Master thesis

Enhancing Digital Health Integration Service Mapping for Healthcare Professionals

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Strategic Product Design - Medisign

Enhancing Digital Health Integration: Service Mapping for Healthcare Professionals

Master Thesis
Medisign specialization
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August 2025

Acknowledgements

This thesis marks the final step in my Master‘s journey. I would like to express my deepest appreciation to everyone who helped me reach this point.

Firstly, I would like to thank Froukje and Fredrik, my supervisors, for your valuable guidance, advice and encouragement throughout this project. Thank you also to my company mentor at the LUMC, Julian, for your practical insights and help in navigating the complexities of this topic.

Special thanks go to all the interviewees and participants who generously contributed their time and expertise. Your openness and honest reflections not only shaped the design process, but also the outcome.

Thank you also to my friends for keeping me motivated through the highs and lows of this process. To everyone in Delft: for our daily conversations, trips to X and coffee breaks. To everyone in Germany: for your change of perspective and welcome distractions.

Finally, I would like to thank my family for their patience, support and constant belief in me.

Executive Summary

Background
The aim of this graduation project was to create a mapping tool to help professionals in the healthcare sector evaluate the fit between context and service when implementing digital health services. Service design mapping methods can make the impact of these changes visible and actionable for all stakeholders, but healthcare professionals lack specific tools and design expertise.

Approach
The project followed a design-led approach, combining a literature review, stakeholder interviews and iterative prototyping to create a functional tool and conceptual roadmap detailing the adoption journey of the tool within the healthcare setting. Interview and user test participants included design researchers in healthcare, implementation managers, and clinicians in the Netherlands, with additional input from Germany and Sweden. Insights from these activities shaped the functionality, usability, and collaborative potential of the tool.

Navis: Service mapping in digital health service implementation
The outcome is Navis, an online implementation tool centred on a shared service map. The name reflects its role in guiding stakeholders through the complexities of implementation. Navis enables future service users to analyse their current and future workflow with a focus on their evolving roles and responsibilities. By embedding service design principles into the process, it addresses one of the key barriers to digital health implementation: uncertainty about the real-world impact of change.

Testing showed that with guidance, users quickly improved their confidence in mapping. Navis delivers value by:

- Externalising actions and interactions, as well as risks, liabilities and training opportunities, to improve healthcare professionals‘ self-efficacy with the new service.
- Supporting the early involvement of healthcare professionals in implementation.
- Providing a comprehensive project overview for the project management team, contributing to the project‘s overall organisational feasibility.

Tool adoption
Several barriers to adopting the tool were identified, including stakeholder awareness, tool onboarding and long-term viability. This strategy presents a roadmap of interventions designed to overcome these barriers. Recommendations include piloting Navis as part of the full implementation process, creating short videos to refine the onboarding process, and expanding the scope of the tool to reflect the growing importance of artificial intelligence in healthcare.

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1 Introduction

1.1 Chapter outline

This chapter begins with an overview of the scope of this graduation project. A case study of The Box illustrates the role of context in the implementation of digital services in healthcare. This is followed by an explanation of the design approach.

1.2 Project scope

Digitalisation is regarded as an essential factor in solving the challenges facing healthcare systems today and enabling more efficient patient-centred care (Ross et al., 2016). There are opportunities to alleviate administrative workload with digital health services – healthcare solutions that use digital technologies, such as connected devices, mobile applications, and online platforms, to deliver, monitor, or enhance care. They are intended to enable healthcare professionals to spend more time on patient care and treatment. This can, for instance be facilitated by clinical decision support systems, predictive analyses or personalised medicine based on patient data (Tchertov, 2024). However, multiple challenges hinder successful integration, such as lack of investment, bureaucracy (Wiegner & Grau, 2020) or healthcare professional's doubts about the need for digital services (Ross et al., 2016). An potentially important facilitator during and after implementation can be service visualisation through mapping and prototyping methods commonly used in design. Service visualisation increases understanding of the system and facilitates the identification of areas for improvement (Blomkvist & Segelström, 2014) by making individual actions, interactions and interdependencies visible.

1.2.1 Graduation assignment

The problem I want to solve is that healthcare professionals are currently unable to use service mapping techniques because they are not commonly applied in their field.

There is a lack of tools that are both tailored to the healthcare context and a healthcare professional's experience level with mapping techniques. However, as experts in their field and work context, they need to be empowered in bringing new digital services into their professional lives. Therefore, healthcare professionals would greatly benefit from being able to independently address the challenges of digitalisation and improve the implementation of digital services with their expertise in their particular contexts. The assignment can be summarised as following:

Create a mapping tool that allows healthcare professionals from different contexts to map their digital services to understand the impact of making changes within the service-context fit. Define a strategy to introduce this tool in practice.

1.3 Case study: the Box

This case study demonstrates the complexity of implementing digital health services.

1.3.1 What is the Box?

The Box is a remote monitoring service developed by the Hart Long Centrum at Leiden University Medical Centre (LUMC) in partnership with IT provider Ancora. It was originally intended for remote monitoring of patients post-myocardial infarction. Its purpose is to reduce pressure on the healthcare system by encouraging long-term prevention among patients with heart disease. This marks a transition from the traditional, supply-driven healthcare model to a focus on preventative care.

Patients receive a set of devices, such as a blood pressure monitor, scale, heart rhythm monitor, pedometer watch, thermometer, and oxygen saturation meter, enabling them to measure biometric health data from home. Measurements are shared with patients through the LUMC Care app and reviewed by the Box office at the hospital.

Figure 1. The contents of the Box.

Two more Boxes are currently in development. The Health Box is aimed at people at risk of metabolic syndrome. This project will soon be piloted but many decisions are still to be made. The Family Box is designed to educate patients' families and support recovery through lifestyle changes for both patients and families. This project is in development, however, implementation is already taken into account during the development stage.

While the concept behind The Box is straightforward, its implementation is shaped by service user needs, technical feasibility, costs, and strict safety regulations. These contextual challenges are outlined in the next section. This project illustrates how these factors interact and why continuous context evaluation is essential from the earliest stages of development.

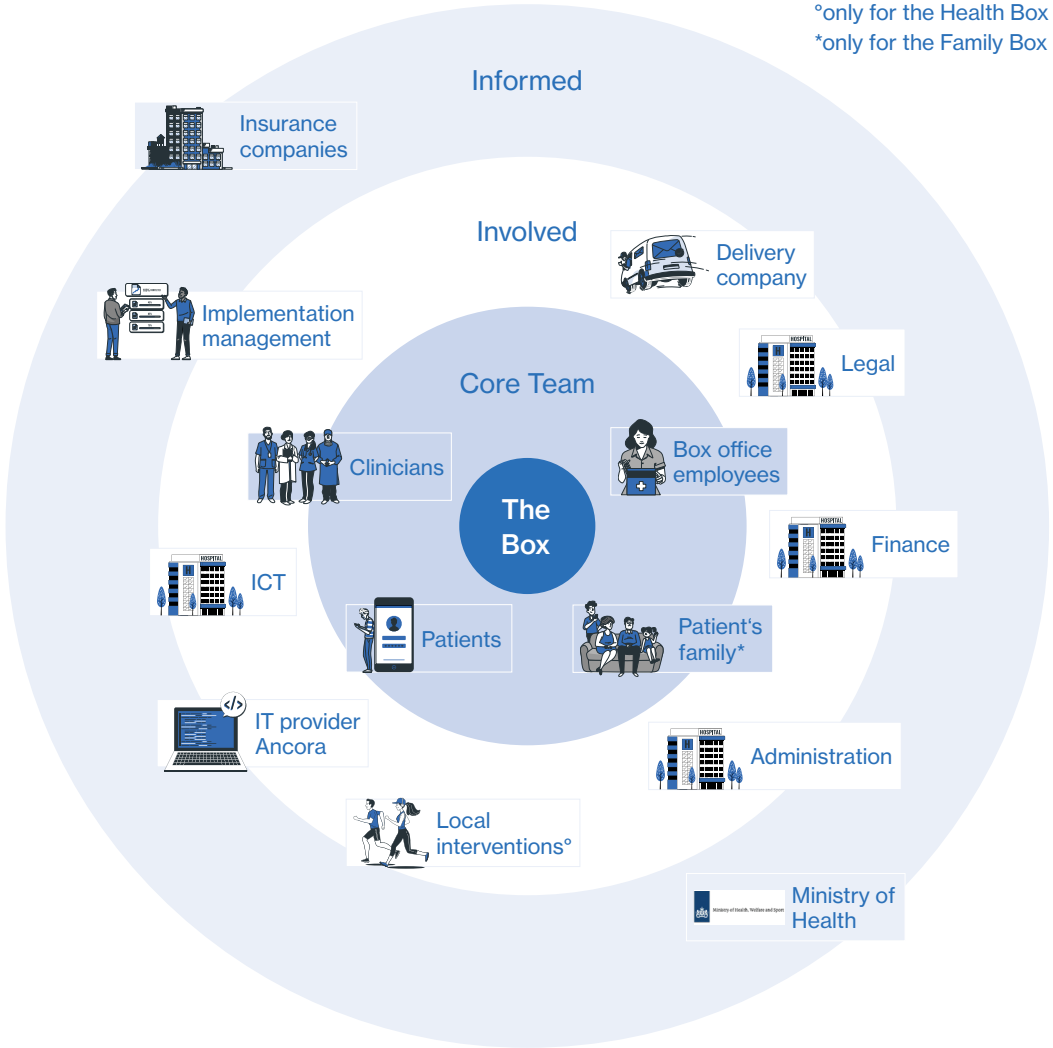

Figure 2. Stakeholder mapping for The Box.

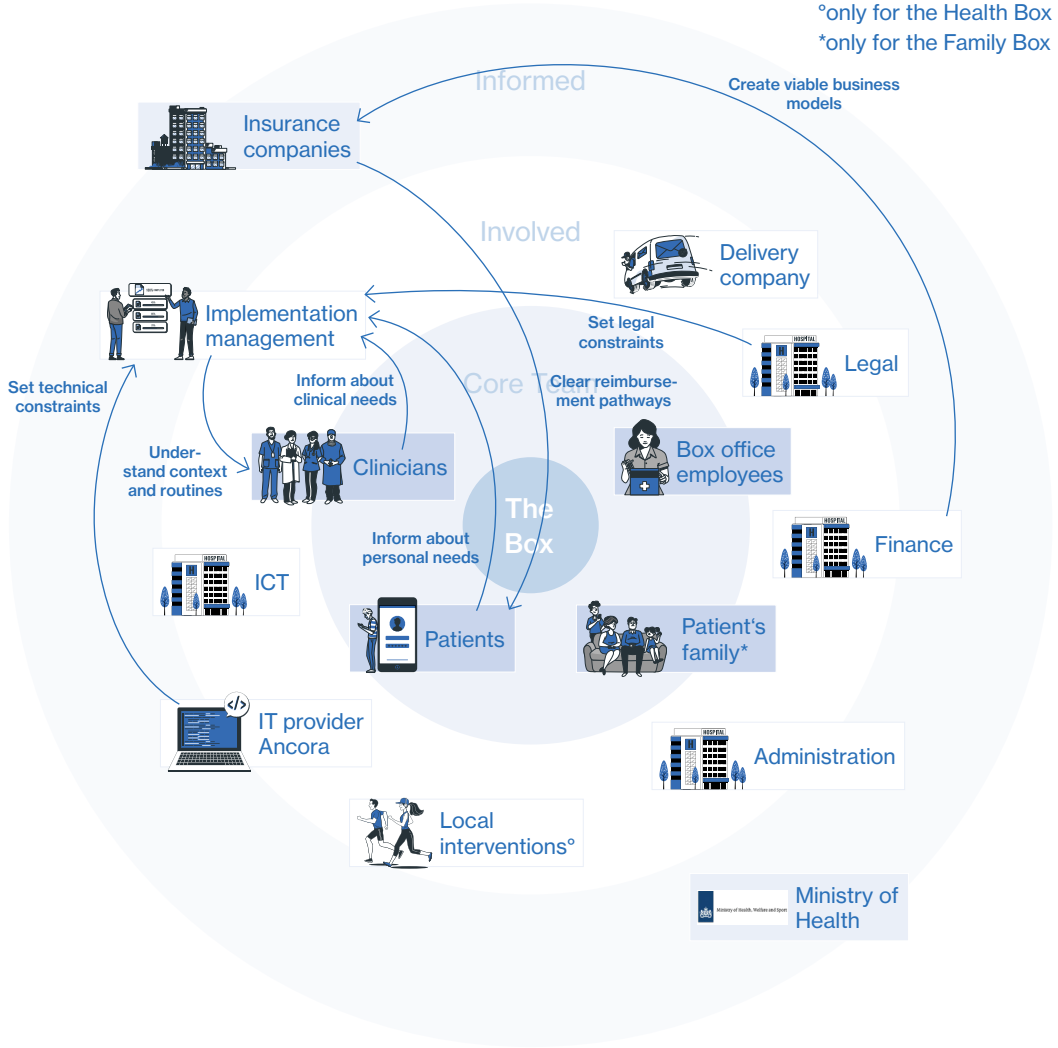

Figure 3. Stakeholder interdependencies during implementation.

1.3.2 Why does context matter in implementation?

These insights were obtained using the methodology described in Chapter 3.3.1.

Organisational priorities shape feasibility

Even when a service is technically sound, competing priorities within the organisation can slow or block progress. In The Box, the IT developer prioritises the core version over the Family Box, delaying decisions that depended on technical input. *"I can build thousands of interfaces,"* one interviewee noted, *"but I need to know what's feasible — and that depends on the developer's priorities."* For the implementation to be realised, it must align with the developer's priorities and resources. Similarly, the Health Box's success relies on general practitioner involvement, yet GPs were absent from early development. Their local knowledge, availability, and willingness to participate remain unclear. This gap risks implementing a service misaligned with their realities, using the service might frustrate users, and implementation risks rejection or underuse..

Implementation managers must then *"help them help us"*, as one participant phrased it, by translating clinician's tacit clinical knowledge into actionable insights fit to inform decision-making.

Financial systems can block adoption despite clear value

A promising service can still fail if funding mechanisms are unclear. Both the Family Box and the Health Box involve activities outside the hospital, such as lifestyle interventions or family education, which fall outside standard insurance coverage. Without new reimbursement models, the financial burden risks falling on the hospital, even when benefits extend system-wide. Understanding these value flows early is vital: a task where service design can make invisible dynamics visible.

Scaling requires re-contextualising

The Box is currently undergoing a transformation involving operational changes at the LUMC. Additonally, plans are in place for its future implementation at other hospitals in the Netherlands.

The Box is tailored to LUMC's specific IT systems, protocols, and routines, but other hospitals have different contexts. The context must be re-evaluated for every new implementation, creating a social and organisational transformation each time, *"If we try to optimise it for the LUMC, then it won't fit in Erasmus MC... For a tech developer, it's not interesting. But if you need to do it for other hospitals, you need to make it very adaptable, modifiable, modular."* This demonstrates the tension between service customisation for specific contexts and creating modularity to improve scalability.

The Health Box adds another layer of complexity. It is intended for nationwide use, with its development spread across work packages, universities and partners. One work package is responsible for making decisions based on insights generated by the others. This involves aligning priorities, timelines, and visions. The current use of journey mapping methods is helpful for gathering research insights and creating a general understanding of processes but, as one participant admitted, *"For now, it's a terrible way to visualise... everything is of the same importance."*

1.3.3 Conclusion

The Box project demonstrates that implementing digital health services requires the active navigation of evolving contexts. For implementation to be successful, it is essential to evaluate early on and continuously how the service fits within clinical workflows, stakeholder priorities, organisational infrastructures and financial systems. This process needs the involvement of future service users, as well as experts in technical, financial, and legal matters. Failing to consider context, or considering it too narrowly, can lead to service rejection, despite clear user needs being identified.

In the case of The Box, the high design maturity at LUMC, including dedicated design researchers, enables deeper engagement with these contextual factors. However, further research has shown that many healthcare projects do not have this advantage. The contextual factors highlighted in The Box emphasise the need for context-specific tools to help healthcare professionals evaluate and adapt services to their own environments.

The following section outlines the design-led approach that was taken to create this tool and an adoption strategy to introduce it into practice.

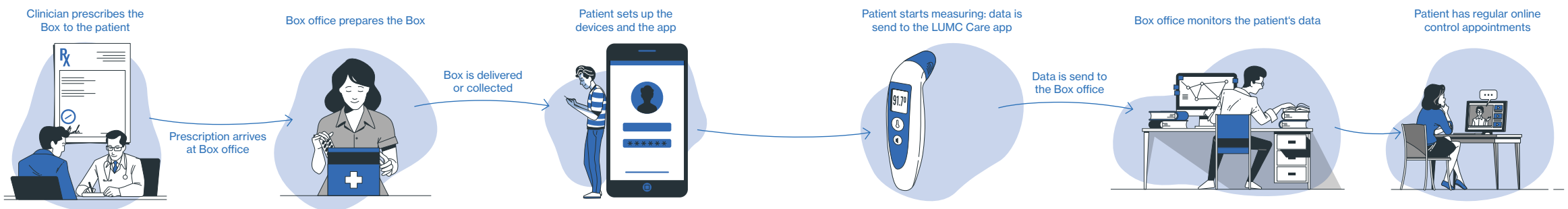

Figure 4. Simplified representation of the current Box workflow.

1.4 Design approach

Section	Activities
Discover Chapters 2-3	The first phase involved a systematic refinement of the literature review to comprehensively map existing techniques for visualising and analysing digital health service implementation. This synthesis provided a robust framework for understanding the diverse methods and components relevant to digital health mapping. Semi-structured interviews were conducted with implementation managers and healthcare professionals participating in digital health service implementation in hospitals. These interviews aimed to clarify the context around digital health service implementation and which challenges a mapping tool could aid with. Also, they identified if and how mapping techniques are currently in use.
Define Chapter 3-4	Building on insights from the literature review and interviews, target group, users and the key components of the tools were defined.
Develop Chapter 4	An initial prototype incorporated key criteria identified in the literature and interview analyis, ensuring that all critical aspects of digital health services and their contextual factors are represented.
Validate Chapters 5	The tool underwent iterative refinement through multiple rounds of user feedback sessions with healthcare professionals at LUMC and selected external participants. These sessions assessed the tool's usability, clarity, and effectiveness in visualising digital health services. Participants were asked to complete scenario-based tasks, after which their experiences and suggestions for improvement was collected. The feedback informed revisions, with a focus on ensuring the tool supports healthcare professionals in independently innovating and tailoring digital health services to their specific operational contexts.
Strategise Chapter 6	Drawing on insights collected during the research and development phases, as well as its reflective analysis, the third diamond started with specifying the prerequisites for successful tool adoption. A roadmap visualised the adoption strategy.
Deliver Chapter 7-8	The final chapters concluded the project by discussing the results, limitations and future recommendations, and reflecting on the project as a whole.

Table 1. Design approach by chapter.

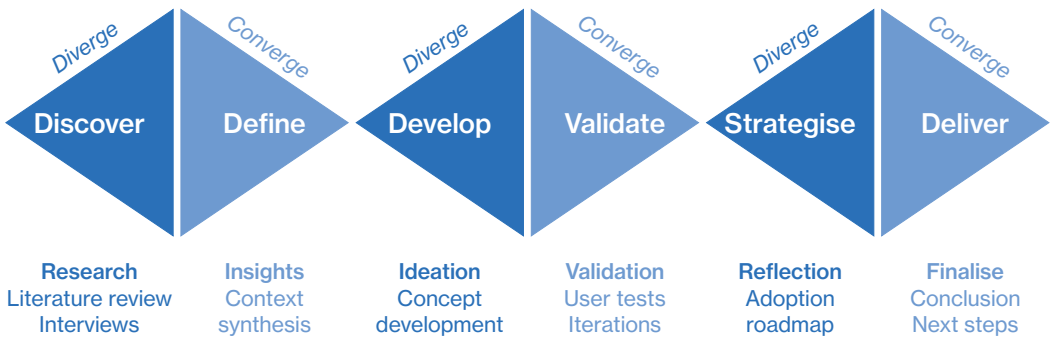

Figure 5. Triple diamond project approach, adapted from Design Council (n.d.).

2 Literature review

2.1 Introduction

This literature review establishes a scientific foundation for the qualitative insights that will be discussed in the following chapters.

2.1.1 Objective

The first aim is to gain an understanding of the current state of digital health in European healthcare, as well as the goals and ambitions associated with it. Understanding the factors that influence implementation informs if and how service mapping benefits the implementation of digital health services and which elements need to be visualised. Evaluating different mapping techniques on their suitability for visualising digital services informs which method can be adapted for the creation of the tool. This literature review also covers aspects that cannot be tested within the scope of this thesis, such as how easy it is for healthcare professionals to learn specific mapping techniques.

Research questions
What is the impact of implementing digital services in healthcare?
What are the quality criteria for a service mapping tool that enables healthcare professionals in hospitals to effectively visualise their digital health services?
Which facilitators enable the adoption of a new mapping method for the implementation of digital services?

Table 2. Research questions.

2.1.2 Method

To answer these questions, papers and reports were reviewed that relate to (1) implementing digital services in healthcare, (2) process visualisation in service design, and (3) service mapping methods and process modelling methods used in healthcare and their reception by health care professionals. In addition to finding answers for the chosen research questions, this review aimed to identify frameworks that could later be used to summarise and synthesise interview insights.

2.2 Digital health services

The World Health Organization defines digital health as “the cost-effective and secure use of information communication technologies (ICT) in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge, and research” (WHO, 2019).

2.2.1 Evolution of digital health services

Initially, e-health platforms served primarily as information and communication tools. They have since evolved into comprehensive platforms for skills training, treatment, and diagnosis (Bente et al., 2024). Modern digital health services encompass a broad range of technologies, including electronic health records, telemedicine, smartphone health applications, and wearable devices (Kasoju et al., 2023). Emerging innovations are the internet of things, robotics, artificial intelligence, big data, and blockchain (Hegerty & Weresa, 2024).

