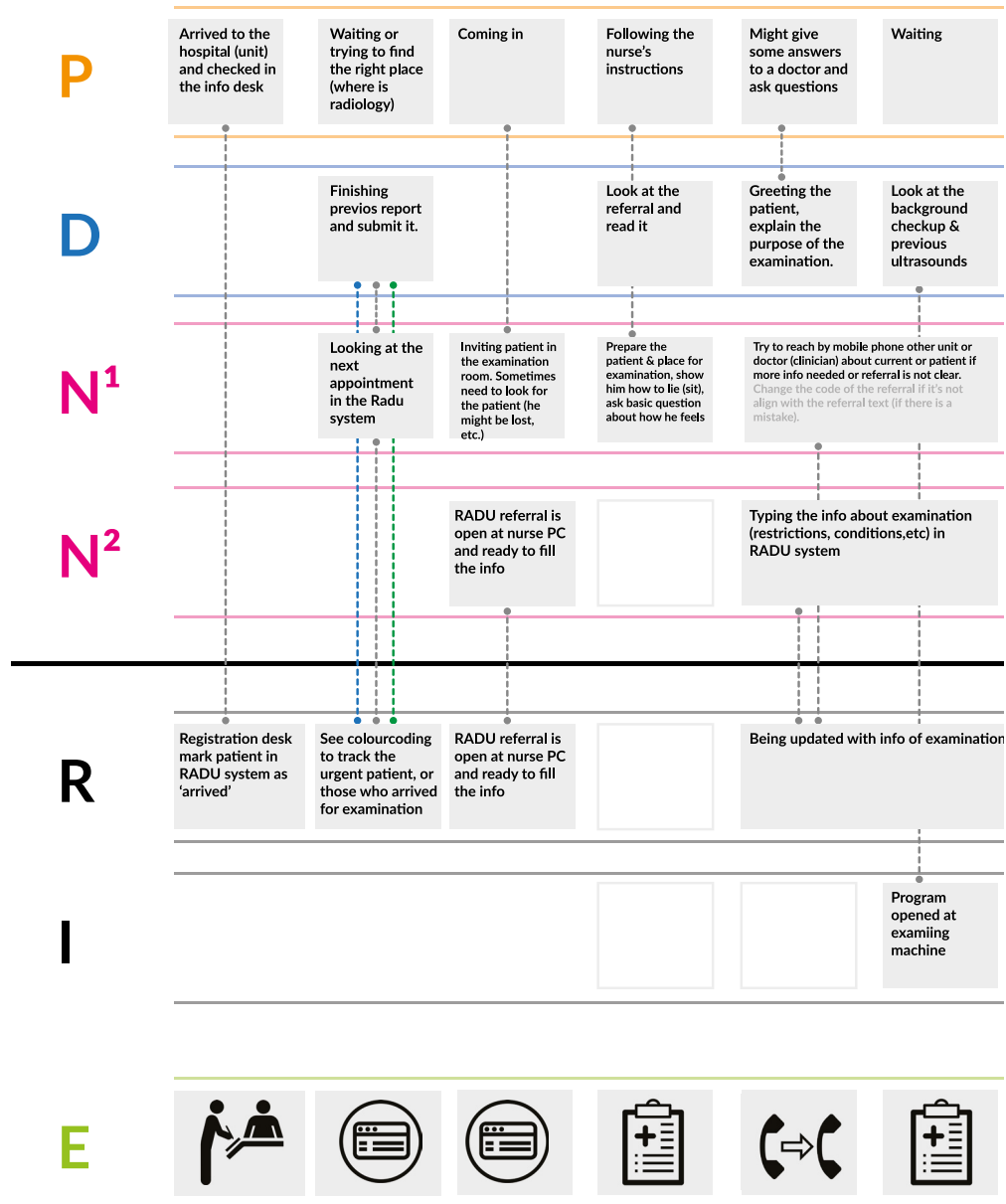
- **Page 31:** *Juha Kronquist, article in Medium: <https://medium.com/human-to-human-stories/this-is-not-service-design-7dc5ad22811a>*
- **Page 43:** *Cristian Grossmann, 2017, link: <https://beekeeper.io/5-telecom-trends-that-will-inspire-internal-communications/>*
- **Page 46:** *HUS Report, 2015.*
- **Page 63:** *David Nichols, 2010, link: <http://www.itsmsolutions.com/newsletters/DITYvol6iss16.htm>;*
- **Page 71:** *Interviews with doctors, conducted for research, March 2017.*

APPENDICES

Appendix 1: Service blueprint for the appointment in the ultrasound room

Service process blueprint (ultrasound examination): P (patient), D (doctor),

N (nurse), R (radu system), I (internal system), E (environment or touchpoints)



Appendix 2: Communication channels are used by HUS medical professionals in everyday work