2.2.2 The impact of digital health services on the healthcare sector

Leveraging technology, digital transformation has the potential to facilitate collaborative decision making, knowledge sharing, and technology adaptation between healthcare professionals (Hegerty & Weresa, 2024) and empower patients to actively monitor their health data (Bente et al., 2024). This example illustrates the ambivalent nature of digitalisation: while it increases the efficiency of care by promoting self-management, which is often framed as empowering, it also imposes new responsibilities on patients (Greenhalgh et al., 2017).

Limited resources collide with increasing demand due to an ageing population and improved treatments (Ross et al., 2016). However, when implemented effectively, digital transformation has the potential to reduce costs. Projections indicate that annual healthcare expenses in the Netherlands are expected to increase from €100 billion to circa €170 billion by 2040. This rise is a consequence of an ageing population, with 80% of healthcare costs being spent on 10% of the population. According to McKinsey, the integration of well-designed and well-integrated services could potentially save €18 billion by 2030 (Van den Bosch, 2022).

This shows the potential for successful digital health service implementation to achieve the quadruple aim, which aims to “improve population health, patients‘ and caregivers‘ experiences, providers‘ experience and reduce costs” (Rouleau et al., 2024). From a service design perspective, achieving this requires balancing the stakeholders‘ need for a positive experience with the service with the service‘s ability to deliver the quadruple aim (Shaw et al, 2018).

Figure 6. Telemedicine is one example of a digital health service.

2.2.3 Digital health in Europe

Within the European Union, there is a big difference between the readiness of the member states to meet digitalisation aims set by the European Commission, such as the 2030 Digital Decade (European Commission, 2024). The WHO European Region 2023–2030 set a Digital Health Action Plan with a particular focus on the healthcare field to improve digital literacy and capacity (Nascimento et al., 2023). Neglecting accessibility challenges could exclude those who could benefit most from digital health, such as people with disabilities and the elderly (Bente et al., 2024).

These findings demonstrate the many opportunities that digitalisation in healthcare provides for improving care delivery and reducing costs. However, there is still scope for improvement in the development and implementation of digital health services. An ageing population will keep putting pressure on the healthcare system and increase the need for digital solutions. The following sections explore how service mapping can support this effort.

2.3 Barriers and facilitators to the implementation of digital health services

Understanding the barriers and facilitators to implementing digital health services provides insight into who the relevant stakeholders are, and what needs are not being met in implementation. The aim is to better understand the user group and what factors can be improved or overcome through service mapping.

2.3.1 Financial factors

Depending on the context in different European countries, the impact of barriers and facilitators varies. A primary global challenge is the lack of investment in digital services (Wiegner & Grau, 2020). Digital health is not yet integrated into global business models. Healthcare-specific factors complicate the creation and scaling of viable business models, such as different reimbursement and financing systems in different countries. Assessing the cost-effectiveness, clinical benefits, and intangible impacts of digital health lead to a limited willingness to invest in new technology (Bente et al., 2024).

2.3.2 Legal factors

Bureaucracy is a significant issue for Europeans (Wiegner & Grau, 2020). The Medical Device Regulations and the General Data Protection Regulation are the main policies safeguarding patient data but also stifling innovation. Increasingly, digital products like software are classified as medical devices and have to adhere to relevant policies (Bente et al., 2024). In the context of artificial intelligence, policies are still in the process of being established (Onitiu et al., 2024). This intimidates healthcare professionals who are unsure of their liability in the event of a data breach or harm to the patient (Bente et al., 2024).

At a policy level, governments can provide frameworks and methods to institutions to facilitate safe data sharing and ease market entry approval for promising solutions. It is essential to strike a balance between regulation and innovation in order to take advantage of technological opportunities (Bente et al., 2024).

2.3.3 Human factors

Attitudes towards new technologies are a key barrier in multiple studies. Health professionals doubt their value and impact (Van den Bosch, 2022), their impression is that “the users are not the centre of attention” (Tchertov, 2024). The value proposition of new digital services is often unclear to them (Greenhalgh et al., 2017). They worry about disrupted workflows, safety of patient data and feel uncertain about or are dissatisfied with new responsibilities resulting from digitalisation (Ross et al., 2016). Choosing first users based on their positive attitude is more important than someone with the right skillset (Yusof et al., 2007). This user can become a ‚local champion‘, so-

meone colleagues can trust to ease concerns (Greenhalgh et al., 2017). Comprehensive and ongoing communication across multiple channels with a clear rationale for the use of the tool helps drive acceptance (Nadav et al, 2021). According to Shaw et al. (2018), a service is ideally adopted on a “demand pull” basis, where a team of future users identifies an issue and the service they perceive as best suited to address it. By then, the team has already agreed on the value of the tool and is ready to commit.

Both medical professionals and healthcare managers have to play significant roles in collaborative service adaptation (Tchertov, 2024). It is essential for the project management to invest in a systematic approach, ensuring that workflow analysis and optimisation (Tchertov, 2024; Ross et al. 2016) as well as evaluation (Nascimento et al., 2023) is applied to the design of new systems. The active involvement of key stakeholders has been shown to foster a sense of ownership within the project and facilitate acceptance throughout their respective departments (Ross et al. 2016).

However, high workloads and staff shortages make it difficult for health care professionals to participate (Nadav et al, 2021). The proficiency, capabilities and experience of healthcare professionals in using digital services can impact their satisfaction levels, too (Ross et al., 2016). Once adopted, it is essential to analyse the effects of implementation on the workflow, offer additional, accessible training and education, including information on expected benefits and their anticipated timeframe. Many barriers can be overcome by providing a sufficient time of transition for the institution (Ross et al., 2016). Familiarity can be facilitated through well-planned trainings or the opportunity to practice with the service in demo sessions (Nadav et al, 2021).

For patients, the consequences of giving informed consent can be unclear. It is therefore crucial to present information in a comprehensive format and to be clear about how data will be handled. Patients with low digital literacy are at risk of being excluded from the benefits of digital interventions (Bente et al., 2024).

2.3.4 Technical factors

In product development, digital tools are often designed based on an oversimplified view of a situation (Greenhalgh et al., 2017). As a result, they may be unsuitable for the care context or too difficult to use (Greenhalgh et al., 2017). Not all systems align well with established work practices in every context and daily clinical routine, thereby validating the concerns of medical professionals regarding workflow disruption. The selected digital services must be adaptable to align with roles, tasks and workflows (Ross et al., 2016), and their implementation strategies must be tailored to the specific contexts within the hospital (Tchertov, 2024). Ideally, requirements for implementation are considered from the outset of technology development (Van Gemert-Pijnen et al., 2011).

Currently, there is a shift happening towards establishing connected environments that integrate multiple different digital services and connect relevant healthcare stakeholders, like patients, healthcare workers and insurances (Bente et al., 2024). This development is hindered by difficult data exchanges and systems failing to work together (Van den Bosch, 2022). Additionally, the dedicated support personnel must be in place during implementation and after adoption (Ross et al. 2016). Users expect close and available resources and seek out feedback whether they are using the service and its features correctly (Nadav et al, 2021).

2.3.5 Bridging barriers with service mapping

Service visualisation makes it easier for teams to deal with complex information and assess the consequences of implementing digital services (Blomkvist & Segelström, 2014). This enables healthcare institutions to pre-evaluate services and avoid unsuitable processes, potentially saving them money or making it easier to invest in new technology because the context-service fit has already been validated by the future users.

Facilitating the collaborative development of maps is a way of bringing together relevant stakeholders (Antonacci et al., 2021), including those who can contribute with their knowledge on regulations to increase healthcare professionals‘ reassurance about liability questions. Healthcare managers can use maps as a key building stone to enhance their systematic approach (Tchertov, 2024). Setting up a comprehensive visual overview of a new digital service also clarifies roles and responsibilities, by showing the complete complexity of the service‘s workflow, components and interactions (Blomkvist & Segelström, 2014).

However, the use of a mapping tool must first be accepted by health care professionals. Since a “demand pull” is unlikely due to a lack of awareness (Jun et al., 2009), involving stakeholder‘s in the tool‘s development to make them aware of the benefits and to ensure that the tool matches their skill level can avoid the use of a “technology push” by management.

2.4 The role of mapping methods in implementing digital health services

By providing a structured understanding of the interactions between users, technologies and organisational contexts, mapping methods help to ensure that digital solutions are not only effectively integrated into practice, but also tailored to stakeholder needs. This chapter explores different mapping methods used in healthcare that have the potential to contribute to the implementation of digital health services.

Figure 7. A mapping workshop by Danish design agency Let's Co.

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2.4.1 Benefits of mapping services

A better understanding of systems helps health professionals to improve the patient experience and the design of the wider health system (Jun et al., 2010). Creating a visual external representation of a service is a way to embody ideas or knowledge, explore alternatives to challenges, and facilitate collaborative problem solving in prototypes (Paust et al., 2025). Creating a shared object of thought, such as a service map with all stakeholders enables team to better deal with complexity and evolving processes (Blomkvist & Segelström, 2014).

2.4.2 Relevant existing frameworks

There are a few existing frameworks that do not apply mapping, but have been developed specifically for the evaluation of technology for implementation in health care. They aim to cover the relevant aspects that need to be considered in implementation and can therefore provide insights on which aspects need to be covered by a mapping tool. The HOT-fit framework introduces the three dimensions technology, human and organisation as most relevant when evaluating the context-service fit of a digital health service. The aim of the framework is to enable stakeholders to align these three dimensions for optimal "net benefits" (Moll et al., 2023). Net benefits are positive effects on clinical practice and outcomes, improved decision making quality, error reduction or communication. They are assessed in terms of workload, efficiency, effectiveness, decision quality and error reduction and balance the positive and negative impacts on users: clinicians, managers and IT, and hospitals or the wider healthcare sector (Yusof et al., 2007).

The NASSS framework gives a structured overview of influences on the adoption, non-adoption, abandonment, spread, scale-up, and sustainability of patient-facing health and care technologies. The evaluation is done through a series of questions to the users of the framework. It is used to predict and assess contextual factors on whether or why innovations will succeed in complex healthcare environments by identifying barriers and enablers (Greenhalgh et al., 2017).

Both frameworks are examples of covering many aspects of alignment in a short summary, which can be helpful during implementation. They are helpful in guiding which context factors the tool may have cover to holistically evaluate the context service-fit, including technology aspects, the stakeholder groups adopting the service and the organisational aspects.

Still, both have limitations. They focus on effectiveness and performance in health care and are limited in assessing the experiences of stakeholders affected by the change. HOT-fit covers "user satisfaction" by assessing satisfaction with specific functions or with the ability to make decisions (Yusof et al., 2007). However, this remains at a superficial level as user roles are not specified. In particular, the role of the patient is

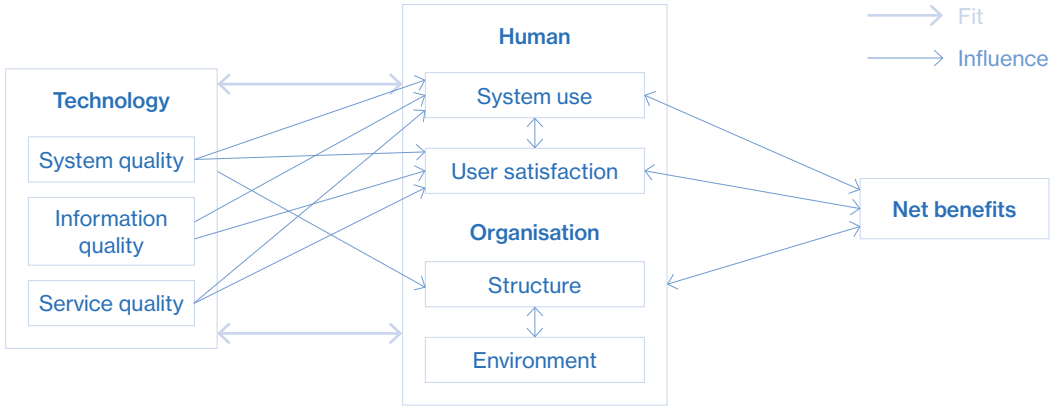


Figure 8. HOT-fit framework for evaluating context-service fit by Yusof et al. (2007)

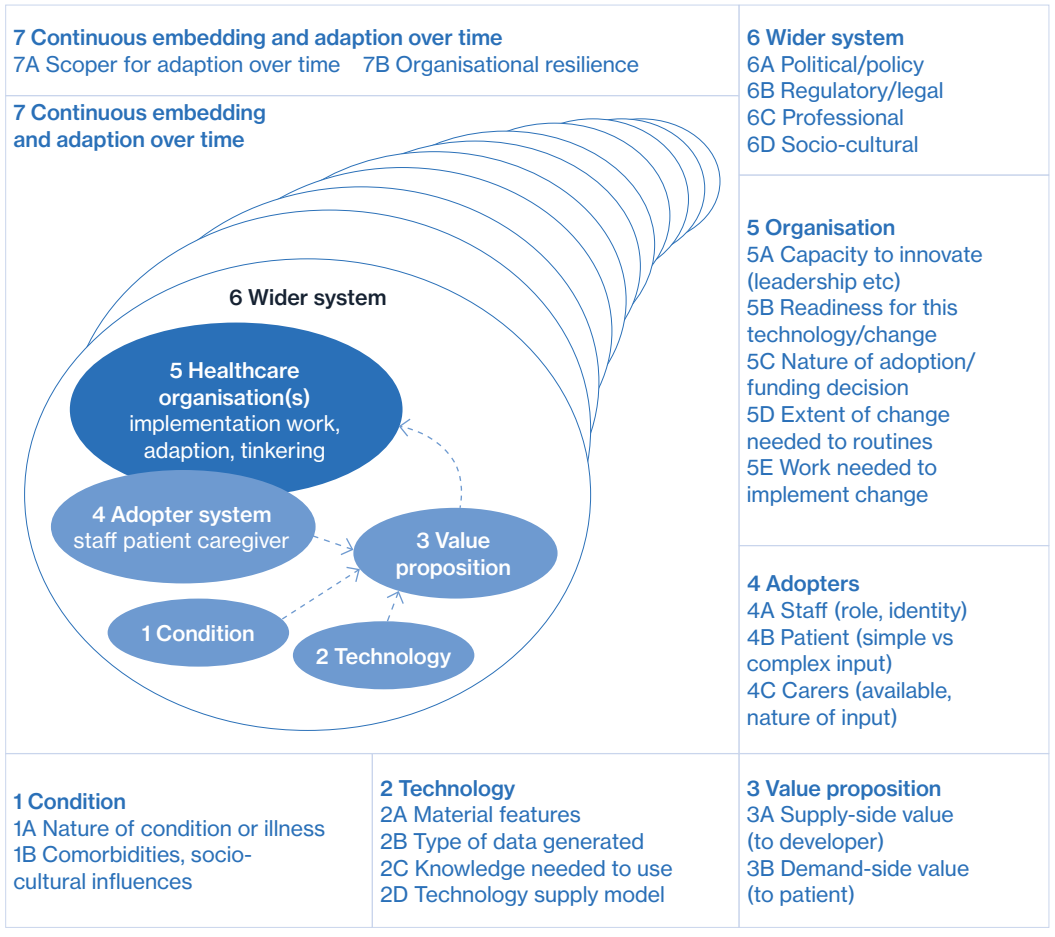


Figure 9. NASSS framework by Greenhalgh et al. (2017)

missing. NASSS only includes the “value proposition“ of the new technology (Greenhalgh et al., 2017). There is little room to include emotions, pain points or trade-offs between different types of staff roles, as they are all lumped together under the same umbrella terms, either “human” (HOT-fit) or “staff”/“caregivers” (NASSS). Neither is designed for iterative refinement at different points in implementation, but are suitable for assessing a particular point in time.

2.4.3 Relevant existing methods

Jun et al. (2010) evaluates multiple methods for healthcare process modelling. Flowcharts show an overall sequence of processes. The swim lane activity diagram is an enhancement of the flowchart, adding clear role definition to the sequences. State transition diagrams focus on the patient‘s state and how it changes over time. Testing this type of diagram revealed that it is able to provide a patient-led view. Additionally, there are methods focusing on certain aspects of a process, such as the data flow diagram that combines the flow of physical material and digital information exchange. Jun et al. (2010) concludes that multiple types of process models would be necessary to accurately represent all stakeholders and their activities. McCarthy et al. (2016) expands the traditional patient journey mapping method for quality improvement in the Integrated Patient Journey Mapping Tool. It is developed to create healthcare pathways by integrating patient personas and journeys, medical protocols, and technological requirements.

Originating from user-centred design to improve the customer experience, the service blueprint visualises service processes as a sequence of steps, customer (or patient) touch points and physical touch points. Different layers are used to show what the patient experiences, where and with whom, and who supports the process in the background. A key feature is that each stakeholder can see their role in the process. The mapping process can reveal inconsistencies and problem areas (Bitner et al, 2008).

2.4.4 Factors for developing a mapping tool

Different criteria are relevant at different levels to simplify collaborative prototyping between stakeholders. At the meta-model level, a structured set of building blocks and rules should guide the model development within a specific domain. The process definition model level should allow different perspectives on the same process to be shared, ensuring flexibility in stakeholder interpretation. The reference model level should establish a standardised process representation that is applicable across multiple healthcare organizations, ensuring consistency in implementation (Framinan et al., 2005). To effectively visualise digital health services, a mapping or modelling tool must facilitate a systematic understanding of the complex interactions between people, practices, technology and health systems (Rouleau et al., 2024). A key metric is the ability of the tool to bring relevant stakeholders together to enable dialogue, define common goals, and promote shared understanding through process modelling

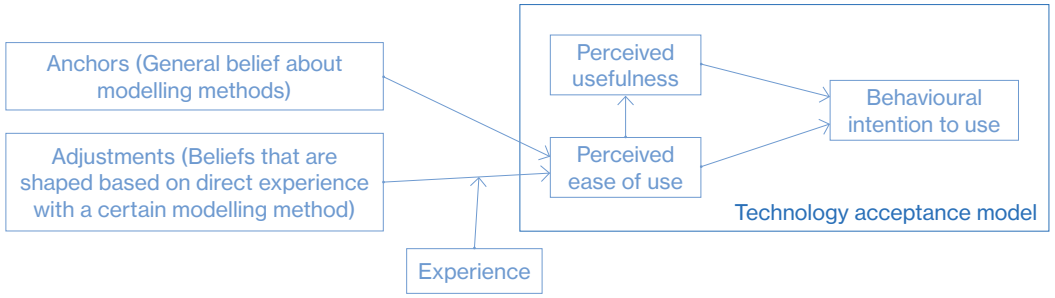
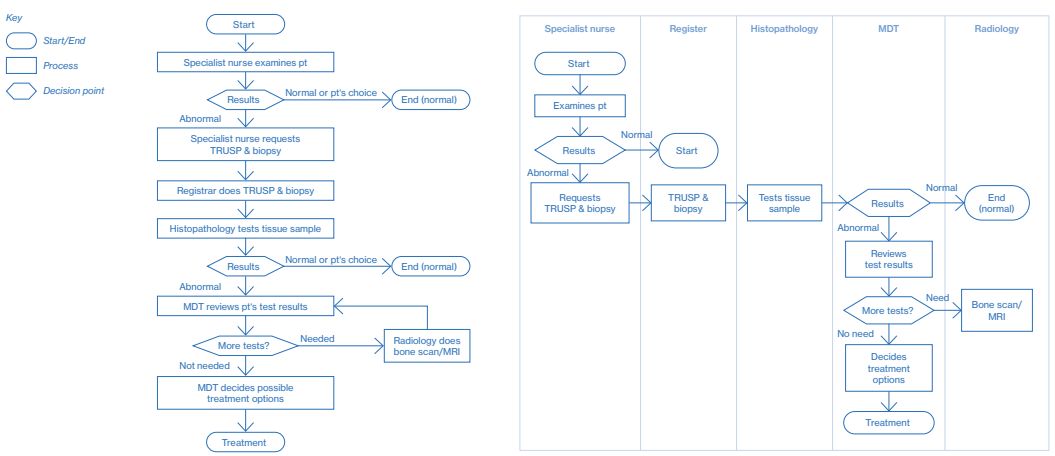


Figure 10. Determinants of perceived 'ease of use' by Jun et al. (2010)



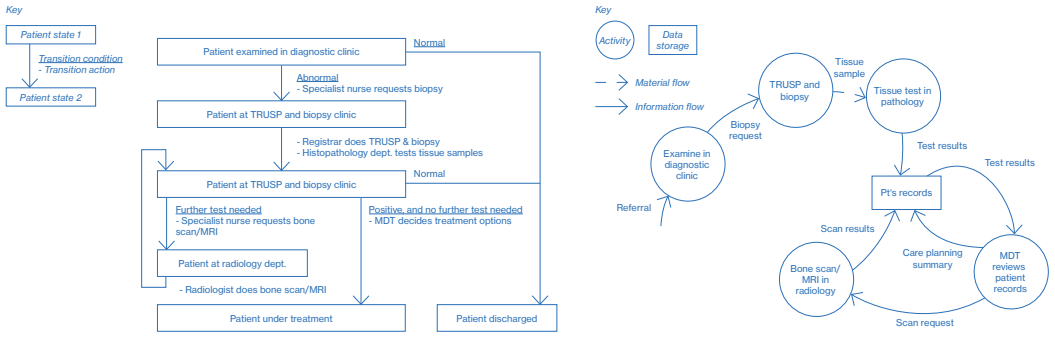


Figure 11. Flowchart, swim lane activity diagram, state transition diagram and data flow diagram of a prostate cancer diagnostic process by Jun et al. (2010)

(Antonacci et al., 2021). This is consistent with Colligan et al.'s (2010) findings that communication gaps and patient movement across healthcare services are critical challenges, making collaboration an essential feature of any effective mapping tool.

Collaborative service adaptation ensures digital services meet both clinician and patient needs (Tchertov, 2024). Everyone should see their own role and competencies in the process, including patients. This means, ideally patients are just as involved in the mapping process as other stakeholder to represent their interests (Bitner et al, 2008). This is supported by McCarthy et al. (2016) who state patient satisfaction as a vital aspect to focus on in implementation, as well as performance improvement and regulatory constraints

Jun et al (2010) found that mapping techniques are used on the basis of "usefulness" and "ease of use". "Ease of use" is based on general beliefs about modelling, previous experience with modelling methods and resulting beliefs (see Figure 10). They find that flowcharts and swim lane activity diagrams scored highest among clinicians and healthcare managers due to their familiarity. However, they lack the depth needed for system-wide insights. When first used, stakeholder diagrams, state transition diagrams and data flow diagrams were the easiest for healthcare professionals to understand. More complex representations, such as communication diagrams with multiple interconnected components, have low usability for healthcare personnel (Jun et al., 2010).

Therefore, intuitiveness needs to be prioritised when choosing a mapping approach. Antonacci et al. (2021) suggest that training can help stakeholders become more proficient in using these tools, ensuring broader participation and more effective service mapping. Healthcare processes are inherently complex, involving both individual actions and cross-organizational workflows. To accurately represent this complexity, Jun et al. (2009) recommend starting with a generic modelling method before introducing specialized approaches. The framework proposed in Figure 12 aims to assist healthcare professionals in selecting the most suitable method for their specific service (Jun et al., 2010). Using multiple diagram types can provide a more comprehensive and both hierarchical and sequential representation of the system (Colligan et al., 2010).

From a human-centred design perspective, quality mapping tools must align stakeholders, facilitate shared understanding and allow for iterative refinement. Techniques such as customer journey maps and service blueprints provide concrete reference points. They use a single representation of a service, but can incorporate multiple representations through their layered structure. Dynamic approaches such as role-playing and service staging support ongoing reasoning and decision making. These methods ensure that healthcare professionals can effectively engage with and refine their digital health services (Blomkvist & Segelström, 2014).

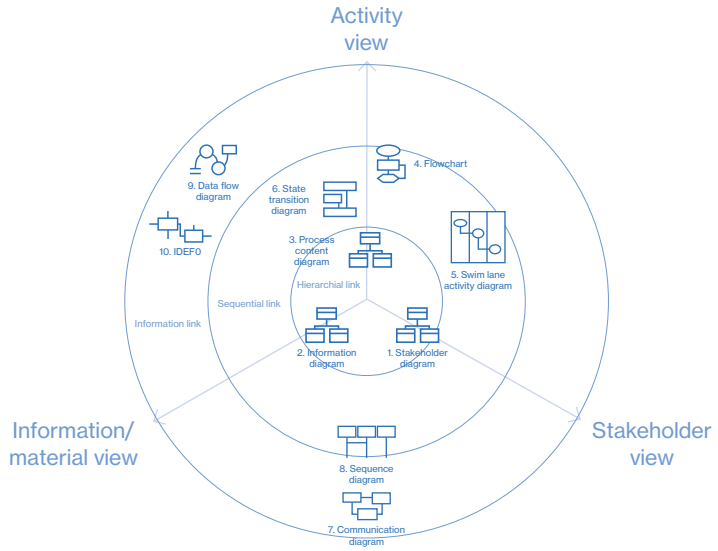


Figure 12. Matrix for characterising system modelling methods by Jun et al. (2010)

Figure 13. Service blueprint for a new outpatient clinic by Bartch et al. (2023)

2.4.6 Quality criteria for a service mapping tool for healthcare professionals

In the complex and time-pressured environment of healthcare, a service mapping tool must be simple, accessible, and relevant to professionals, who have limited experience in visual or design-based methods (Jun et al., 2009). To be effective, the tool should be useful in helping healthcare professionals make sense of how a service operates across departments, technologies, and patient interactions (Jun et al., 2010). It should facilitate collaborative reflection and include patients, who are becoming increasingly active participants in the delivery of care (Bitner et al., 2008). By making interdependencies and handovers visible, the tool can surface gaps or inefficiencies that might otherwise remain hidden. Importantly, the constraints and enablers of the healthcare system must be represented, such as clinical protocols, digital infrastructure, and regulatory frameworks (McCarthy et al., 2016). These factors directly shape what is possible in practice.

Overall, a mapping tool must translate system complexity into actionable clarity, engaging professionals without requiring extensive training or abstract thinking. It should serve as practical tool for reflection, alignment, and gradual service improvement.

2.4.7 Summary: suitability of mapping methods based on the key criteria

Mapping methods relevant to digital health services show sequences, workflows, processes, data flows, information flows (Jun et al., 2010) and patient experience (McCarthy et al., 2016; Blomkvist & Segelström). The factors were evaluated according to how much they can be integrated into the mapping method, which was categorised as low, medium or high.

Mapping method	Ease of use	Usefulness	Stakeholder engagement	Stakeholder's roles and competencies	Adaptability to multiple digital services	Rules and regulations	*Would this method be suitable in the context of the Box?*
Flowcharts[1,2]	High – high familiarity[1,2]	For sequences[1]	Low – no system interactions[1]	High - for individual workflows	Low – simple workflows with one user[1]	Low – does not include regulation	*Cannot represent multiple stakeholders collaborating.*
Swim lane activity diagrams[1]	High – high familiarity[1,2]	For sequences and roles	High – clear role definition[1], patient-centred[2]	High - activities arranged by responsibilities[1]	Medium – suitable for team-based processes	Low – does not include regulation	*Suitable for showing multiple possible actions..*
State transition diagrams[1,2]	High – easy to learn[2]	For showing patient's state[1]	High – patient-centred[2]	Medium - stakeholder activities are named[2]	High – see system's behaviour changes[1]	Low - does not include regulation	*Patient's state does not change constantly with the Box, it is not a pharmaceutical intervention.*
Data flow diagrams[1]	High – easy to learn[2]	For digital systems	Low – not focused on team interactions	Medium - stakeholder activities are named[2]	Medium – best for human-machine interactions[1]	Low – does not include regulation	*Data flow is a key part of Box's workflow, from the patient to the Box office.*
Communication diagrams[1]	Medium – more complex to learn[2]	For stakeholder interactions[1]	High – focused on team interactions[1]	High – focused on team interactions[1]	Medium – best for human-human interactions[2]	Low – does not include regulation	*Would be suitable to represent interdependencies. Less suitable for showing workflow.*
Information diagrams[1]	Medium – more complex to learn[2]	For hierarchical information structure[2]	Low – no human interactions	Medium - stakeholder activities are named[2]	Low – best for information exchange	Low – does not include regulation	
Integrated Patient Journey Mapping Tool (IPJM)[3]	High – sequential flow is intuitive	For performance, regulations and patient[3]	High – clear role definition, patient-centred[3]	Medium - focused on patient[3]	Medium – needs to include a patient[3]	High – can include regulations[4]	*Does not include non-clinical stakeholders, such as IT teams.*
Journey maps[3,4]	High – sequential flow is intuitive[4]	For incorporating patient experience	High – patient-centred	Medium - focused on patient	Medium – could integrate data flow	Low – does not include regulation	*Has not helped with prioritising issues. Suitable as a space to collect research insights.*
Storyboards[3,4]	Low – highly complex and time intensive	For service interactions	High – each stakeholder visualised	Medium - stakeholder activities are visualised	Medium – for different scenarios	Low – does not include regulation	*Too time intensive and not suitable for complex systems.*
Service blueprints[4,5]	Medium – requires training[5]	For holistic visualisation of service interactions[5]	High – each stakeholder visualised[4,5]	High - shows how roles fit into the bigger picture.[5]	High – integrates multiple process layers[5]	High – can include regulations[4]	*Can incorporate multiple workflows and is highly adaptable.*

Table 3. Comparison of mapping methods.

References: [1] Jun et al., 2009 [2] Jun et al., 2010 [3] McCarthy et al., 2016 [4] Blomkvist & Segelström, 2014 [5] Bitner et al., 2008

2.5 Discussion

Barriers and facilitators to the implementation of digital health services, and mapping methods used in healthcare by both healthcare professionals and designers, provide insight into priorities for the tool‘s development and adoption strategy.

2.5.1 Insights for tool design

While section **2.4.7** outlined core quality criteria for effective mapping tools, The Box revealed additional context-specific requirements that shaped the development of the tool. This provided greater clarity regarding the iterative nature of implementation and the distinction between stakeholder roles, neither of which was outlined so clearly in the literature. It also reinforced the need to prioritise these factors in the tool‘s design:

- The tool must support joint anticipation, discussion, and resolution of workflow challenges, and therefore needs to visualise the actions of each service user.
- The tool must allow for including specialised stakeholders, such as those with financial, legal, or regulatory expertise, whose knowledge is often not visible in mapping.
- Finally, healthcare professionals must clearly understand the benefits of the tool to justify their investment of time and attention.

Addressing these aspects ensures that the tool empowers professionals to explore, test and refine digital services themselves. However, there seems to be a discrepancy between the complexity of digital health processes, the tools required to create comprehensive system representation and the mapping methods healthcare professionals are able to use effectively. Jun et al. (2010) found that many healthcare professionals struggle with complex diagrams and require training. More advanced methods from human-centred design may be inaccessible to them. To address healthcare professional‘s skill level with visualisation, Jun et al. (2010) suggest experimenting with users to identify their needs.

A key finding is that only the service blueprint is able to capture regulatory constraints as well as human-human and human-machine interactions, which is critical for digital service implementation. It enables interdependencies between domains to be highlighted (Bitner et al., 2008), such as the effect of organisational culture on technology adoption. Simpler diagramming formats, such as swim lane and data flow diagrams, provide an accessible starting point. Both can provide important information, as they can be used to illustrate complex workflows and data flows. Combining these formats could create a tool that strikes a balance between clarity and comprehensiveness.

These insights have shaped my understanding of the tool’s core value, which is not only system understanding, but also enabling collaboration. The Box has shown how complex the interdependencies between stakeholders are. As I cannot influence legal, financial and technological constraints, I believe the tool should address human barriers by inviting the relevant stakeholders to join the conversation.

2.5.2 Insights for the tool being adopted into practice

Low up-front costs and transparent running costs ensure financial accessibility. This lowers the threshold for organisations to start using mapping techniques. The biggest financial investment will be in having stakeholders take time out of their working day to be involved in mapping activities. It is important to provide specific information about the expected benefits, as well as accessible education (Ross et al., 2016). Jun et al. (2010) showed that healthcare professionals quickly picked up many of the process modelling methods and recognised the benefits of visualising when given some guidance. Being able to practice with existing services in demo sessions (Nadav et al., 2021) could help to compare the different experiences of the previous process and the new process using mapping. In addition, the appointment of a local champion who is trusted by colleagues can alleviate concerns (Greenhalgh et al., 2017). These local champions would have to be open to learning how to use the tool. How likely it is to find these types of people will be evaluated in the coming chapters.

These results suggest to me that mapping is less inaccessible to healthcare professionals than I previously thought. However, their willingness to try it appears to depend on who is introducing it. It will also be important to explain the purpose of each feature at every step, to help stakeholders understand its value and the benefits it will bring.

2.5.3 Conclusion

For stakeholders to invest time and energy in service mapping, they must clearly understand its value. For healthcare professionals to visualise and improve digital health services, the mapping tool must prioritise usability, stakeholder engagement, and adaptability, while remaining compatible with regulatory constraints and professional realities. The core insight emerging from interviews and literature is that mapping is not just a method of analysis, it is a collaboration tool. By incorporating principles from human-centred design and making the mapping process transparent and inclusive, the tool can foster communication, alignment, and shared ownership of digital transformation.

My main challenge will be to strike a balance between complexity and usability. It is well known that healthcare professionals have very little time. Although this factor is only mentioned as one of many, I believe it is one of the main considerations that determine whether and how the tool will be used. Designing for quick, meaningful engagement, without sacrificing the integrity of the system being mapped, will be central to the tool’s success.

3 Understanding the context

3.1 Chapter outline

To understand the competitive landscape around mapping tools made for healthcare, I conducted market research into other tools. I wanted to understand their focus and, subsequently, which gap in the market could be filled by a tool for implementation. Recognising that these tools would be designed for use by healthcare professionals meant that they might provide inspiration for offering a simplified mapping experience.

I conducted multiple interviews with healthcare professionals involved in implementing digital services. These interviews provided insights into the current role of mapping in healthcare and enabled a contextual analysis of digital health service implementation in hospitals. This gave insight into which additional features are important for the tool and which priorities need to be set.

A key finding of the literature review was the importance of selecting the appropriate medium to facilitate a straightforward and effective service mapping experience. However, this did not provide any guidance on which medium would be most suitable. A key requirement of the tool is the ability to iteratively build current and future service maps, a task that can be accomplished using online collaboration platforms such as Miro. This is why I tested and analysed different platforms to determine their potential to host the tool. Insights from interviews informed which platforms were already being used by healthcare professionals or designers and how they perceived them.

This chapter concludes with a new problem statement that informs the iterated design assignment in Chapter 4.

3.2 Market research

In addition to available service design methodologies, there are toolkits and frameworks from commercial providers or research that aim to visualise hospital processes. Most mapping or visualisation tools focus on the patient's experience, which is a priority for healthcare professionals (Zayas-Cabán et al., 2022). This, and the recognition that patients are part of the adoption system for health technologies (Greenhalgh et al., 2017), means that it is essential to consider the impact on the patient's care pathway and experience when implementing digital health services.

Figure 14. Metro Mapping.

Figure 15. GoMedFlow.

Figure 16. IPJM tool.

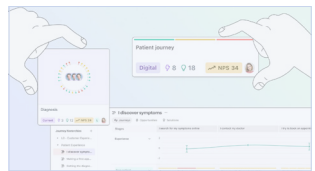


Figure 17. TheyDo tool.

3.2.1 Adjacent tools

Metro Mapping is used to visualise and improve patient's care pathways. The map uses five layers: patient journey and decisions, information exchanged, healthcare professional's involved, location and patient and family experience (Metro Mapping). Several of my interviewees are using this tool, both health and design professionals.

GoMedFlow is a digital patient journey mapping tool that connects healthcare professionals and management to understand care pathways, the current state of digitisation, and communicate opportunities to implement digital resources. Healthcare professionals can make suggestions from the existing resources in the hospital, such as video calls or informational videos (Van Rijckevorsel, 2022).

The Integrated Patient Journey Mapping tool (IPJM) supports in developing create healthcare pathways by integrating patient personas and journeys, medical protocols, and technological requirements. Implementation is not part of the scope, it supports in changing care pathways and digital touchpoints (McCarthy et al., 2016).

The TheyDo Patient Journey Mapping Tool is a commercial tool for digital patient journey mapping. It uses building blocks to collaboratively build journeys and highlight opportunities and solutions (TheyDo). It might help implementation by integrating project and software management platforms but is not optimised for this use case.

3.2.2 Evaluation criteria

In researching these tools, it became clear that most of them focus only on the patient's perspective. While assessing the patient experience is important, these tools fall short in taking into account the roles of clinical and supporting staff, which are important for implementation. The second evaluation criteria is the tool's capacity to visualise the key criteria identified in the literature review: stakeholder engagement, stakeholder's roles and competencies, adaptability to different types of digital service, rules and regulations.

3.2.3 Evaluation

None of the tools are optimised for service visualisation or implementation. All the adjacent tools aim to map the patient journey through a specific care pathway, focusing on the patient as a stakeholder. Only the GoMedFlow tool includes flows of data or information and only the IPJM tool factors in regulations. Therefore, the IPJM tool is the closest mapping tool to support implementation, as it also considers device touchpoints. However, it misses the interconnection between stakeholders and its format may oversimplify the situation. A more in-depth analysis of the healthcare professionals experience with the service is necessary. It has limited potential to help in technical and systemic analysis because it is still heavily focused on the patient.

Nevertheless, all four of them attempt to simplify the mapping process to suit the skills of healthcare professionals, making them a good source of inspiration for developing the service mapping feature. The TheyDo Patient Journey Mapping tool is optimised for seamless online collaboration and uses a modular structure with building blocks to ease the mapping process. It also enables integration with project management tools. Metro Mapping effectively incorporates contextual elements by using a narrative structure that visualises the perspectives of multiple stakeholders, while maintaining a patient-centred focus. GoMedFlow connects healthcare professionals and organisational staff, which is integral to implementation. While the IPJM tool is too simplified to capture complex workflows, it can be used as a basis for further development.

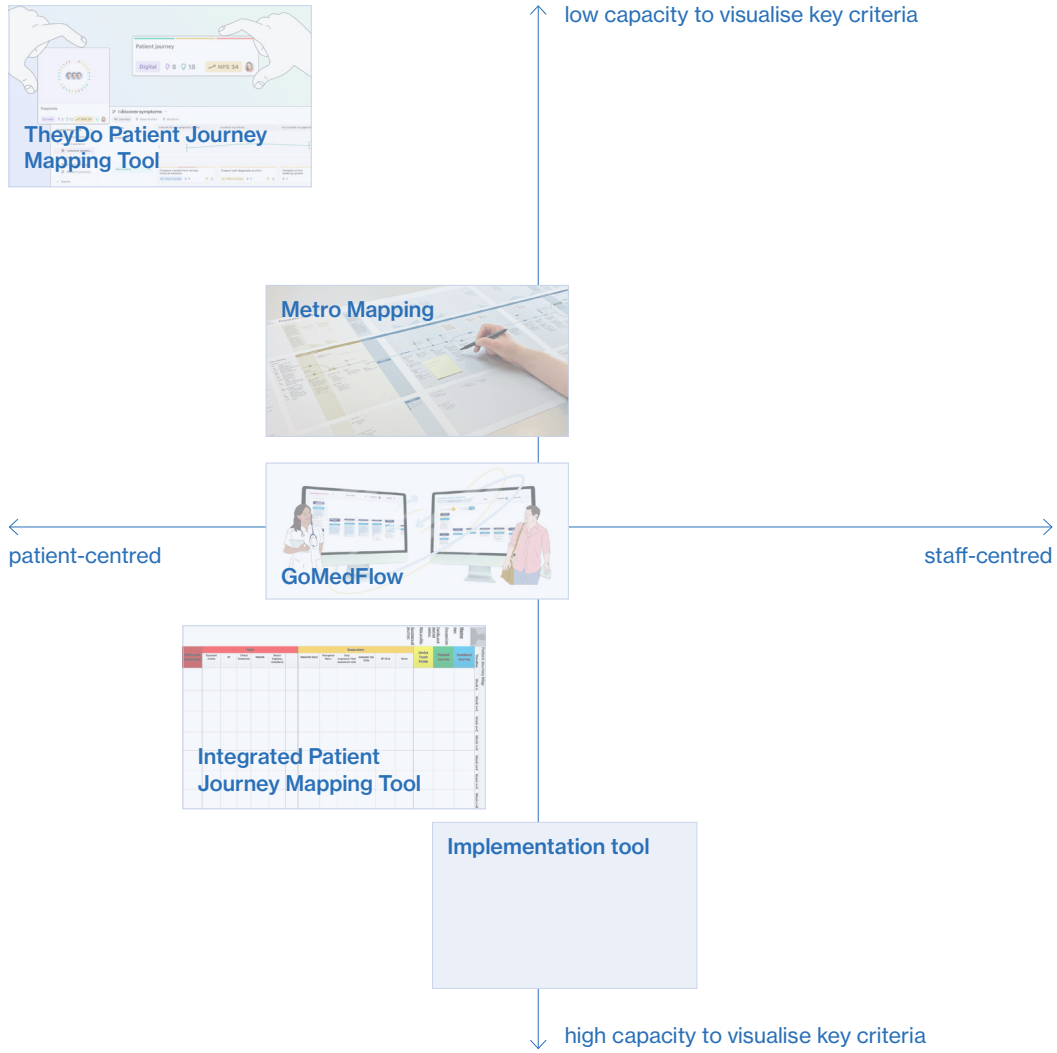


Figure 18. Evaluation matrix.

3.3 Interviews

The next research activity was to conduct interviews with relevant stakeholders. The aim was to gain information for the creation of the tool by gaining a more in-depth understanding of the implementation context and the role of mapping in practice.

3.3.1 Method

Semi-structured interviews of around 40 minutes were conducted with the participants listed in the table below. Each interview was transcribed, coded, and thematically clustered in relation to each research question. The first thematic analysis aimed to understand the views of healthcare professionals on service mapping in their practice. ‚The Box' was initially chosen as a case study to provide an in-depth view of a digital health service and its context, as described in chapter **1.2**. The main context factors identified in the interviews are highlighted in this section.

Contextual factors were clustered in the Consolidated Framework for Implementation Research 2.0 by Damschroder (2022) to provide a comprehensive overview over the interview insights and determine healthcare-specific context factors.

Service mapping experience	Occupation	Digital health service	Focus of the interview	Nr
High	Design researcher	The Box (Health Box)	Service and implementation	1
		The Box (Family Box)	Service and implementation	2
		Telemedical prehospital care	Service and implementation	3
	Lean coach in hospital	-	(Service) mapping	4
	Healthcare professional with service design training	Prehospital care	Service and implementation	5
	Healthcare professional	Telemedicine		6
		Electronic health record		7
		Prehospital care		8
		Remote patient monitoring		9
		Prehospital triage	Service, role of (service) mapping	10
		-	(Service) mapping	11
Low		-	(Service) mapping	12
	Implementation researcher	E-signposting	Experience of learning service mapping	13

Table 4. User test participants.