Name of the channel	Channel Status	Current channel grade*	Notes concerning the current channel
Phone calls	existing	3	<ul style="list-style-type: none"> • Good, because you can get the answer right away; • Bad, because it is hard to reach the doctor (we are physically separated and both have a very busy schedule).
E-mails (outlook client)	existing	1	<ul style="list-style-type: none"> • Almost always there is a delay in reply, about one week.
Meetings	Potential, it exists but for different purpose	2	<ul style="list-style-type: none"> • Very irregular with primary healthcare specialists; • More regular with secondary healthcare specialists and doctors from our hospital; <ul style="list-style-type: none"> • In general we discuss the interesting and challenging cases and don't have time to talk about communication management.
Chat	Potential, use is limited by imaging department at the moment	4	<ul style="list-style-type: none"> • Now it is only for the radiology department internally, available through IMPAX software; • Software with instant messaging and chat options (Like Skype) could be useful, but usually they are expensive and we might have security issues while exchanging personal patient's data.
Extranet (share-point)	Existing	1	<ul style="list-style-type: none"> • Not in use, because it is difficult to login there.
TerveysPortti	Existing	2	<ul style="list-style-type: none"> • One-way channel that is not own by HUS; • It's an constantly updated information data-base rather than communication channel (articles, medical studies, general guidelines for procedures, manuals).
Intranet (share-point)	Existing	2	<ul style="list-style-type: none"> • Only for the Radiology departments in secondary healthcare, no connection with clinicians or primary healthcare.

*Channels are graded from 1 to 5, where 1 is very poor or non-satisfying communication quality and 5 is excellent and satisfying.

Appendix 3: Survey for the healthcare practitioners in Finland, March 2016 (4 pages)

SURVEY 'INTERNAL COMMUNICATION IN PUBLIC HEALTHCARE'
FINLAND, MARCH 2016

RESEARCH PURPOSE:

Current research is a part of a master thesis work of Collaborative and Industrial Design department in Aalto University. Main focus of the work is the investigation of the digitalization of public healthcare in Finland with focus on digitalization aspects of internal communications among healthcare employees.

This questionnaire aims to understand better the process of digitalization for the public healthcare service in Finland, with focus on the internal communication. Those studies include: understanding the reasons for digitalizing of internal communication in healthcare; the processes and challenges that employees could face during digital transformation. Finally, research could help to clarify a possible benefits and challenges of the healthcare communications transformation for hospital personnel, healthcare professionals and stakeholders of the public healthcare system. The secondary focus of the research is on service design tools and how they can help in digital transformation of communication in healthcare and improve employees experience with it.

All information that you're providing in this study will be used only for current thesis work research. The information that you would like to share anonymously only, will be treated respectively.

If you would like to keep in touch and receive the digital copy of the paper, please leave your contact information (email) in the beginning of the survey, together with your name.

*Before you start I would like to thank you for your input and time!
I hope this research would help in the developing of internal communication channels and improve healthcare employees experience.*

Best Regards,
Valeria Azovskaya
Master student at Aalto University
Collaborative and Industrial Design program
Department of Design
+358 44 2317072 | | v.azovskaya@gmail.com | | Helsinki, Finland

START OF THE SURVEY

1. Please, tell your name (if it is possible) and occupation. If you would like to keep in touch, you can leave your email as well.

2. Please, specify what type of public healthcare are you representing:

- a) Primary care
- b) Secondary care
- c) Tertiary care
- d) I work in a private sector, _____ care.

3. How often in your professional practice you're interact with other doctors and nurses via digital tools (internal hospital software and devices, your personal mobile devices)

- a) Every day, it is a regular practice and I use both hospital and private devices equally often.
- b) I don't communicate: It's not possible to communicate in person through the hospital software and devices, it is just for sharing the data. Also, personal devices cannot be used for professional matters.
- c) Often: I communicate through work phone if I need some input from certain specialist.
- d) Often: I communicate through personal phone if I need some input from certain specialist.
- e) Few times a week or less: Usually I don't have to talk with other specialists: referral and EPR (Electronic Patient Records) contain enough information.
- f) _____ (Please, write your answer here if nothing above rang the bell)

4. How often you need to have more data from another doctor that would support his/her referral? In case if you are writing referral for another specialist how often would you consider some extra guidance or brief consultation to write a clear and descriptive referral?

- a) I need extra information quite often and it is difficult to get it (I don't know how to get it).
- b) I need more information from time to time and it's mostly not very urgent to obtain right away.
- c) I need more information in very exceptional cases. To get it I always have an access to the proper source of information.
- d) I need more information in very exceptional cases (less than 5% of the cases). Usually, I cannot get it and have to wait for more data from another doctor that comes from renewed referral or updated patient info.
- e) _____ (Please, write your answer here if nothing above rang the bell)

5. What are the most valuable and helpful source and tools of information during the patient's appointment you have? Please, evaluate the following (1- not helpful/valuable to 5-very helpful/valuable):

- a) Email 1 2 3 4 5
- b) Phone call 1 2 3 4 5
- c) Referral 1 2 3 4 5
- d) Discussion with another doctor/nurse 1 2 3 4 5
- e) Patient 1 2 3 4 5
- f) EPR (electronic patient records) and digital patient history 1 2 3 4 5
- g) _____ (please, write your option) 1 2 3 4 5