The participants were healthcare professionals in a management role who are currently implementing or have implemented a digital health service in a hospital. This leadership role was achieved in the clinical setting either through work experience or additional education. Outside the clinical setting, through a position as a researcher or a career move into consulting. They fall into four categories: healthcare professionals, healthcare design researchers, design professionals in healthcare and healthcare professionals trained in service design. Many, but not all, of the healthcare professionals have little to no experience with creating service maps but experience in collaborating with designers and understanding service maps. They are based in Sweden, Germany or the Netherlands.

Widening the scope beyond the LUMC ensures a more general validity for the tool by understanding the constraints in different countries within Europe and in different project types (academic and non-academic), by covering both university hospitals and smaller hospitals. Finally, an implementation researcher was interviewed about their experience of learning to use service mapping techniques. They recognised the value of mapping techniques and wanted to use them to gain a better understanding of the system surrounding a digital service they wished to develop.

3.3.2 Service mapping in practice

What are challenges faced by healthcare professionals when learning to use service mapping?

This question aimed to understand how non-designers approach and experience the autodidactic learning process. To answer it, an implementation researcher who is currently learning service mapping was interviewed. Learning **platform-specific techniques** was the key challenge. Even with a high usability, there was still a learning process to understand how to use the main functionalities.

This task was introduced by their supervisor, which may have contributed to another challenge: the **purpose of mapping** the (eco)system was **unclear**. It seemed too disconnected from the service itself. *“I understand I need to map the system because we need to understand what things are in the system. But then I'm struggling a bit with understanding how that can inform the implementation of the text message service.”*

The participant struggled with **how to visualise in a way that is useful** because starting with a blank slate felt daunting. They were approaching the task with a trial-and-error approach. The participant reported **structured guidance and training** as the main facilitators to gain confidence and skills. Although tutorials were regarded to be useful, the interviewee found them annoying and used academic papers as guidance. As a researcher, they aimed to make decisions based on data. However, these fell short in explaining how to use certain tools and methods.

How do healthcare professionals perceive the role of visualisation in supporting shared understanding in healthcare settings?

This question aimed to gain insight into the desirability and feasability of a tool for service mapping.

Theme 1: Healthcare professionals‘ perceived value of service mapping

A **comprehensive overview** makes it easier to focus on a lot of information at once. Online, they noticed a usability problem: it is impossible to see the full overview. Ideally, however, a map is a living document that can be easily changed as new information emerges. *“People are distracted, so having it easily visualized is 100% better than text.” - Healthcare professional*

Bringing stakeholders together creates an opportunity for deeper, more detailed communication than it is possible during everyday work. *“What I find really exciting and challenging is when different professional groups are involved [. . .] and then you go through it together so that everyone really understands it. Because certain terms are also understood differently by some people and if you then have this drawn up and can then work your way through it. That‘s helpful.” - Healthcare professional*

Service mapping can **highlight misunderstandings**. These were misunderstandings about how things should be, as well as about the definitions of certain terms. Having everything mapped out either uncovered these issues or ensured that everyone was on the same page. *“Visualising is easier than just imagining, because before we thought we were all on the same page with how we imagined it. But then you discovered that not everyone was really imagining the same thing.” - Healthcare professional*

Theme 2: Healthcare professional‘s experience with visualising services

There are different perspectives on healthcare professionals‘ use of visualisation. In designer‘s experience, healthcare professionals are **not used to design processes, visualisation tools and terminology**. I also noticed that using design terminology during interviews was confusing unless the participant had previous experiences working closely with designers. *“I can take their ideas out of their heads. Everything is here. They don‘t tend to put things in systems or visualise them or illustrate them.” - Design researcher*

Healthcare professionals however stated they prefer visuals over text. *“And yeah, maybe like you said, doctors are not so used to visualization. But I think all they do is visualisation. They hate text. All they do is seeing patients. You have a visualisation of your patient because it‘s in front of you and based on what you see and what you‘re asking, the interaction you have, you create an idea of the diagnosis. But if you give a doctor a page, a four page of text, they’re never going to read the full text.” - Healthcare professional*

Several healthcare professionals stated that they **use simple visualisations** like flowcharts to show processes because of the management tasks they have in their position. In this role, they have more time to work on visuals than those who work exclusively with patients. The main objects of these process visualisations were stakeholders, specific documents and often a financial component. *“I like to draw pictures of who the prescription comes from, who issues it, which route the prescription takes, who bills it, where it is then billed, where the money comes from and things like that, I like to do that visually. I‘m the only one, but I think these little pictures are well-received. You see them pop up again and again somewhere when you talk about the topic again much later, someone comes along with a picture like that and says, yes, that‘s the diagram here. Then I say, yes, it‘s mine, I know it.” - Healthcare professional*

Despite this, healthcare professionals have a **low self-perception of their visualisation skills**. *“So this is kind of like a sort of a flow thingy, but then probably not as beautiful as you all can do it. But just to make sense.” - Healthcare professional*

Unexpectedly, the research question also lead to opposing views on healthcare professionals‘ role in digital innovation:

Theme 3: Perception of healthcare professional’s role in digital innovation

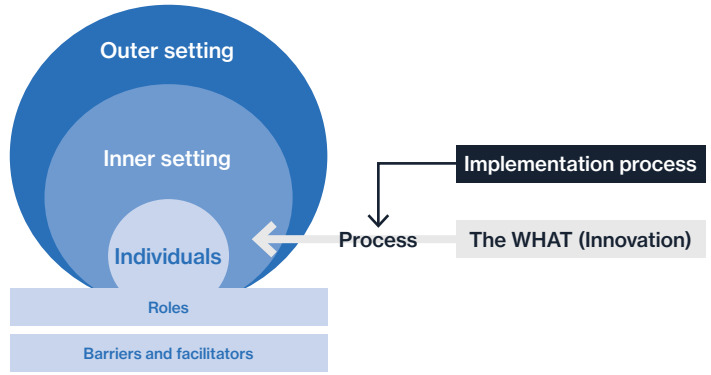
There was a general consensus that it is essential to involve healthcare professionals in order to benefit from their knowledge of stakeholders and clinical needs. However, they are not trained in leading innovation processes. *“Should they be the innovators? I don‘t know. It‘s not their profession. Not really, but they also know the context, so they have certain things that maybe designers wouldn‘t have so easily. So we need them.” - Design researcher*

Knowing the context has led other designers to believe that designers are not always needed in innovation processes. *“They are very optimistic about it, very creative, all sort of times and many times designers are not needed in new environments because they build their own things.” - Design researcher*

Further opinions are that healthcare professionals are not yet involved enough, because their understanding of clinical needs drives changes in the service. *“I think there is a huge potential in how you could [...] increase the participation of healthcare personnel. When it comes to also driving change and innovation amongst themselves.” - Healthcare professional with service design training*

3.3.3 Context outline

The CFIR framework is one of the most frequently used for evaluating contextual elements in implementation (Damschroder, 2022). Understanding these factors is essential for creating an effective evaluation tool for implementation projects, as it ensures that the relevant factors are identified and prioritised correctly. The framework was adapted to be more concise, with ‚IT infrastructure' added to the ‚Inner Setting' section to include technological factors. Themes from the interviews were allocated to the framework's sections to provide a comprehensive overview.



Outer setting

Policies and laws	Partnerships and connections
Patient has a right to informed consent and might not want service	Dependance on health insurance companies for financing service
Data privacy laws can hinder innovation, for example if consent would be needed in medical emergencies	Prevention efforts are only relevant (cost-effective) for countries in the long term, making it hard to receive funding
Healthcare professionals work with standardised protocols to minimise liability. With digital health, liability is not always clear.	IT provider's slow responsiveness can slow down already slow progress
National digitalisation strategies can determine what is implemented	

Inner setting

Tension for change	Mission alignment	Communications	IT infrastructure
Overtime and effort does not get rewarded or financed	Gap between stakeholders who see the need for change and those who have accepted the current situation (even if they agree that there are problems)	Healthcare professionals want updates even when they have no time to read them	New service should link into services that are already implemented, ensuring interoperability
Need for long-term strategy clashes with fast-paced environment		Communicate new workflows with portable mediums, like cards for the coat pockets	Patient data is received remotely with an app
Healthcare professionals fear unknown outcome, extra workload and changes to the patient relationship	Healthcare professionals don't feel involved enough, while implementation team feels dependent on healthcare professionals' will to help	Implementation team needs to continously seek feedback and input from other roles	Necessary to determine who can access which data in order to ensure the data safety

Individuals

Roles

Innovation recipients (patients)	Innovation deliverers (healthcare professionals)	Implementation team members
Look for clear instructions for their recovery	Are frustrated by their lack of power in driving change	Are highly reliant on the support of clinical advisors
Ability to use and want a digital service is impacted by their digital literacy	Feel like they are included because they are supposed to be included, but decisions have already been made	Need to involve innovation deliverers in co-development effectively but have different views on what role they should have

Barriers and facilitators

Need	Capability	Opportunity	Motivation
Healthcare professionals are unsure when there is not enough research, want role models to believe that effort is worth it.	Services are used before healthcare professionals are ready, leading to burnourt	Good concepts fail when service duties are not clear, leading to abandonment	Short-term pressure for change needs to come from inside: the ‚customers' will keep coming because people get sick
Implementation managers need input provided by healthcare professionals to make decisions	Healthcare professionals often have the perception that technologies are too complex to use	Healthcare professionals are reassured by their colleagues' positive reviews and examples	Long-term pressure for change due to aging population and lack of available personnel

Implementation process

Assessing context	Planning	Engagement
Implementation team need to understand clinical needs before coming up with a solution	Implementation team need to make trade-offs between different needs, leading to healthcare professionals not feeling heard	Implementation team need to focus on healthcare professional's skills and self-efficacy with and attitude towards the service
Implementation team needs to uncover the tasks needed to upkeep the service	Implementation team need to meet healthcare professionals where they are, in coffee breaks or existing meetings	Start with a small team of innovation deliverers that is enthusiastic about implementing the service
Implementation team need to find out what healthcare professionals want to learn from the collected data	Patient journey is not suitable for making decisions for the service	Including future service users creates expectations that might not be met

The Innovation

Adaptability	Complexity	Cost
For off-the-shelf software, IT provider is not always willing to make changes and workflows need to be adapted to the software	Implementation process should link into services that are already implemented, ensuring interoperability	New payment systems are necessary when patients are treated remotely
Services should be adaptable to the workflow, not the other way around	Different work packages are dependent on decison-making by first work package	Funding software that is used outside the hospital by non-patients is difficult
Service needs to be highly customisable to each context and highly modular to be scalable, which is difficult to balance	Differences between hospitals means that an entire new strategy is needed for each implementation	Custom-made programs are expensive
		Gap between possible advantages for individuals and uncertainties about (monetary) ROI
		Business models include tenders and insurance companies

Figure 19. Consolidated Framework for Implementation Research 2.0.

3.3.4 Takeaways from CFIR 2.0

Digitalisation can be an overwhelming transition for any organisation. This context analysis once again highlighted the unique challenges of implementing digital health services, which combine the complexities of digitalisation with the realities of a high-pressure work environment and the intricacies of the healthcare system.

One reason why some healthcare professionals may be reluctant to embrace new digital services is that their workflows are guided by protocols, while also being fast-paced and high-stakes, which makes risk assessment vital. Any disruption can compromise patient safety or significantly impact their experience, with direct professional liability for clinicians.

While individual workflows can be standardised, the systems between different hospitals and even within hospitals are fragmented. There are too many existing systems impacting a service, and it is rare to find someone with a good overview. This can make it a frustrating environment to implement in: *“In my ideal world there is a process of design that links into implementation but also a process of implementation that links into the implementation of everything that is already there.” - Design researcher*

As healthcare deals with highly personal information, data privacy laws and informed consent considerations are particularly strict, and compliance is a priority. Integrating new and existing systems into a unified technical environment is challenging and requires careful determination of who is authorised to access which data. This conflicts with the aim of digital services to use patient data, often outside of the hospital, to improve care and relieve pressure on the healthcare system.

There are also difficult professional dynamics between the different roles. All key stakeholders feel highly dependent on each other, creating a dynamic between healthcare professionals and the implementation team. Healthcare professionals have learned to rely on scientifically proven interventions, and negative experiences of increased workloads due to digitalisation make them reluctant to accept the unknown outcomes of implementation. This hinders the implementation team from finding suitable local champions who are willing and able to devote time to the project. The implementation team relies on these champions to understand the implementation context.

But healthcare professionals are under thight time constraints while feeling that they are not involved enough. One interview participant even left healthcare to work in implementation for this reason: *“And I think that one of the main reasons healthcare personnel ends up in different kinds of jobs as myself is because that we are getting frustrated that we cannot do the changes that we want or and that we see as necessary.”*

Now, on the other side, they are reliant on a clinical advisor. *“(...) You need to collect those key people from start. Which I think can endanger the project in a way because it makes it so fragile.” - Healthcare professional with service design training*

Both implementation management and healthcare professionals feel dependent on and often let down by IT teams and providers to build and integrate their solutions into existing legacy systems. IT providers set technical limits to what can be done with custom software. Off-the-shelf software is not always as adaptable as needed, highlighting the discrepancy between customisation and modularity. This can mean that workflows have to be adapted to software rather than the other way around. IT teams in the hospitals are concerned about ensuring data safety. *“But we know that many projects when it comes to digital healthcare, it‘s like they‘re reaching the IT department and then they die in there. So I think sometimes the IT department sets a lot of limits of what healthcare, clinical professionals and those working in clinical care actually can do.” - Healthcare professional*

Healthcare is also highly impacted by the outer setting. Implementation teams need to work with complex reimbursement models, using tenders, grants and having to align with health insurance companies. These factors make business modelling and scaling innovation in healthcare particularly difficult.

3.4 Platforms for mapping digital health services

For people to use a new method, it needs to be easily accessible and usable. Digital collaboration platforms provide teams with the opportunity to collaborate on mapping projects. However, which platform is used highly impact usability.

3.4.1 Evaluation criteria

Ease of use is essential for the method (Jun et al., 2010), so the platform‘s features must be intuitive. Stakeholders must be able to collaborate easily (Bitner et al., 2008). The ability to upload custom templates would make the tool accessible to all users signed up to the platform. These templates could include both the tool itself and instructions for using it. Certain platforms were mentioned during the interviews and have proven useful. Lastly, price is an important factor because adopting a new platform involves financial investment.

3.4.2 Evaluation

Name	Usability	Collaboration	Custom templates	Used in practise	Price per month
Miro	High - used by healthcare professional working as researchers	Specific comments and reactions, activities and decision aids, collaborative AI	Possible	Most frequently mentioned platform by design researchers in healthcare	16$ professional license
Mural	High - very simple setup	Specific comments and reactions, activities and decision aids, collaborative AI	Possible	Used for service design in healthcare	9.99$ professional license
Canva	High - used by healthcare professionals	Specific comments and reactions	Possible - but search can be overwhelming	Used by multiple healthcare professionals	Free
Visio	Medium - optimised for IT/technical processes	Comments are possible but not connected to certain sections	Not possible	Metro Mapping uses Visio	Included in Microsoft 365 5€ individual license
Draw.io	High - very simple setup	Comments are possible but not connected to certain sections	Possible	Not mentioned	Free for up to 10 users 34$ team license
Lucidchart	High - optimised for maps and charts, with interactive features	Specific comments and reactions, activities and decision aids, collaborative AI Can import Visio to link Metro Mapping files	Possible	“Most widely used visual collaboration platform” (Lucidchart), positively rated by implementation researcher who is learning mapping	11€ individual license 35,67€ two professional licenses
Creately	High - very simple setup	Microsoft/Google tools can be embedded	Not possible	Not mentioned	5$ individual license 89$ team license
Kumu	Low - takes a long time to build a map	Discussion forum for collaborators	Not possible	Abandoned due to poor usability	10$ professional license

Table 5. Comparison of online collaboration platforms.

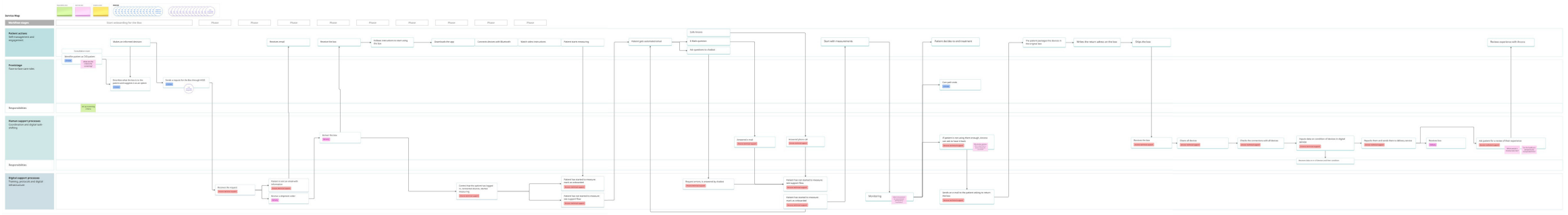


Figure 20. The Box workflow in Miro.

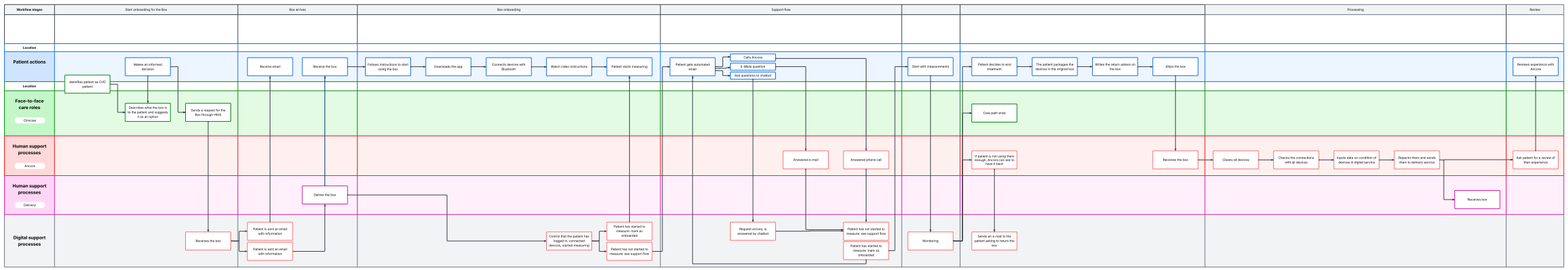


Figure 21. The Box workflow in Lucidchart.

3.4.3 Conclusion

Miro and Lucidchart are the two tools that stand out. Miro is by far the most widely used tool, but Lucidchart is better optimised for mapping. Mapping the same processes on both platforms revealed that, although both have limitations, Lucidchart is quicker and more effective, offering greater customisation and more options for iteration. For example, stickers do not have to be copied and pasted, and layers can be created to allow a more step-by-step process. It is these factors that made me choose Lucidchart over Miro.

3.5 Discussion

The market analysis revealed that no existing mapping tool is specifically optimised for the implementation of digital health services. This gap presents a clear opportunity, but interest from the target group still had to be validated.

Interviews with implementation managers and healthcare professionals who had experience of working alongside designers recognised the beneficial impact of service mapping on their work. Many also used simple visualisations or diagramming tools independently to improve their own system understanding, demonstrating at least basic skills in visual communication. Although not formally trained in innovation management, several had taken on innovative roles because of their extensive workexperience or additional qualifications and actively influenced their work environments. This indicated that the concept of an implementation-focused mapping tool is desirable, and that some interviewees would be well-positioned to lead its use in practice.

3.5.1 Insights for the tool‘s design

The context analysis showed how important it is to analyse current and future workflows, taking into account existing and future digital systems and hardware. It enables users to address the key issues they face during implementation. Aligning workflows gives healthcare professionals clarity about their new tasks and may create new standards in the form of protocols. Being able to highlight pain points, outstanding tasks and open questions clarifies what the implementation team still needs to do before creating the ideal future workflow, and enables stakeholders to continue mapping even if they do not yet know everything.

The analysis should focus specifically on compliance-related tasks and exchanges, as these were identified as one of the most important aspects to validate during the interviews. Data exchanges can be analysed in detail to indicate compliance for each sent document or measurement. Additionally, the tool needs to structure stakeholder involvement to bridge the identified gaps in collaboration between healthcare professionals, implementation managers and technical roles.

3.5.2 Insights for the method being adopted into practice

To ensure consistent use in practice, one person within the implementation team should take ownership of the mapping process. This includes organising meetings, recruiting participants and maintaining the mapping effort over time. While the interviews showed that the tool would clearly benefit healthcare professionals, they would not have time for this task. This means that the implementation management should be actively involved to fill this gap. The tool can provide implementation managers with a structured approach to collaborating with healthcare professionals and receive the information they need.

Many of the interviewees would fit this position, as they are already familiar with the benefits of service mapping and use visualisation tools independently or have received formal training in service mapping. To encourage wider adoption, it is important to share positive experiences and, ideally, clear, measurable results to demonstrate the tool‘s value and encourage its use.

Choosing Ludichart was an easy decision as it is by far the most optimised tool for diagrams and effective mapping. However, the cost of the platform may put users off trying it and hinder its adoption. This makes it even more important to focus on the tool‘s value proposition in the adoption strategy.

3.5.3 Conclusion

Several implementation managers reported that negative attitudes towards change among healthcare professionals were hindering the implementation of digital services. This further complicates the relationship between the implementation team and the healthcare professionals. Still, their concerns are valid. Previously, they have had negative experiences involving additional administrative tasks following implementation. They are worried about an increased workload and changes to their relationships with patients. Even well-prepared implementation projects can be affected by this. Although interviewees mentioned some strategies to ease this problem, such as strategic stakeholder engagement and seeking ongoing feedback from healthcare professionals, it continues to be an issue. This led to the following problem statement:

Healthcare professionals are reluctant to digital health services implementation due to concerns about increased administrative workloads and changes to their relationships with patients.

The literature review established that service mapping can support collaborative problem-solving and make ideas more tangible. An implementation-focused service mapping tool can address this reluctance by making processes visible, clarifying roles and responsibilities, identifying workload implications early, and enabling professionals to actively shape the future workflow, thereby reducing uncertainty and building ownership in the change process.

4 Concept development

4.1 Chapter outline

Based on the initial problem statement, a design direction was selected. Insights from previous chapters were used to define the target audience, users, a first-time use scenario, and to identify key visual elements. Before outlining the ideation phase, usability considerations and constraints were defined. During the ideation phase, potential features of the tool were explored, with special focus given to the mapping component.

4.2 Design directions

Strategies to improve healthcare professionals doubts about new digital services were improved communication, improved collaboration and shared system understanding. Although these aspects are interconnected, a specific design direction was chosen for each of them:

Focus	Direction
Communication	Empower healthcare professionals to align their needs with newly implemented digital health services by equipping them with a service mapping tool.
Collaboration	Support the implementation team and future service users in shaping and understanding their evolving roles during digital health service implementation by equipping them with a service mapping tool.
Shared system understanding	Enable the identification of interactions between relevant stakeholders with new digital health services by equipping them with a service mapping tool.

Table 6. Possible design directions.

The ability to visualise exactly how tasks and responsibilities will change with implementation makes it possible to understand and reassign responsibilities, discuss concerns and clarify the impact of the new service on each stakeholder‘s role. This provides the basis for interactions and interdependencies, focusing on the healthcare professional‘s self-efficacy and highlighting their competencies and opportunities to develop their digital capabilities. That is why the second direction was chosen:

Support healthcare professionals, as future service users, in shaping and understanding their evolving roles during digital health service implementation by equipping them with a service mapping tool.

4.3 Definitions

Going into ideation, several aspects needed to be defined to make more deliberate design decisions and clarify how the tool can add value for whom.

4.3.1 Target audience and facilitators

The interviews revealed that implementation managers are primarily responsible for overseeing the implementation process and engaging with future users of the service, as well as other relevant stakeholders. Consequently, larger, more project-specific user groups have emerged. Ultimately, however, the implementation team is responsible for making key decisions, such as when to engage stakeholders and which tools to use. Implementation managers have less mentally and physically demanding workdays than healthcare professionals. This makes it easier for them to familiarise themselves with the tool. Therefore, it makes sense to initially select a ‚tool owner‘ from the implementation team based on their previous experience with visualisation, who can initiate the use of the tool and demonstrate it to others.

The tool‘s owner is responsible for arranging meetings with relevant members of the implementation team, including legal experts and future service users such as clinicians, nurses, and remote monitoring teams. Interviews indicated that the main issue with mapping was understanding how different platforms function. Becoming well versed in Lucidchart may be sufficient to enable someone to fulfil this role. However, ideally, this person would also have a designer‘s mindset and be comfortable with uncertainty and continuous iteration.

4.3.2 Users

The primary users of the tool are healthcare professionals involved in implementing digital health services, including clinicians and nurses. These users have practical knowledge of care delivery and are directly affected by changes introduced through digital solutions. Their involvement is essential in aligning service design with real-world workflows and ensuring that new services enhance, rather than disrupt, patient care. The tool supports these professionals by clarifying roles and responsibilities, encouraging early engagement and enabling active contribution to the introduction of new services into daily practice.

The additional users depend heavily on the service implemented. For example, it could be support staff operating in the background, such as data monitoring teams or IT teams providing technical support. Their workflows support healthcare professionals or patients, meaning their interactions change or start when a new service is introduced.

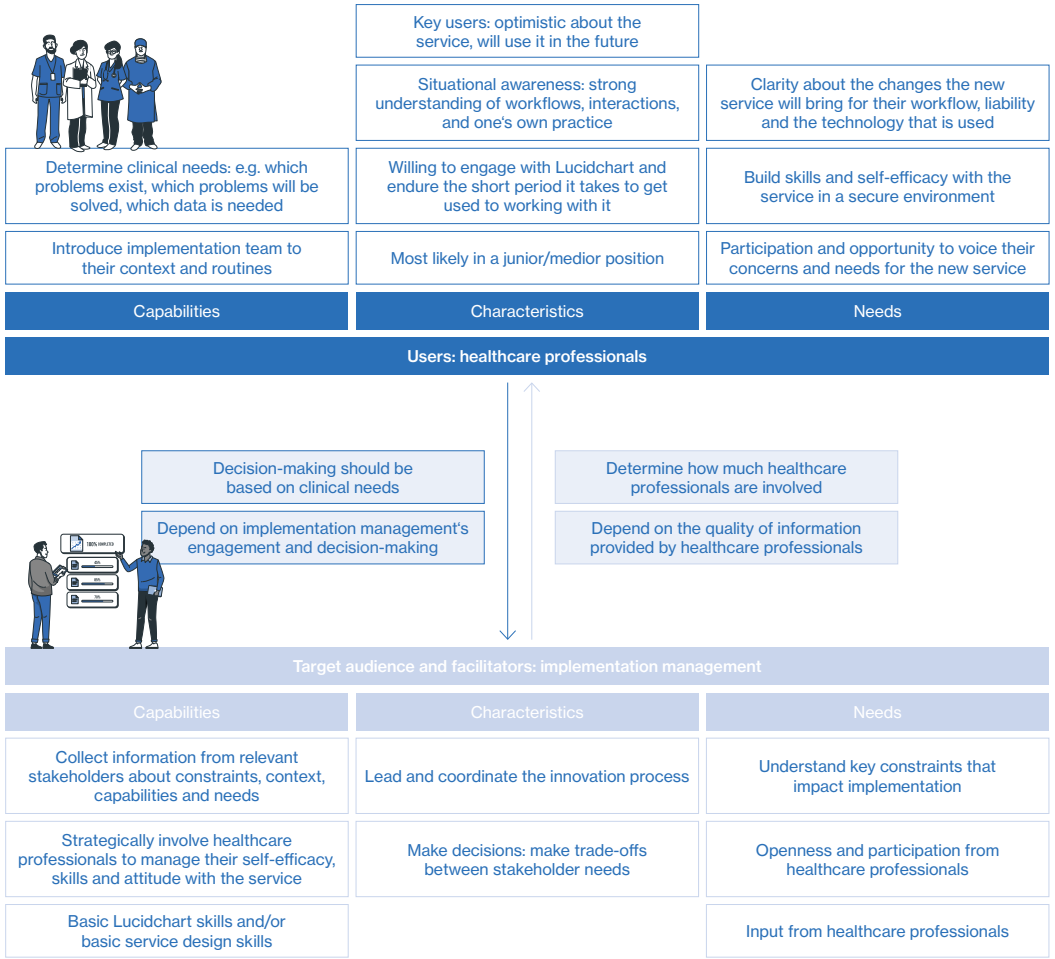


Figure 22. Target audience and user definitions.

4.3.3 Tool elements

These elements were defined based on the key criteria found in the literature review and context and service elements from user research:

Visual elements	Relevance
Prepare service mapping	The implementation team needs to be aligned on what the service is and who will use it before engaging future service users. Concerns future users have about their future tasks with the new tool can impact the division of responsibilities. This element facilitates engagement with the future users of the service and alignment on which goals they want to achieve with the new service. This aims to bridge the gap between healthcare professionals, IT and implementation teams, so they can work together more effectively.
Communicate usefulness	Briefly explains the purpose of every section so that teams know what they are investing time in and why.
Service mapping	
Instructions	Written instructions cover the platform's functionalities while explaining what needs to be done to build the map.
Service elements	The service elements need to be represented across the components of the tool. The example of ‚The Box' shows how diverse these components can be. There are software and hardware components, new and existing. There are organisational processes with a remote monitoring and logistic infrastructure, as well as communication processes and human interactions. Additionally, data exchanges must be carefully analysed to ensure compliance with data privacy law, and to understand who has access to which information, which systems work together and what that means for interoperability.
Workflow analysis (current)	The current workflow must be analysed in order to identify and any shortcomings that could be resolved or would be enhanced by the new service. Visualising current tasks provides a basis for the future workflow and shows stakeholders how their tasks are connected. Based on those tasks, current responsibilities can be defined.
Workflow analysis (future)	Building the new workflow iteratively allows healthcare professionals to envision their ideal way of working, while taking into account the constraints that the new technology will impose. They can discuss how responsibilities will change, disappear or how they will be reassigned.
Tasks and responsibilities	Issues such as uncertainties in the workflow result in tasks that need to be organised by the implementation team.
Debrief service mapping	After mapping, summaries and conclusions give a structured ending and a final opportunity to discuss changes in responsibilities.

Table 7. The tool's defined elements.

To keep the service map as simple as possible, not all necessary features could be integrated into it. Nevertheless, these elements are still related to the service map, as they aim to set priorities for service implementation and facilitate reflection on these priorities.

4.3.4 Usability factors

In addition to the basic usability factors of learnability, efficiency, memorability, error-resistance and user satisfaction (Nielsen, 2012), more specific factors were identified from the context analysis:

Factor	Explanation
Familiarity	Jun et al. (2010) found that becoming familiar with a method had a positive impact on usability. This affects which mapping method is used, but also suggests teaching to use the service map by using the same recurring visual elements leading up to the service mapping component would be beneficial.
Balance simplicity and complexity	Workflows can become complex and long, especially for the untrained eye. Visual design can help in being able to focus on specific sections or a simplified version of the workflow.
Flexibility	This means users can take small steps that can easily be divided into larger or smaller mapping sessions. This gives them more flexibility over how much time they allocate to the tool in one session, adjusted to healthcare professional's schedule.

Table 8. Additional usability factors.

4.3.5 Constraints

First, platform functionalities can restrict usability, affecting how users interact with the system and how much can be iterated. It is important to consider that both the platform and the mapping process will be new to most users. The initial learning curve may slow progress and impact users opinion on the tool, but efficiency is expected to improve with experience. To support this, selecting enthusiastic users who are more resilient can help with engagement and patience. Financial constraints also play a role, as effective collaboration requires multiple user licences, representing a financial investment. However, as discussed in the literature review, this is a predictable investment as long as prices are transparent, and easier to justify.

Lastly, stakeholder availability impacts timelines. Regular input and timely decisions are crucial, but often difficult to secure. To address this, the mapping process should be structured in small, flexible steps, with guidance on how and when to involve the right stakeholders.

4.4 Ideation

For ideation, techniques such as the morphological chart were used to brainstorm potential solutions to factors like stakeholder engagement, encorporating regulations and usability. Inspiration was found mostly in Miro or Mural workshop templates on topics like stakeholder alignment, roles and responsibilities or mapping methods. Another activity was to become familiar with Lucidchart's features and functionalities.

4.4.1 Tool components

The ideation on tool components explored different ways of engaging stakeholders, improving collaboration and visualising roles and service elements based on the identified visual elements and usability factors.

4.4.2 Service mapping

The initial literature review clearly showed that the service blueprint and swim lane diagram could be adapted to assist with service mapping for implementation purposes. Due to the numerous factors identified that demonstrate context and complexity, the focus shifted towards modifying the service blueprint to align with the healthcare sector and ensure clarity. This involved activities such as creating different types of building blocks, different combinations of lanes and stakeholders distribution.

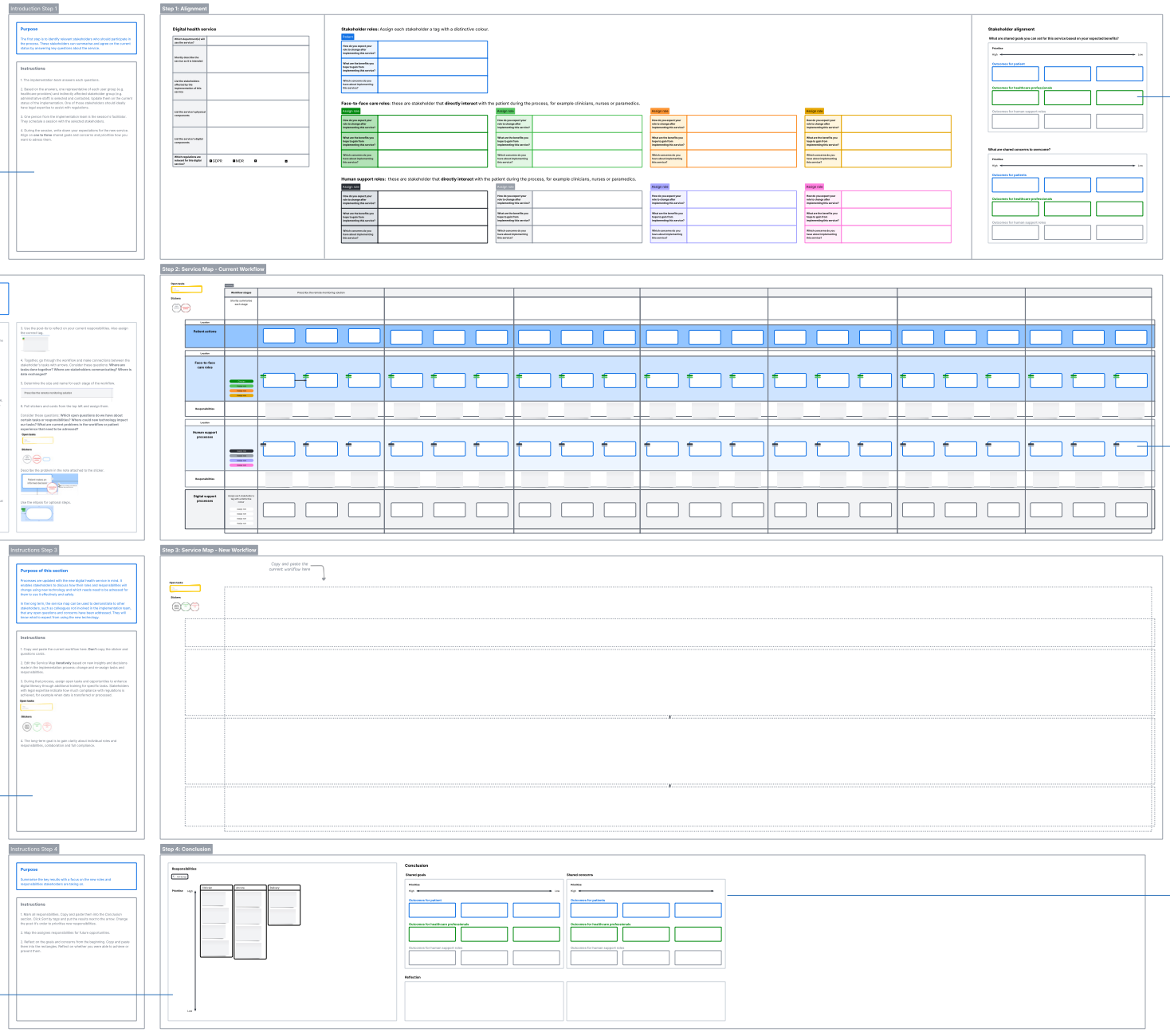
4.4.3 First-time use scenario

The tool's owner will guide the other members of the implementation team, as well as the future service users, through the tool, providing instructions and support. Initially, stakeholders will be asked to discuss their expectations and agree on goals for the implementation's outcomes.

When it comes to mapping, different service users should map their workflow individually before drawing connections and defining workflow stages. Responsibilities are defined based on tasks in the workflow. This scenario was further defined as the tool was developed and iterated. Once users have gained more experience, they can rely on their experience or the written instructions.

After defining a new workflow collaboratively, the responsibilities of each future service user are summarised to create their new role. Finally, stakeholders reflect on the initial goals.

The implementation team is asked to define the service components and identify which stakeholders need to be engaged.



Engage future service users: pick one representative (‚local champion') for each user group, such as patients, clinicians or IT professionals. Discuss their expectations and align on shared goals.

Map the current workflow. Use cards and drag-and-drop stickers to identify the tasks and issues that must be addressed prior to implementation. Define which service component will impact each task. Based on their tasks, allocate responsibilities to service users. Define stages to be able to focus on smaller sections of the map.

Copy and paste the current workflow to iteratively define the new workflow. Use stickers to define where digital skill training will be needed and the compliance of data flows.

Summarise and prioritise responsibilities by service user group.

Reflect on set goals.

Figure 23. Final concept before user testing in Lucidchart.

4.5 Discussion

The ideation process raised some anticipated issues, such as the need to balance clarity and complexity. Despite the platform being carefully chosen, its limitations became apparent, for example, that certain time-saving features were only accessible with a certain licence.

Defining the use scenario was somewhat difficult as this also depended on how the individual tool components would evolve. However, each component had instructions to guide users through the tool. It was also difficult to determine how many components were too many and which components would work best where. The research brought up a variety of important factors, but not all of these could be included in the service map as it would become overloaded and too complex. For example, the data flow was now defined by stakeholder actions to speed up the process but carried the risk of losing those details in the map, even with a compliance sticker.

4.5.1 Conclusion

As access to the ideation file was lost, decisions about the level of detail and the visual structure had to be made quickly when recreating a testable file. Although this was frustrating, it helped to make quicker decisions and start testing the tool at an early stage. I therefore expected that the first few tests would require many changes.

5 Concept evaluation

5.1 Chapter outline

During the evaluation of the concept, the tool was tested with potential future users to gain insight into its usefulness and iterate the design of the tool. Finally, the concept was evaluated in theory, re-evaluating its desirability, viability and feasibility, as well as testing it against the characteristics of effective healthcare toolkits.

5.2 User testing

User testing is vital to make sure that the tool is aligned with real-world needs and to evaluate the value future users see in the the tool. The process also increases the likelihood of adopting a tool into practice, as potential future users are directly included in the development of the tool.

5.2.1 Objectives

The goal was that, by the time of the final test, every component of the tool would have been tested. There was a focus on testing service mapping, as it is the most complex component. However, it was necessary to be intentional about what each participant was asked to test because the tool grew in components based on the user‘s feedback.

The main objective was to gain insights into the usability and usefulness of the tool. For usability, it was important to understand whether healthcare professionals would be able to use the tool and especially building a service map using verbal instructions, thereby mimicking the experience of a first-time user. For usefulness, it was important to learn how relevant or redundant participants would find which components and whether they would find the tool useful for their implementation efforts.

5.2.2 Process

To prepare for the user tests, each participant was given a explanation about the tool and what they could expect from the test. When they had to test the service mapping component, they received a suggestion about which short process they could map based on the digital health service they were implementing or had previously implemented. The user tests were set up based on the number of participants and the test‘s focus. Each session started with leading the participants through the components of the tool, explaining how it is used, who is using it and what the purpose of each component is. An example for the service mapping was a current and future process from the Box, which most participants were also working on. Then, they were asked to complete an activity based on verbal instructions to mimic the use scenario of someone using the tool for the first time. They were guided through the activity and were asked questions for evaluation and feedback. All tests except for test 3 focused on evaluating usability with individual participants. Test 3 focused on usefulness with multiple participants.

After each test, the transcript was analysed to collect the main insights. Also taking into account feedback from the client and the supervisory team, iterations were made before the next user test.

Test	Participants	Service mapping experience	Focus of the test
1	Interaction designer (with knowledge of implementation context)	High	Service mapping
2	Implementation manager with healthcare background	None	Service mapping
3	Healthcare professional with implementation responsibilities	None	Stakeholder engagement Technology evaluation
	Assistant professor for digital health		
	Assistant professor for design, health systems	High	
	Design researcher in digital health	High	
	Design researcher in digital health	High	
4	Healthcare professional with implementation responsibilities	None	Stakeholder engagement Service mapping
5	Operation/IT management professional	None, but experience with Lucidchart	Relevance and usefulness
6	Healthcare professional and digital health project manager	None	Relevance and usefulness

Table 9. User test participants.

5.3 Iterative improvements

The first test was conducted based on the concept presented in the previous chapter.

5.3.1 Test 1: Involving ‚key users' in implementation projects

This test was set up based on the participant's previous experience of implementing service design and their expertise as an interaction designer, to understand another designer's perspective on the tool's usability. The objective was to receive feedback on their experience of using the service mapping component and discuss potential solutions to existing issues.

After the introduction, they reported feeling overwhelmed by the amount of information and how close the components were together. When mapping, they had multiple steps in the service that were optional, so not strictly necessary but added value. These needed to be visually different from the regular boxes. They quickly picked up the Lucidchart functionalities due to previous mapping experiences but reported some usability issues. They preferred setting their own boxes rather than using pre-set boxes but thought that they might help people without mapping experience. The stickers were easy to forget in the corner. The pre-set workflow stages might confuse unexperienced users, as it could indicate that only three actions can be in one stage. Their also suggested to let healthcare professionals prepare their workflow analysis before the mapping, so it would not have to be thought of spontaneously.

Client feedback was received on this version before iteration. The main criticism was that the tool focused solely on the roles and responsibilities of future service users, not yet representing the implementation team. It would also be beneficial to section the tasks done by the implementation team and outside sources, such as IT providers.

Iterations

The introduction needs to stress that not all components are done in one session. Smaller steps and more space between components could help with moving step-by-step through the tool. A recognisable shape needs to be determined for optional steps. The pre-set boxes were kept, The stickers need to stay visible throughout the mapping process as much as possible, which means they were moved from the corner to the top of the map. Also, the instructions clarify that the section with the stickers can be moved as the users work thorugh their workflow. The components were sectioned into smaller steps with more margin. For the implementation team a section needs to be added with space to identify and divide roles and responsibilities taken on by them and team members outside the hospital.

5.3.2 Test 2: The Box (Health Box)

This implementation manager with a healthcare background is part of the Health Box team. They have no previous experience with service mapping. The objective was to receive feedback on their experience with the service mapping component.

After explaining the tool to the participant, they requested more guidance on the order of components. They felt that there were many steps before the service mapping starts and lots of information to take in when the entire tool was explained to them. They reported that they felt overwhelmed by all the elements of the service map. They found it hard to orient themselves and knowing where to start. The pre-set boxes contributed to that impression, they were not immediately sure which boxes to use. They would have preferred to add the boxes by dragging-and-dropping, just like the cards and stickers.