6. What do you value most in internal communication and information systems for your everyday work and referral practice? Please, place it in order from 1 (less important) to 10 (very important), you can choose as many as you like and leave some of those out if you think is irrelevant:

- a) Printed paper on your desk with clear instructions how to proceed with the task or use some tool;
- b) Digital instructions how to use internal communication channels or where to get information;
- c) I value other people's opinion and would like to get information from the communal internal forums;
- d) I value simple and intuitive interface of the channel or referral software, so I don't need any instructions;
- e) I value good functionality of communication channel;
- f) I value clear connectivity and delivery status; I want to know that my message or request has been delivered to the receiver I directed it;
- g) I value the availability of particular channel for multiply devices, both hospital and private ones;
- h) I value the access to all information and communication channels through one software (touchpoint), minimizing time and effort to login and remember what would be best tool to send a message, i.e. automatization and centralization of internal communication;
- i) I value flexibility and variety of communication channels;
- j) I value personal face-to-face discussion with other specialist or general practitioner (instead of digital way to communicate);
- k) I value the possibility to have feedback on my referral/report if it is not complete or misleading;
- l) _____ (please, write your option)

7. Would you like to be involved (imagine you have time for that) in developing internal communication channels for your hospitals or even on a broader scope? Please mark the activities you think are beneficial for you and other employees to be part of. Please, share your own alternative if you have one too:

- a) Regular meetings with other professionals and hospital IT staff support and management to discuss the issue and ways to develop communication channels for internal use;
- b) Workshop-based group activities with defined goals (small improvement at a time) facilitated by the outside consultancy, that help to improve your experience with the existing communication channels;
- c) Workshop-simulation of problematic channels and communication issues, with further analyzes, ideation, and planning how to improve it in a long-term;
- d) Sharing your way of using digital communication channels (tips, for making a good referral, for example) with other colleagues in person;
- e) Help to develop the educational program (video-tutorial, for example) for new doctors and guiding them through the opportunity the internal communication system your company has. Also, warning them on the most common communicational mistakes emerge during their practice and teach them to avoid it;
- f) Advising side consultancy that would work on improvement digital communication system for your hospital and help to facilitate the changes (participate in ideation, developing and testing);
- g) _____ (please, write your option)

8. What are the main statements that you think can illustrate situation with internal healthcare communication in Finland. You can pick up to 3 main statements:

- a) Digital internal communication channels work well unless it is inside one hospital, to transfer data to another hospital or between primary and secondary healthcare units we need to use printed files;
- b) Internal healthcare communication channels are modern and functional;
- c) Developing internal communication system for healthcare should be one of the priority on the decision maker's list;
- d) Internal healthcare communication's main problem is software that was developed for one particular unit and non-interoperable with other hospitals information systems;
- e) Internal healthcare communication's main problem is lack of knowledge about how to use it, we need more coaching and instructions;

- f) Internal healthcare communication's main problem is organizational culture overall;
- g) Digital channels are something we need for our everyday communication to improve efficiency, treat patients better and save time and money;
- h) We need more human-to-human contact to be more efficient and do less mistakes in our primary job;
- i) The key in development digital communication channels is involving users (doctors and other staff) of those channels from the very start of the developing process
- j) Main problems with the digital healthcare communication is data privacy and policy for using the data. SO many tools that doctors can use for communications are forbidden;
- k) We need to educate personnel how to communicate via existing communication hospital software and be familiar with it. Even perfect digital channels could fail if people won't develop culture of using it appropriately;
- l) Currently, hospital personnel (direct users) are not involved in the development of the internal communication channels;
- m) Doctors and nurses need more advanced internal communication channel for instant (real time) communication;
- n) _____ (please, write your statement)

9. Please, describe briefly in few sentences the positive and negative aspects of internal digital communication channels you're using during your work? I understand that it might be a huge topic to talk about, but try to mention few general channels and some points that are important in your opinion and has a value for your work.

10. Are you familiar with tools and methods that service design could use to improve the experience of healthcare employees in communications? Please, evaluate your familiarity with listed methods (1- not familiar to 5-familiar/ has an experience):

- a) Interview or survey;
1 2 3 4 5
- b) Following and observing the object of research in a real environment (in our case it can be observing a doctor during his working shifts and appointments with patient);
1 2 3 4 5
- c) Simulating the service process (patient appointment), creating a customer experience map;
1 2 3 4 5
- d) Focus-groups and workshops with facilitation;
1 2 3 4 5
- e) Design-games or role-play (methods where you can have another role in the system and see the process from another perspective);
1 2 3 4 5
- f) Service blueprint or offering map for analyses of the weak points in the service or its components;
1 2 3 4 5
- g) Benchmarking (looking for alternative solutions on the market);
1 2 3 4 5
- h) Co-designing (when users of the system involved in the process of system development);
1 2 3 4 5
- i) Storyboard
1 2 3 4 5

11. Finally, if you have something to add about the topic of the survey that you think is important for its developing, feel free to type it here or contact me via email.

Thank you for your participation!