Before iterating, client feedback was received for this version. To prepare for different contexts, it would be valuable to see what is a fixed action (such as: it will always be a doctor who prescribes medication) and what is a flexible action that will be context-dependent. It would also be good to see what needs to be changed about digital components and who will take care of it.

Iterations

The components should be split up further, with clearer instructions on what to do and in what order. The pre-set boxes caused more confusion than help when getting started. However, the next iteration should ensure that users do not have to start from scratch and strike a balance between providing instructions and giving users the freedom to make decisions. The chosen solution here was to pre-set a few boxes and add a drag-and-drop option. Since the example workflow shown during the tool's introduction was well received, an example workflow has also been added to the instructions.

The service mapping could benefit from fewer visual elements at the beginning, which is why a layered approach was chosen to gradually introduce the workflow stages and responsibility post-its. This approach also makes the mapping more flexible, as it can be completed in multiple sessions. Fixed and flexible actions should be visually represented, so it will be clear what to change when entering a new context, such as a new hospital. That is why a step was added that asked users to identify fixed actions and changing their outline's colour. A section to evaluate responsibilities for digital components was added.

5.3.3 Test 3: The Box and the Regional Diabetes Box

This workshop was attended online by a healthcare professional with implementation responsibilities, an assistant professor who specialises in eHealth, an assistant professor, my mentor and client mentor. This test focused on the components that lead up to the service mapping, especially on the new technology evaluation component. The objective was to understand if the right level of detail was used to cover this key

topic. Also, the aim was to understand the participants‘ opinions on the tool‘s usefulness for their implementation efforts.

Analysis
Right at the beginning, asking the healthcare professionals to set goals resulted in relatively non-specific goals, which would be difficult to evaluate at the end. Additionally, the participant was missing space for specifying the problem that would be solved and the measures for success, like key performance indicators.

The participants emphasised the importance of addressing key questions about the new software and hardware technologies that had only been partially addressed in this case of the Box so far. The responses to existing questions (e.g. ‚What changes need to be made to existing systems?‘) and the participants‘ suggestions showed that more specific questions were necessary, providing insight into which additional questions were required to evaluate new and existing technology more thoroughly. In particular, the data flow required a simplified, summarised representation outside the service map, including details such as who is monitoring data and how frequently it is transferred.

Participants did not notice any redundant features and were positive about the value the tool can add. They appreciated how the tool determines a structured process that allowed users to address important questions in small steps. *“It‘s really nice that it kind of helps to spark a discussion about certain elements that you need to organize and that you can set it a little bit or at least draw outlines of the things that need to be there. […] It helps you to sketch this overall strategy of implementing. It provides structure.”*

“It forces you to think of the elements of the whole change process procedure. It will focus people‘s minds on actual subjects rather than being afraid to delve deep into it, and I think your tool allows someone to think of the individual nuggets.”

Iterations
The goal setting needed to be moved, so it would be done at the very beginning of the project, including service users early on. I decided against KPIs and for a method that I recently learned during a seminar called “Why innovation fails”. Unlike KPIs, the objective and key results framework is less performance-based but rather enables users to create an actionable strategy for their project with long-term goals. Objectives should be set to encourage users to work towards a shared vision and can guide the long process of implementation (Hughes, 2024). The results should be measurable, aligning with the feedback and the scientific nature of healthcare by allowing teams to quantify their project evaluation. The component on technology integration was expanded, covering aspects on physical elements, new and existing digital systems that came up during the test.

5.3.4 Test 4: Electronic Health Record (Medication Module)
This healthcare professional supports implementation as a ‚local champion‘. The objective was to receive feedback on their experience with the updated stakeholder engagement component and the service mapping component.

Analysis
We had to reschedule this test due to technological issues, but I had already explained all components in the first meeting. Upon starting, the participant reflected on a recent experience that made them think of the tool: *“I‘m responsible for setting up a medication list for an implementation project. I was in a meeting this week and they never asked me about my progress with the list and I did not bring it up. I‘m not sure they know I‘m responsible for it.”* This illustrated to them the importance of making tasks and responsibilities visible to everyone on the project team.

They were positive about the fact that they could list all members of the implementation team at the start of the Summary component. When testing the Stakeholder Engagement component, the participant filled in the questionnaire. They answered with their positive expectations about the service when being asked about how their way of working will change. They had no issues identifying the steps they were taking in the process before implementation and set a scope.

The participant stated that neither the software providers nor the hospital group had asked them or their colleagues about their expectations, concerns or objectives prior to implementation. There was no evaluation afterwards, either. Nevertheless, the participant thought this would have been valuable. They selected measurable results based on what they thought would be easy for healthcare professionals to evaluate during ‚key user meetings‘, as well as claims made by the IT provider (e.g. fewer clicks than before). This demonstrates how the tool can contribute to an implementation process in which hospital staff have less control over the impact of new digital health services on their routines, by holding the IT provider or the hospital group accountable for the promised outcomes.

During the workflow mapping process, it became clear that the main difficulty was in learning the platform functionalities, such as knowing how to draw arrows and when to double-click. Even though the functionalities were explained initially, it was more effective to explain them as the participant was filling in the first boxes. They explained the steps out loud and seemed sure about where to place which step, what to connect and even added descriptions on the arrows on their own initiative. The participant seemed more comfortable and also reported more comfort towards the end of the test. However, initially they needed some nudging towards writing, changing the tags to indicate who is doing a certain action and towards using the stickers. They said the amount of stickers felt overwhelming put liked being able to specifically highlight

actions that cause issues and use the notes feature on the stickers to add information that will inform the future workflow. They also had some ideas for additional stickers, such as highlighting where documents that are currently still paper-based can be digitalised.

It helped the participant to think out loud and check their approach to mapping with me. This demonstrated the importance of working in teams and with someone familiar with the Lucidchart platform functionalities when using the tool for the first time. Although instructions with pictures are helpful, they cannot replace the value of live support, which also speeds up the process.

Finally, the participant was asked about what they would use the tool for if they had it available to them tomorrow: *"I would use it for optimising current processes. And for the next software implementation."* This suggested that, although the service mapping components were optimised for implementation, they were also relevant for other use cases, such as general process improvement.

Iterations
The questionnaire will be revised on content and space given to the answers. Rather than asking users to set the scope of the service map based on objectives and results, it would be beneficial to provide them with some examples to choose from. Also, this question makes more sense to clear up shortly before starting the service map. It is generally a priority to consider where examples could be valuable additions, since they have been extremely helpful in explaining what a service map is and what it could look like. It might also be helpful to recommend picking a short demo workflow so healthcare professionals can practise and there is space to explain something a second time. The stickers need to be better categorised and sectioned so they look less overwhelming.

5.3.5 Test 5: The Box
This participant is a project manager for Box, specialising in operations and IT. The main focus of this test was to identify any potential obstacles to using the tool and the expected benefits, in order to understand its relevance for practical use.

Analysis
First, the participant was asked about potential obstacles to integrating the tool into their daily practice. They stated that, in order to make the best use of the tool, it will be necessary to have a clear understanding of the project and how it will address the questions posed by the tool. However, this information is not always there at the beginning of the project and will evolve over time. This means that, although the tool is set up in linear sections, these may not be followed in that way and may instead have to be used more iteratively. The participant also saw this as an advantage of the tool over more static project plans. They expect it to enable more dynamic project management, which complements the agile working methods used in IT management and software development.

This is also how they envision using the tool. They would meet with the entire project team, particularly the IT team, to complete as much as possible during a workshop. Using the first sections of the tool, they would record everything that needs to be determined at the beginning of a project. Then, they would iterate the data based on new insights and decisions made for the project.

The participant sees the main benefit of the tool in connecting aspects that usually need to be updated in multiple documents, such as stakeholder roles and risk assessment: *"I have so many documents, it's really hard to keep them all updated and, there is so much administration. So, I think this tool will help to limit the administration for project managers because it's all in there and it's dynamic."* The Stakeholder Engagement section is most valuable. They have previously struggled to engage healthcare professionals because they are often unenthusiastic about discussing IT-related issues. Without their input, however, the project's success would be at risk: *"If you really do a good stakeholder engagement, then the project will most likely succeed. (...) Because if somebody is not hooked from the first time, then it's really difficult to put IT on the map (...) because care professionals, they don't care. They just need to give healthcare and not be busy with IT solutions."* It is therefore beneficial to involve healthcare professionals at an early stage of the project, so that they can discuss their desired outcomes, rather than waiting until the implementation team needs their expertise.

The participant suggested that establishing a link with project planning would improve the tool, as this helped them to see the connection between development and implementation. As project manager, keeping track of deadlines was one of their key tasks. At present, Lucid Cards document open tasks and questions in the tool. It is possible to assign responsible people, deadlines and the progress status. However, no more specific project planning tools, such as Gantt charts, are included in order to stay within the scope of clarifying roles and responsibilities.

Iterations
In response to the requirement for project planning to be integrated with the tool, the instructions were updated to highlight Lucidchart's capacity to integrate various project management applications, including Jira (for software development), Trello, and Google Sheets. Lucid cards can then be synchronised with some of these applications to improve organisation. This enables the tool to connect to the existing applications used in the project management process and integrate into the wider ecosystem of tools used during implementation.

5.3.6 Test 6: Prehospital triage

This participant is a healthcare professional in clinical research who also manages a digital health service project. They have previous experience of working with a designer and are familiar with the benefits of service mapping.

Analysis

The participant‘s project is currently half a year before implementation, which now has funding, a clear mission and goal, and the support of stakeholders. They would therefore envision to apply the tool to their project right before the implementation phase in order to benefit from the comprehensive overview of roles and responsibilities. The participant expressed interest in using the tool for the upcoming implementation of their digital health project with the help of a design student.

They identified the extensiveness of the tool as the main obstacle to using it. It would take time to understand everything, and someone would need to be willing to commit to diving into it. They felt that this would require someone working on implementation full time, which they are not. However, none of the sections were identified as obsolete and the participant suggested to include a financial evaluation. This suggestion was not pursued as it does not directly relate to the roles and responsibilities of healthcare professionals, and to not further extend the tool. Based on their experience, another barrier is that healthcare professionals do not interact with tools without clear instructions or if there are too many steps involved. This means that the tool owner must explain the step-by-step process thoroughly and accurately estimate how much they can ask healthcare professionals to do in one meeting. The tool should facilitate this by presenting instructions in the form of steps and sub-steps, which makes it easier to break an activity down into multiple sessions.

The main benefits they see in the tool are its ability to align processes, liability and technology, and to create an overview for all stakeholders: *“Who does what and how is it affecting the actual end players. And how is it affecting the management team, and how are those two interacting actually. And who is responsible for that interaction. Actually, it‘s a bit the whole overview.”*

This makes it possible to understand the effect of the service on its end users and the management team, how they interact, and who is responsible for that interaction. They find it beneficial to see others‘ responsibilities in order to understand who can be asked for information on a given topic. This shows that the core value proposition resonates with the participant. Even the simplest function of the tool, displaying how names, roles and responsibilities are connected, can benefit the implementation project.

The tool would also help to demonstrate to healthcare professionals that the implementation project is both professional and serious. Any new interactions resulting from the implementation of the service would not need to be explained; they could simply be showcased to demonstrate the changes and establish them among end users. Furthermore, the tool could be used to communicate the project‘s value and feasibility to external stakeholders, such as potential collaborators or health insurers. During accountability meetings with health insurers, the tool would allow the project team to demonstrate their awareness of potential risks and they can be overcome.

Iterations

As these tests progressed, the tool became increasingly elaborate, as this participant also pointed out. This made it time-consuming to explain during the tests and asked the participants to take in a lot of information in a short amount of time. Therefore, in addition to explaining the purpose of each section at the beginning of that section, a short summary of each section was added to the introductory text about the tool. This also addresses the dynamic use of the tool, giving teams a better overview and enabling them to start with what they already know. For example, they can decide who will take on which role in the implementation team. Ideally, however, the tool should be followed step by step, since the sections build on each other. For instance, knowing what the service will be should also influence who will be involved in the project.

5.4 Results

The tool focuses on the initial stages of implementation, prompting users to address key project-related considerations through specific activities. It is organised into 6 sections. Each section provides step-by-step instructions on what to do and how to use Lucidchart's features. Each activity begins with a short statement of purpose to clarify the value of doing the activity. There are two defined group that interact within the tool:

The implementation team is the group of people responsible for carrying out tasks and taking on responsibilities to ensure the implementation is successful.

Future service users are any stakeholders whose daily workflow and responsibilities will be impacted by the implementation. For example, clinicians who switch from in-person to video consultations.

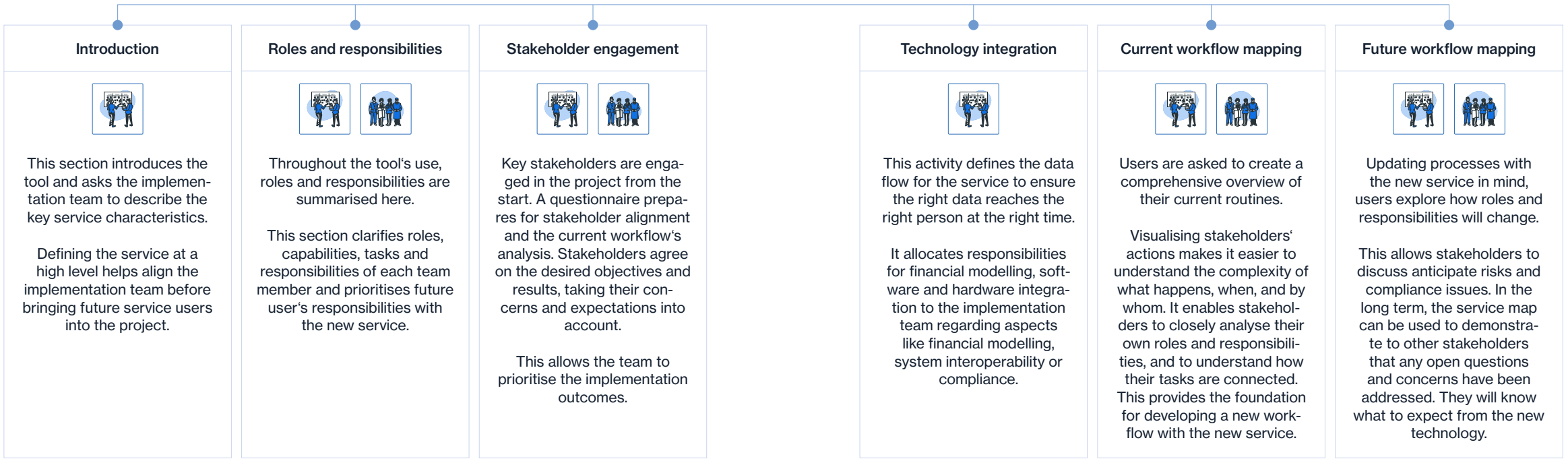
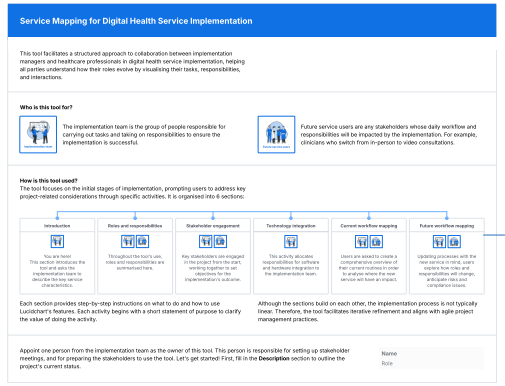
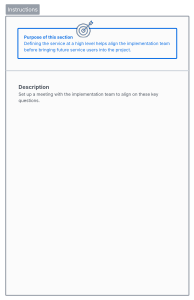


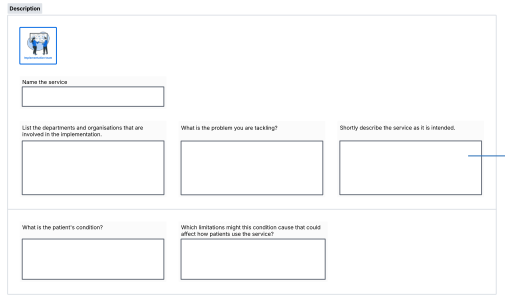
Figure 24. The tool's sections.

Introduction



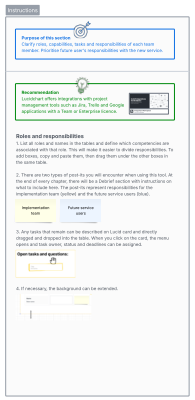
Tool introduction: clarify target group and purpose of each section

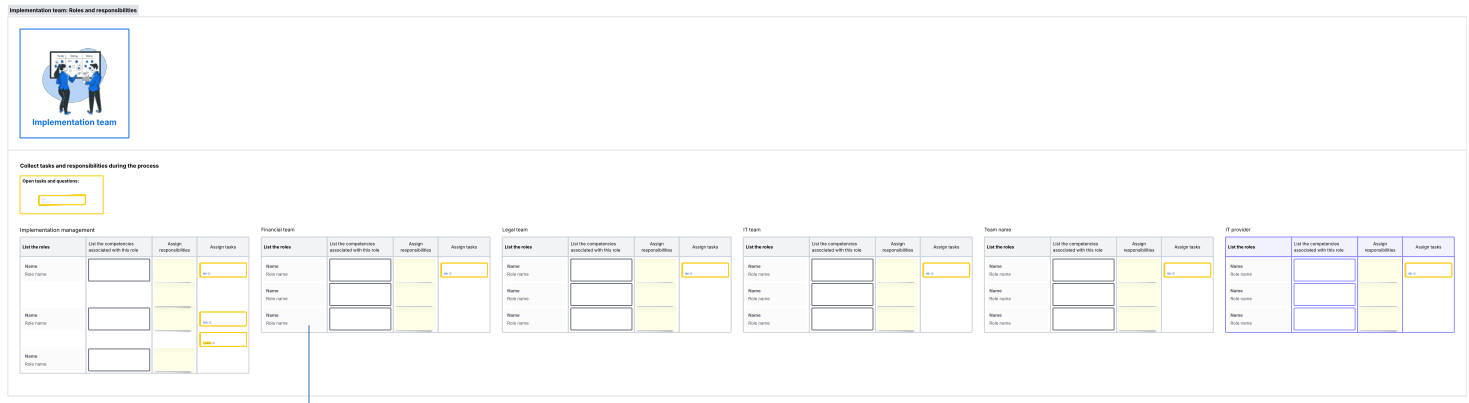




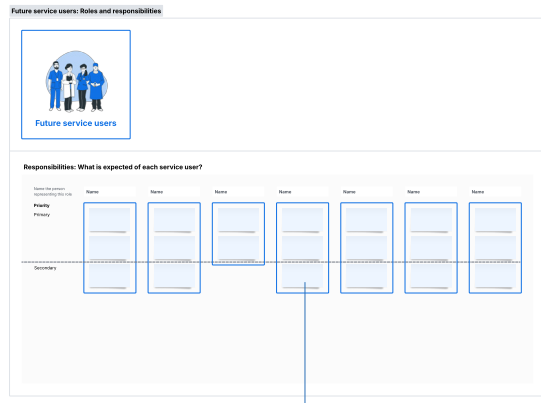
Define the service with key questions

Roles and responsibilities



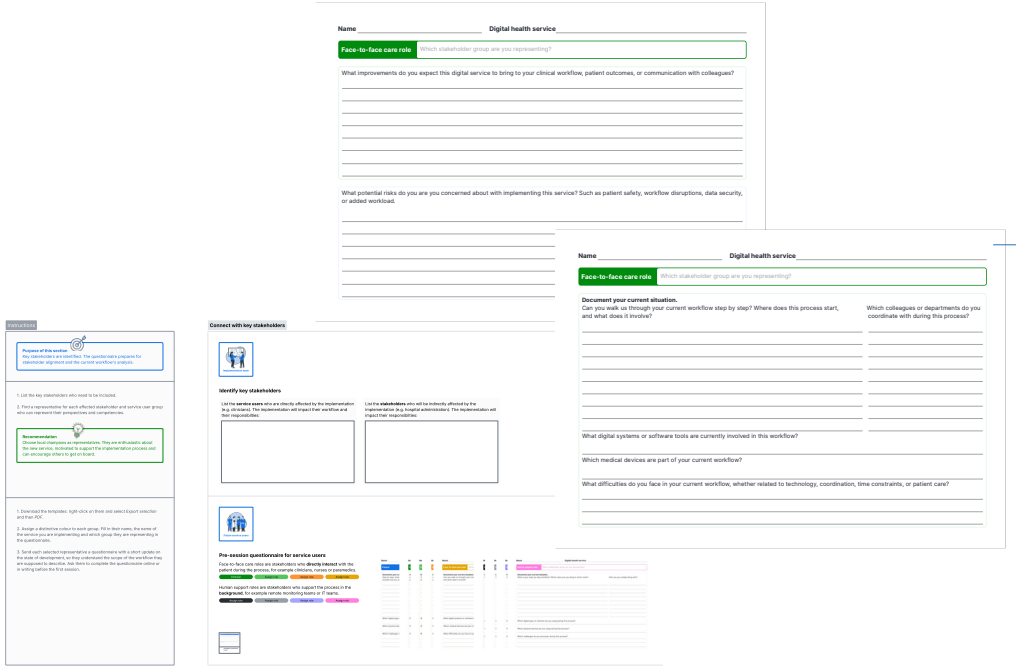


Roles are defined and assigned. This is where all responsibilities will be summarised



Priorities are set for future service users

Stakeholder engagement

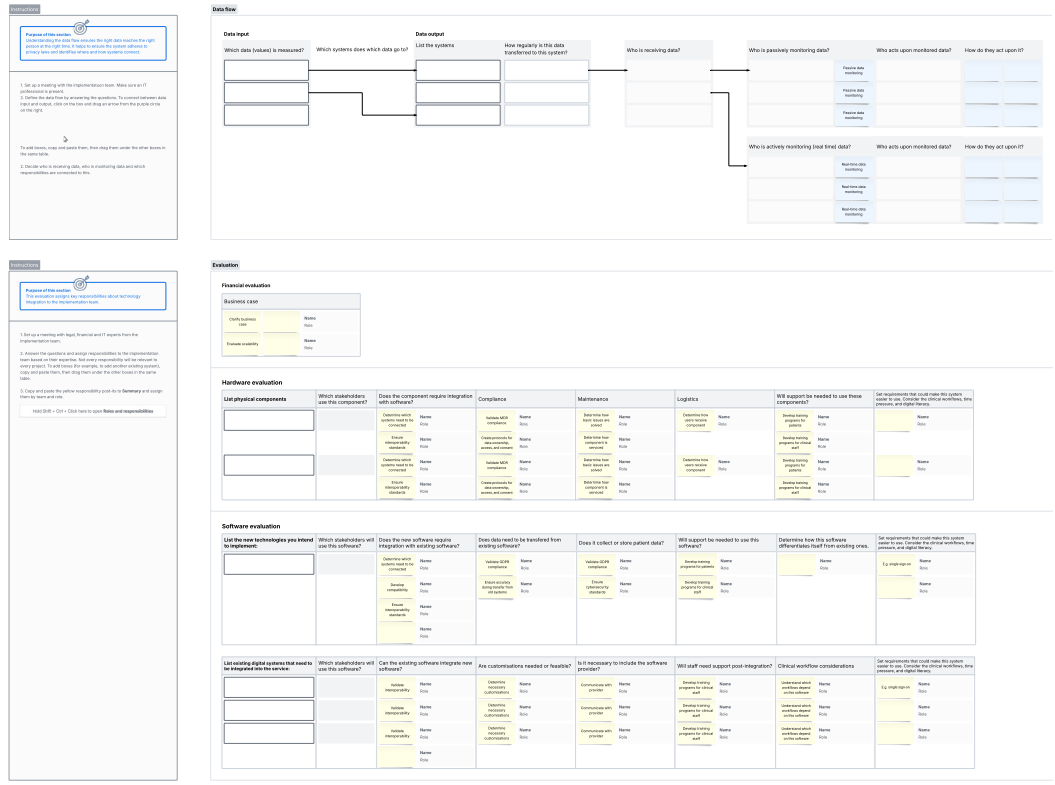


Service user questionnaire: define expectations and prepare the current workflow

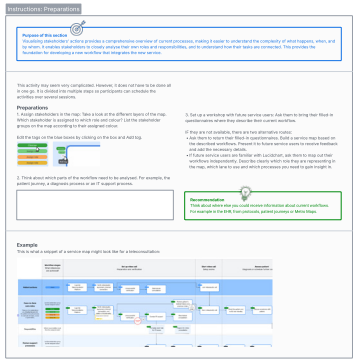
Set objectives together to prioritise outcomes for patients, healthcare professionals and any support staff

Technology integration

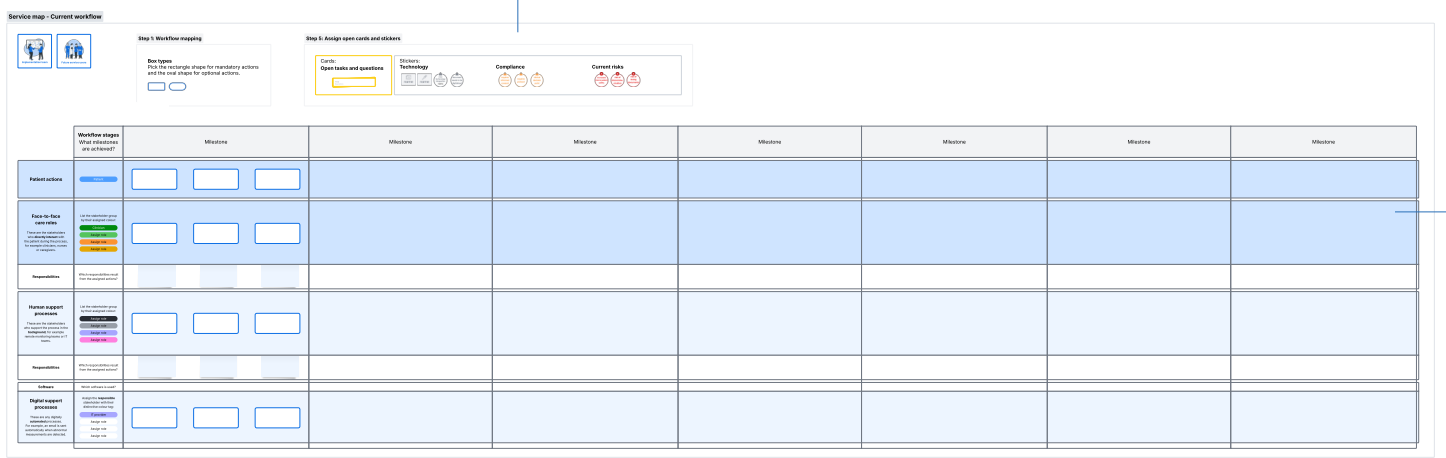
Technology evaluation determines the implementation team‘s responsibilities



Current workflow mapping

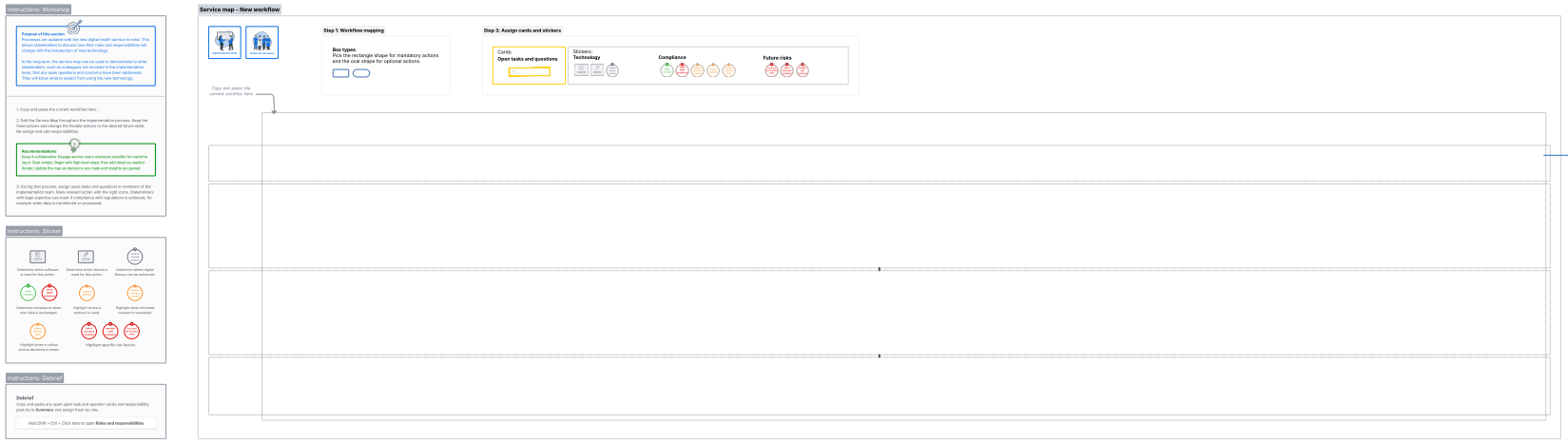


Specific actions that pose risks to safety or compliance can be highlighted



The map is build in layers. Actions are mapped first, then the work-flow stages are determined and responsibilties are assigned

Future workflow mapping



Copy and paste the current workflow and iteratively update it to represent the new workflow

Access the template in Lucidchart

Figure 25. Final iteration after Test 6. The components are divided on multiple pages.

5.5 Discussion

Throughout the evaluation process, several areas of discussion and opposing opinions emerged. A key challenge was finding the right balance between being concise and being specific. There was an ongoing dilemma: the tool needed to avoid overwhelming first-time users, yet also provide enough detail to be precise and useful. One example of this tension was the structure of the service map and whether to create swim lanes for each individual stakeholder or group them, as is currently the case. Despite these tensions, there were clear points of agreement, particularly around usability. The general architecture of the service map, how features like swim lane diagrams and drag-and-drop stickers worked well. It needed adjustment to create smaller steps and avoid information overload. The overall initial setup was positively received, but needed further expansion to include the implementation team, as their role definition also determined their collaboration with healthcare professionals.

There were some constraints during testing. Conducting one in-person test would have been beneficial in order to understand its impact on the dynamic between me, the facilitator, and the participant, as well as on their understanding of the tool. Also, during the workshop, participants were more reluctant to engage directly with the tool. This was different in the one-to-one tests, which may have been due to the existing dynamic between the healthcare professional and the designer. Typically, the designer uses online collaboration tools and asks the healthcare professional questions. While this dynamic worked well for the sections that were tested, it could be more challenging during mapping.

5.5.1 Conclusion

Overall, the changes to usability made after iterations were well received. From an early stage, participants could identify the tool‘s advantages and its potential to support their implementation projects. Ideally, the tool should be piloted with the involvement of a design student, as suggested in the final test, in order to refine it further and potentially overcome some of the weaknesses the tool presents.

Reflecting on the iteration process, I realise that I was too hesitant to add detail in the beginning. I had emphasised the importance of keeping it concise for beginners, not just for the tool‘s usability, but also for its adoption. Had I been more specific earlier, the tool would have been able to represent contextual details more effectively from the start. At the same time, factors such as supporting stakeholder collaboration and compliance, which were considered from the beginning, were found to be as relevant as anticipated.

Figure 26. The tool in use.

6 Adoption strategy

6.1 Chapter outline

Building on insights identified in earlier chapters, a strategy was developed to support the implementation of the service mapping tool in healthcare settings. Rogers (2003) was referenced to understand which factors can be leveraged for adopting innovations in practice. The characteristics of effective toolkits were employed to evaluate the tool‘s suitability for adoption. The value proposition design framework summarises the tool‘s benefits, as outlined in previous chapters. The analysis concludes with a TOWS matrix to generate ideas for interventions to address key barriers and opportunities. Finally, the proposed interventions are presented in the form of a roadmap to demonstrate how I would approach introducing this tool to the target audience.

6.2 Analysis

A key concept throughout this project is the importance of beginning with a small, enthusiastic team. The same principle applies to the adoption of this tool. The context analysis showed that healthcare professionals are more easily convinced by successful examples from other teams than by being the first to implement a service themselves. As it was not possible to test the tool throughout a full implementation process, this should be the first step. Rogers (2003) defines five types of adopter. The strategy should therefore target innovators (the team piloting the tool) first, in order to gain the trust and commitment of early adopters.

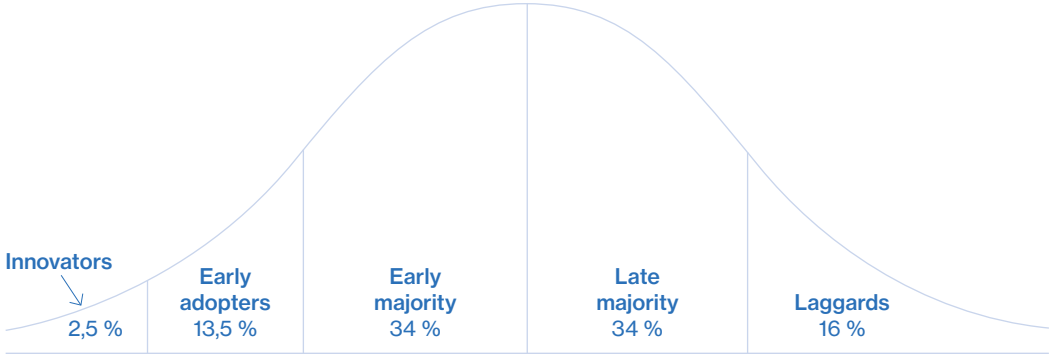


Figure 27. Adopter categorisation on the basis of innovativeness (Rogers, 2003).

The roadmap should cover the transition from the initial use of the tool in an innovator‘s implementation project to the attraction of the early majority.

6.2.1 Characteristics of effective toolkits

Davis et al. (2017) identified the characteristics that effective toolkits must possess to encourage healthcare organisations to incorporate them into their daily lives. They explore what clinic- and community-based stakeholders want from toolkits, and identify factors that facilitate their use in practice. By understanding whether the tool meets these criteria, I aimed to determine its suitability for adoption into practice:

Characteristics of effective toolkits	Evaluation
Specify the target audience	The target audience has been defined at the beginning of the tool‘s development in Chapter 4.3.
Tested and effective	The tool has been tested with potential users within the time constraints of this project. In order to achieve a definite evaluation of its effectiveness, the tool would need to be tested in implementation projects in different contexts throughout the project timeline.
Brevity with high functionality	During testing, one of the objectives was to determine which components were absolutely necessary in order to keep the tool as concise as possible. As the implementation process is complex, the tool still involves multiple sections, with functionality being prioritised. These sections are divided into small, step-by-step instructions to guide users. The tool is designed to enable implementation teams to arrange flexible sessions on different topics with relevant stakeholders. The length of each session can be determined based on the stakeholders‘ availability.
Multiple formats with easy to tailor tools	The tool is available in a single format online to facilitate a dynamic use. If necessary, the sections can be printed to present them to stakeholders. One of the healthcare professionals who tested the tool expressed interest in using the tool for general process improvement, suggesting that some of its components could be relevant for other use cases. The online format makes it easy to customise the tool to these use cases or to drastically different contexts.

Table 10. Characteristics of effective toolkits in healthcare.

Although the tool could be improved, this evaluation shows that it is effective overall based on the given criteria. Further testing is needed to confirm this. When each section of the tool was introduced, the perception was that it was extensive. The number of steps covered during one session depends on the person facilitating the activities, which can influence this perceived length for end users.

The adoption strategy should address this perception by providing solutions that could make it easier to gain an overview over the tool.

6.2.2 Value proposition

A key focus in adoption should be on communicating the value proposition. The value proposition design framework by Osterwalder et al. (2014) summarises the original intended value proposition and the additional benefits identified during testing and validation.

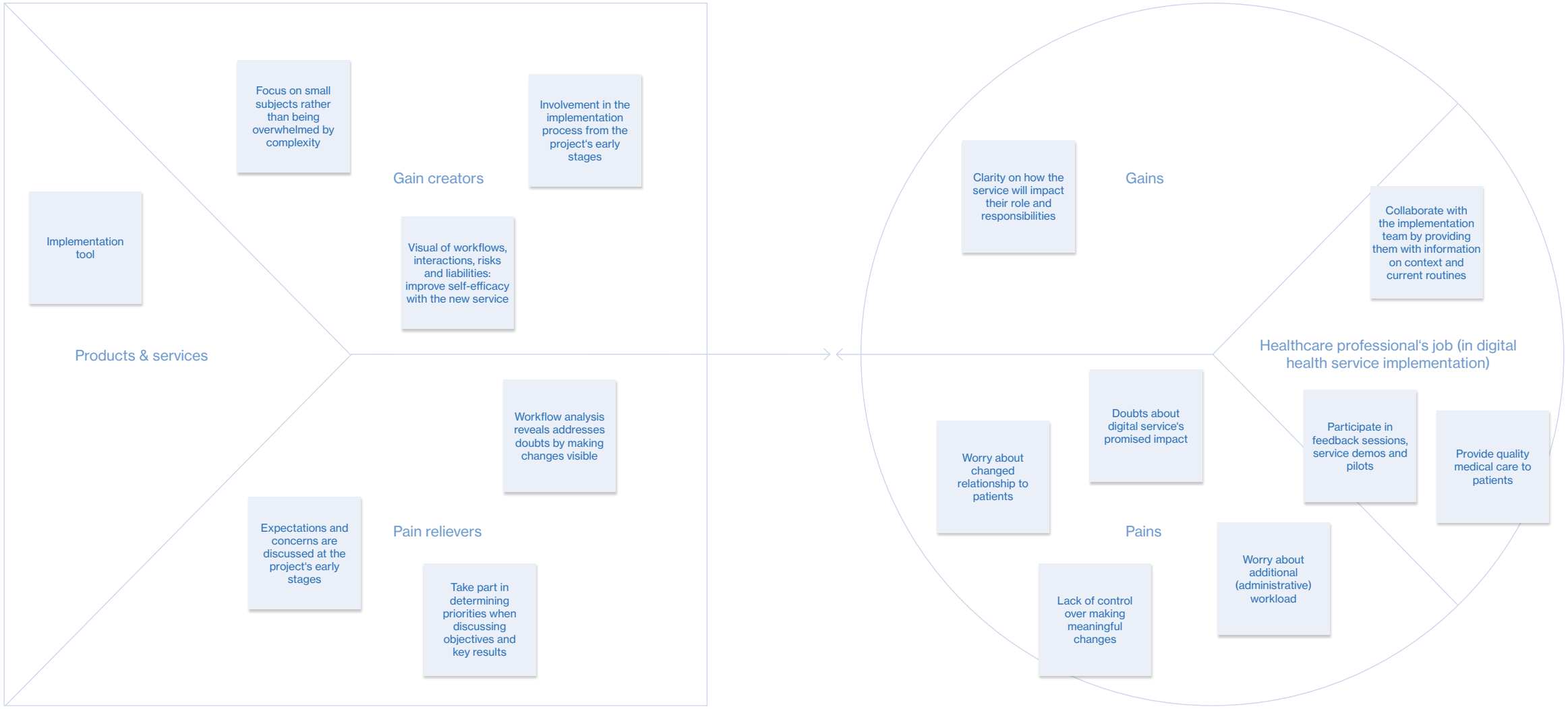


Figure 28. Value proposition canvas by Osterwalder et al. (2014).

6.2.3 TOWS analysis

Previously identified barriers and facilitators to adopting the tool were organised in a TOWS analysis to generate ideas.

The main barrier to the tool being adopted is a lack of awareness of its target group, coupled with its size, which may be intimidating for first-time users. Among my interviewees, awareness of service design was relatively high, but I don‘t expect this to be the case everywhere. Therefore, sharing short introductory videos that demonstrate the tool‘s value proposition and explain how it works could generate interest among the target group and provide an accessible entry point to the tool. Designers and healthcare professionals who are already familiar with the benefits of service mapping, use visualisation independently, or have received formal training in service mapping should be leveraged by contacting them directly as potential early adopters.

Once the pilot has provided more information, the expected time commitment and positive experiences can be shared with early adopters alongside the tool. Rather than trusting the target group will discover the tool themselves, it is better to connect with them directly, as this gives them the opportunity to ask further questions and ensures they receive all the relevant information needed to make an informed decision. An additional activity has already been implemented to overcome the lack of awareness: the tool has been given a name and tagline to make it more searchable and recognisable, and therefore easier to share with interested teams. The name is Navis, which comes from the Latin word for “ship,”, reflecting the tool‘s role in guiding stakeholders through the complexities of implementation.

In order to share the results, the pilot must be documented in detail and the measurable results must be determined in advance. These results could include factors such as the time spent coordinating responsibilities or satisfaction with the implementation process. However, further iterations may be required to optimise the tool, which would extend the time commitment necessary for its use beyond what is usually required. Therefore, support should be provided for early adopters as well, to gain more insight into the tool‘s impact.

	Strenghts	Weaknesses
	Clarifies roles and responsibilities, reducing uncertainty during implementation	Size of the tool can intimidate
	Facilitates collaboration between healthcare professionals and implementation teams	Requires initial and ongoing financial and human resources
	Connects future service user interactions, liabilities and risk assessments	Initial learning curve may deter adoption without adequate onboarding support
	Potential future users were involved in the tool‘s development	Context analysis may not apply to other regions (e.g. countries outside EU)
Opportunities	**Opportunity-strength strategies**	**Opportunity-weakness strategies**
Need for structured digital health implementation processes	Present the tool in staff meetings and flyers: find participants for a pilot	Communicate the necessary time commitment
User test participants can define expected benefits of the tool and are willing to test it	Partner with one implementation project to pilot the tool	Share experiences reviews and measurable results
Helps organisational learning: capture process insights to be reused and adapted	Create database with completed examples of the tool	Understand the long-term effects and necessary resources
Template is highly adaptable to technology advancements or other contexts	Update the tool for AI integration	Adapt the tool for current technology developments adn other contexts
Threats	**Threat-strength strategies**	**Threat-weakness strategies**
The target group must be made aware of the tool‘s existence	Get in touch with designers, innovation agencies working in the hospital environment	Role-specific demo videos that show only parts relevant to each stakeholder group
The way stakeholders meet is inconsistent, the use scenario may not fit every team	Share ‚train the trainer‘ scripts and facilitation tips	Make sure you continue to receive user feedback and iterate
Risk of low adoption if collaborative use is not prioritised by management	Share experiences reviews and measurable benefits	Give demos and practice sessions
Rigid processes and resistance to change		Support early adopters with check-ins

Figure 29. The TOWS matrix by Weihrich (1982).

6.3 Strategic roadmap

navis
Guiding healthcare teams through change

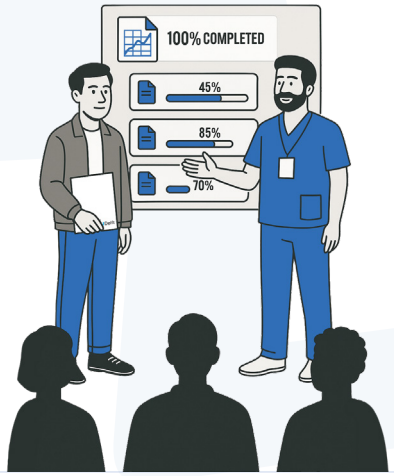
	HORIZON 1: 2025 Awareness and interest	HORIZON 2: 2026 First use and education	HORIZON 3: 2026 Champion activation	HORIZON 4: 2027 Scale and sustain
				
Objectives	Generate curiosity and initial understanding.	Provide safe, supported first experiences.	Strengthen leadership and validate the tool.	Expand use and integrate the tool into daily workflows.
Activities				
Design	Create short explainer videos focussing on the value proposition Create role-specific demo videos that show the parts relevant to each stakeholder group	Partner with one implementation project to pilot the tool Iterate based on feedback from the pilot team	Leverage advanced training offerings: give demos and practice sessions Support early adopters with check-ins	Update the tool for AI integration Create database with completed examples of the tool
Communication	Find participants for a pilot project: Present the tool in staff meetings, newsletters and flyers.	Create early adopters: Get in touch with designers and innovation agencies working in the hospital environment to share the videos and positive reviews of the first pilot	Share ‚train the trainer' scripts and facilitation tips Keep in touch with early adopters to understand long-term effects and necessary resources	Share case studies as stories of success: experiences and measurable results Communicate time and resource expectations based on early adopter's experience
Partnerships	Pilot team		Healthcare organisations Early adopters	

Figure 30. Adoption strategy.

6.4 Discussion

This strategy aims to overcome the practical barriers and complex organisational structures within the healthcare sector that could prevent the tool from being adopted. It is shaped by two opposing forces. While potential users may prefer clear data to commit to the tool, such data can only be generated once teams start using it. Furthermore, although the tool promises clarity for healthcare professionals, its effectiveness may be enhanced by further iterations, meaning the current state may not be as impactful as a future version. Fortunately, user tests have revealed potential interest in applying the tool to future implementation processes.

To encourage further adoption, a key activity will be engaging directly with stakeholders by making them aware of the tool, demonstrating how to use it, maintaining contact to provide ongoing support and gathering feedback on their experiences. This approach would enable any issues to be identified and resolved quickly. However, establishing and maintaining these connections with stakeholders would require significant resources to implement the roadmap.

Finally, creating the adoption strategy and reflecting on the value proposition for healthcare professionals highlighted that the use of the tool still depends heavily on implementation management and their willingness to include healthcare professionals in the relevant sections. User testing reinforced the decision to give implementation management ownership of the tool, as they are available to lead the process and require the insights it provides. This does not change the mutual dependency, but it does make collaboration easier, particularly when implementation managers want to involve healthcare professionals at an earlier stage.

6.4.1 Conclusion

Although communication, training and leadership support are vital for initial uptake, long-term sustainability depends on the adaptability of the tool, regular evaluation, and a supportive organisational culture. The interaction of these factors suggests that adoption is an ongoing process of embedding, refining and maintaining the tool within the healthcare ecosystem, not a one-time event.

7 Discussion and conclusion

7.1 Chapter outline

This chapter provides a final assessment of the value of the tool for its users, the limitations of this project, and the implications for future research and implementation practice.

7.2 Interpreting results

In order to assess whether this tool is now and in the long term relevant for implementation processes, it was evaluated on feasibility, desirability and viability.

Feasibility: Can it be done?

The main task of this project was to create a service mapping tool for implementation that would be fit for practical use. This was evaluated and refined during user testing, although with a small sample size. Therefore, the biggest threat to the tool‘s use is not its technical feasibility, but its organisational feasibility and how it can be integrated into the implementation process.

Testing the tool revealed that its iterative design aligns well with the beginning of implementation processes. However, it also highlighted the importance of collaborative use of the tool, which can be hindered by the demanding schedules of healthcare professionals, making it challenging to bring together future users. Another barrier is that engaging with the tool requires not only availability, but also some resilience from first-time users to overcome the initial learning curve with service mapping. User tests showed that providing verbal instructions when using the Service Map section for the first time improved understanding of mapping and the platform within minutes.

This was also demonstrated in the literature by Jun et al., as well as during some of the interviews. It requires users who are committed to the success of the service implementation. Therefore, the tool provides alternative routes use scenarios to implementation teams to improve feasibility and ensure they can experience the benefits of having a service map.

Desirability: Does it address the users’ values and needs?

The tool is designed to clarify the roles and responsibilities of the management team and future service users during implementation. This alleviates the uncertainties that cause healthcare professionals to doubt digitalisation initiatives. During the interviews and user tests, participants expressed an interest in using the tool and asked if it would be made available to them by the end of the project. This demonstrates that the concept of the tool was appealing even before seeing a prototype.

This remains the case with the current version of the tool. Participants recognised the benefits of the core value proposition of clarifying roles and responsibilities, as well as additional benefits, such as:

- Ensuring healthcare professionals‘ involvement from the beginning by including them in setting priorities.
- Supporting the implementation team in connecting to healthcare professionals with specific activities.
- Showcase the service‘s feasability to external stakeholders.

While this early interest and clear articulation of the expected benefits suggests a strong perception of value, barriers were identified. For example, the initial time required to become familiar with the tool was seen as a barrier.

Viability: Will it survive in the long term?

The tool addresses one of the many challenges faced by current implementation processes, thereby demonstrating its relevance to the current situation. For the long-term use of the tool, Chapter 6‘s adoption strategy highlights the importance of improving the tool iteratively through a pilot project, as well as raising awareness of its existence and communicating its benefits to the implementation process. The benefits of using the tool need to outweigh the financial investment in Lucidchart and the time users spend participating.

In the future, new technologies such as artificial intelligence will become more prevalent in digital health services, so the tool will need to be updated to stay relevant. Presumably, it would especially affect the Data Flow section by incorporating algorithms. Given that it already incorporates automated steps involving digital technology, it might not alter the Service Map section significantly. It would have to be established though, who is responsible for the output of AI models and AI-driven workflows.

7.3 Limitations

The development and evaluation of the tool was impacted by several limitations. Using an online collaboration platform for prototyping introduced usability constraints. While this helped with producing a functional prototype, it limited the options for ideating on different user interaction, despite the careful selection of the right platform.

Different types of digital health services were covered during the research for the tool to be universally applicable to implementation and ensure scalability. However, the focus was on custom-built services, such as ‚The Box', based on the assumption that the ability to manage complex services with the tool would facilitate the management of less complex implementations, such as off-the-shelf software. This focus could also suggest that the tool is more suitable for custom-built services.

The tool was not tested during a full implementation process. Piloting the tool could reveal further areas for improvement, enabling a definitive evaluation of its benefits and limitations, particularly with regard to its long-term value. Additionally, the size of the tool meant that it was not possible to test every activity with the same participants. To address this, the recruitment process selected specific stakeholders to test particular parts of the tool, based on its relevance to their service and expertise. Nevertheless, the number of people testing the tool was small, but aimed to balance between health care professionals and implementation management.

The interviews and user tests were conducted with participants from the Netherlands, Germany and Sweden. Therefore, it is unclear whether the tool is definitely universally applicable and could also be applied to lower-resource settings or healthcare systems that differ significantly from these contexts.

Although patients were eventually assigned a role within the tool, their involvement was not covered by the original ethical approval, so their needs during the implementation process were not explored.

7.4 Recommendations for the future

To ensure the tool is relevant and acceptable at all levels of implementation, it is important that all stakeholders have continuous opportunities to provide feedback on its iterations. In particular, it might be valuable to hear from patients about how they see their role in implementation and their experience of completing the tool's activities.

The insights gathered during this process were used to create an actionable adoption strategy for the tool in Chapter 6. The main activity is to pilot the tool and understand if additional educational material beyond the instructions are necessary. This could be accompanied by longitudinal studies comparing the tool's performance with that of traditional coordination methods and by gathering reviews to encourage adoption and enable scaling up to other institutions. Once the adoption strategy has been implemented, it is important to evaluate its success and whether adoption has been achieved long-term. This strategy is intended for the contexts in which the tool was developed. Therefore, it does not cover the possibility of conducting further pilots in non-European healthcare systems to assess the tool's applicability and determine whether it can be scaled in this context or needs to be adapted.

As previously mentioned, the tool could be further adapted as new technologies such as artificial intelligence become more widely used, thereby ensuring its continued relevance. As the AI features in Lucidchart become more advanced, it may also be useful to incorporate them into the tool. For example, existing protocols could be automatically translated into service maps of current workflows.

7.5 Contribution

This tool for digital health service implementation bridges the fields of implementation science and service design, showing how design methods can be applied in practice to support complex change processes in healthcare. The service mapping component of the tool adapts the traditional service blueprint by integrating swim lane diagrams, a familiar format for non-designers, to make it more accessible. This combination simplifies participation, supports learning-by-doing, and enables mapping to start early, evolve over time, and remain useful throughout implementation.

The tool is customised for implementation by linking stakeholders, workflows, liability, and risk assessment in a single visual framework. It highlights the importance of clear roles and stakeholder alignment as essential conditions for successful digital transformation in healthcare. Its features accommodates pain points, open questions, and incomplete information, allowing teams to work iteratively in complex, fast-changing environments.

Implementation teams are provided with a tangible tool to help them navigate the complexities of digital service integration. It addresses common challenges in healthcare settings, such as unclear responsibilities, limited coordination time, and a lack of shared understanding among clinical, managerial, and technical stakeholders. This structured and adaptable planning framework helps teams to clarify ownership and engage relevant stakeholders early in the process. Its step-by-step structure ensures consistent progress.

Furthermore, the tool contributes to capacity building by guiding teams through mapping activities without requiring them to have expert-level design knowledge. This can be particularly beneficial in organisations without dedicated design staff or in settings where external support is limited. By encouraging collaboration, transparency and early involvement, the tool helps to build trust in the implementation process, potentially increasing the likelihood of long-term adoption and successful outcomes.

While it could not finally be proven that its design is universally applicable to all types of services, it allows for further customisation or adaptation. Early testing with potential users demonstrated strong interest, suggesting both practical relevance and scalability in the healthcare sector.

7.6 Conclusion

The initial aim of this thesis was to address the challenges of implementing digital health services in the healthcare sector by providing healthcare professionals with a service mapping tool to help them evaluate the context and drive their own innovation.

The research identified a clear lack of suitable visualisation tools optimised for this purpose. It revealed a network of interdependencies that drive implementation, including not only healthcare professionals, but also implementation managers, patients, and technical, legal, and financial experts, all of whom are engaged in the process and must be taken into account when developing this tool. These insights from the interviews were extremely valuable because the chosen literature did not cover these findings. The research also showed that the unknown impact of new services on workflows was discouraging healthcare professionals from embracing new digital services.

This guided the second part of the thesis, which set the focus of the tool on clarifying roles and responsibilities, leading to improved engagement in the process. The tool presents a structured approach to facilitating collaboration between stakeholders, ultimately helping them with dealing with complex issues better.

Ultimately, this thesis contributes a tangible solution to one of the most pressing challenges in healthcare: how to effectively implement digital services in complex, multi-stakeholder environments, as pressures on the healthcare system rise from an aging population. By simplifying and streamlining the service mapping process, the project promotes a more transparent, collaborative and sustainable approach to digital transformation in healthcare.

8 Reflection

One of the key trade-offs I had to consider in this project was balancing conciseness with precision while remaining context-specific. My aim was to make healthcare professionals central to the implementation process. The tool reflects this by emphasising the importance of involving these professionals and clarifying when to do so. However, it also became clear that excluding implementation management entirely would have been unrealistic and healthcare professionals would not have the capacity to manage the tool – no matter how concise it might be – without support. Nevertheless, I am glad that the final outcome focuses on their priorities and benefits: creating clarity, self-efficacy with new technology, alignment with their expectations and ensuring patient safety.

Working on this thesis was an exercise in managing complexity and translating it into practical actions to help others manage complexity in their work. I had to continually revisit my analysis, even during concept development, to reassess and refine my conclusions. As I had hoped, this project gave me the opportunity to connect directly with multiple hospital stakeholders. Conducting a large number of interviews was challenging, but it strengthened my confidence in my findings and enabled me to refine my interviewing skills and adapt my questions over time. Recruiting relevant stakeholder was far more successful than I had initially expected, primarily due to the contacts I received from my supervisors. They were eager to get involved and provided straightforward, genuine responses, giving valuable insights into the complexities of implementation and the relationships between different stakeholder groups. Their engagement and positive feedback were both rewarding and motivating during difficult phases of the project.

That meant that I could achieve my goal of enhancing my user research skills. Coming from an educational background that emphasised execution in industrial design with limited methodological guidance, I initially had little experience of structured research approaches. This experience helped me to trust in the process and to further develop my skills along the way. With this project, I was able to shift my focus from execution to a more research-driven, context-sensitive approach, enabling me to identify real needs and adapt design methods to address them.

Looking ahead, the skills I have developed, especially in connecting with diverse healthcare stakeholders, will be invaluable. I hope to continue working in the healthcare sector, applying the research abilities and stakeholder engagement experience gained through this thesis to future challenges.

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21 Lucidchart. https://www.lucidchart.com/

22 Target audience and user definitions. All illustrations are from Storyset.

23 Final concept before user testing in Lucidchart.

24 The tool's sections.

25 Template after the final iteration. All illustrations are from Storyset. All icons are from Flaticon.

26 The tool in use. Mockup created with Adobe Firefly.

27 Rogers, E. M. (2003). Diffusion of innovations (5th ed.). *Simon & Schuster*.

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30 Adoption strategy. All illustrations are created with Sora, based on illustrations from Storyset. All icons are from Flaticon.

Tables

Appendix

Project brief

DESIGN FOR our future

TU Delft

IDE Master Graduation Project

Project team, procedural checks and Personal Project Brief

In this document the agreements made between student and supervisory team about the student's IDE Master Graduation Project are set out. This document may also include involvement of an external client, however does not cover any legal matters student and client (might) agree upon. Next to that, this document facilitates the required procedural checks:

- Student defines the team, what the student is going to do/deliver and how that will come about
- Chair of the supervisory team signs, to formally approve the project's setup / Project brief
- SSC E&SA (Shared Service Centre, Education & Student Affairs) report on the student's registration and study progress
- IDE's Board of Examiners confirms the proposed supervisory team on their eligibility, and whether the student is allowed to start the Graduation Project

STUDENT DATA & MASTER PROGRAMME
Complete all fields and indicate which master(s) you are in

Family name	Tschiersch	IDE master(s)	IPD ☐ Dfi ☐ SPD ✔
Initials	L.S.	2nd non-IDE master	
Given name	Lina Sofie	Individual programme (date of approval)	
Student number		Medisign	✔
		HPM	☐

SUPERVISORY TEAM
Fill in he required information of supervisory team members. If applicable, company mentor is added as 2nd mentor

Chair	Froukje Sleeswijk Visser	dept./section	HCD
mentor	Fredrik Bodell	dept./section	DOS
2nd mentor	Julian Houwen		
client:	Leiden University Medical Center		
city:	Leiden	country:	Netherlands
optional comments			

! Ensure a heterogeneous team. In case you wish to include team members from the same section, explain why.

! Chair should request the IDE Board of Examiners for approval when a non-IDE mentor is proposed. Include CV and motivation letter.

! 2nd mentor only applies when a client is involved.

APPROVAL OF CHAIR on PROJECT PROPOSAL / PROJECT BRIEF -> to be filled in **by the Chair** of the supervisory team

Sign for approval (Chair)

Froukje Sleeswijk Visser — Digitally signed by Froukje Sleeswijk Visser

Name F. Sleeswijk Visser Date Signature

DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Name student Lina Sofie Tschiersch Student number

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT
Complete all fields, keep information clear, specific and concise

Project title Enhancing Digital Health Integration: Service Mapping for Healthcare Professionals

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

The Dutch healthcare system is undergoing a significant shift towards digitalisation to meet the challenges of reducing high workloads amidst staff shortages to improve the provider experience, reducing the cost of healthcare delivery, keeping up with increasing healthcare demands to improve the overall health of the population, and the need for patient-centred care to improve the individual patient experience. Digital health services also open the door to new possibilities, such as AI-based personalised care solutions or remote diagnostics.

However, several challenges hinder implementation, such as a poor communication with key stakeholders about what implementation will mean for their roles and responsibilities, a lack of training for future users, or a disconnect between IT systems that need to work together and share information. There is little incentive to experiment with innovation as the healthcare sector is constrained by strict regulatory requirements to protect patient safety. Healthcare professionals are concerned about their liability, patient privacy, disruption to workflow and may have doubts about the usefulness of new technologies.

To overcome such barriers, designers would apply process analysis using mapping techniques. They can visualise stakeholder interactions, communication and information flows, clarifying roles and contextual factors that influence the service. While designers are skilled in such methods, their use is not yet widespread in healthcare, leaving untapped potential to improve service design and implementation.

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DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

The problem I want to solve is that healthcare professionals are currently unable to use service mapping techniques because they are not commonly applied in their field. There is a lack of tools that are both tailored to the healthcare context and a healthcare professional's experience level with mapping techniques.

However, as experts in their field and work context, they need to be empowered in bringing new digital services into their professional lives. Therefore, healthcare professionals would greatly benefit from being able to independently address the challenges of digitalisation and improve the implementation of digital services with their expertise in their particular contexts.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Create a mapping tool that allows health professionals from different contexts to map their digital services to understand the impact of making changes within the service-context fit. Define a strategy to introduce this tool in practice.

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

1. Refine my literature review on mapping techniques and components of digital health.
2. Conduct interviews. By interviewing stakeholders at LUMC, I hope to gain insight into what mapping techniques, if any, are currently being used at this hospital and under what circumstances they are being used. This may also identify potential participants for user testing. By interviewing other sources, such as experts in service visualisation or healthcare professionals from outside the LUMC, I aim to increase the general validity of the tool.
3. Develop an initial version of the mapping tool using insights from the literature and interviews.
4. Iteratively refine the tool by conducting user feedback sessions to gather feedback on the usability, clarity and effectiveness of using the tool to visualise all key aspects of the digital service and contextual factors.
5. Validate that the tool supports healthcare professionals in their independent innovation efforts and is tailored to their specific needs.
6. Define the conditions under which the tool has to be introduced the first time it is used.

Project planning and key moments

*To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting**, **mid-term evaluation meeting**, **green light meeting** and **graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).*

Make sure to attach the full plan to this project brief.
The four key moment dates must be filled in below

Kick off meeting	18 Feb 2025
Mid-term evaluation	16 Apr 2025
Green light meeting	23 Jun 2025
Graduation ceremony	28 Aug 2025

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	✔
For how many project weeks	16
Number of project days per week	4,0

Comments:

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

Digital health has the potential to benefit all stakeholders in the healthcare system, but its full impact is hindered by challenges in adoption and integration. I am motivated by the potential of a new tool to address these issues and put healthcare professionals and their knowledge of their own context at the heart of the digital health transformation process.

I would like to further refine my skills in tailoring design methodology to specific contexts and audiences, supported by my experience in digital product design and using mapping techniques, for example for medical technology companies at a design agency. I will also be able to use my network, such as my previous role in a telemedicine company, to engage with key stakeholders.

Through this project, I aim to further develop my user research skills and deepen my understanding of healthcare professionals, a user group for whom I would like to design in the future.

Interview guide

Participant

• (Healthcare) professional taking part in implementation
• Implementation manager

Key research objective for this interview

Understand the context of digital health services from different domains. Understand when and how services are implemented, and changes are made. Explore previous experiences and perceived benefits of mapping techniques in implementing digital health services from a frontline perspective.

Interview

1. Introduction
• Do you have any questions before we start?
• Can you introduce yourself?
• Can you describe your research focus and experience with digital health service implementation? OR Can you describe your role in (domain)?

• Can you describe the digital health service?
• What are the components of the digital health service?
• Who are the stakeholders involved?

2. Challenges and needs in implementation and making changes
• How do healthcare professionals typically respond to new digital health services?
• Can you take me step by step through your process for implementing a digital service?
• What are the biggest challenges you have faced in implementing digital health services?
• How do you and your colleagues currently decide to make changes in the service?
• How does collaboration happen? What is your mode of communication?
• Can you take me step by step through your process for making changes to a digital service?
• Which stakeholders are included during implementation or when making changes?
• What is your relationship to IT and support?

3. Use of mapping techniques
• Have you used visual tools to better understand workflows or service changes?
• Can you describe your experience of using visual tools for the first time?
• What are your main challenges in using visual methods?
• Have you used a certain tool for visualisation (digital or paper-based)?
• Would you be interested in improving your visual skills if that meant it would be easier to understand the impact a new digital service will have on your daily work?
• (If they have a good understanding of mapping tools) What features would a useful mapping tool need to have to fit your daily work?

4. Wrap up and close
• If you could change only one thing about implementing digital services in healthcare, what would it be?

“Your thoughts have been very valuable: Thank you for sharing!”

Interview guide

Participant
• Want to use mapping techniques in their research on digital health and implementation science but aren't sure how to

Key research objective for this interview
Understand the challenges faced by researchers in digital health implementation who recognize the value of mapping techniques but struggle with their use.

Interview
1. Introduction
• Do you have any questions before we start?
• Can you introduce yourself?
• Can you describe your academic background and research focus?

2. Motivation to use mapping techniques?
• In which context do you want to use mapping techniques?
• Can you describe the digital service you are currently working on?
• What motivated you to explore mapping techniques in your research and implementation efforts?
• Have you previously used any form of process visualisation or mapping techniques in your work?

3. Challenges in applying mapping techniques
• What difficulties have you encountered when trying to implement mapping techniques in your research or practice?
• Are there specific design skills you feel you lack that make applying these methods challenging?
• What kind of guidance, training, or tools have you tried so far?

4. Needs and support for implementation
• Are there specific aspects of mapping methods that seem particularly difficult to grasp or apply?

5. Wrap up and close
• What next steps would help you feel more confident in using mapping techniques in your research?

"Your thoughts have been very valuable: Thank you for sharing!"

45-Minute Testing Plan

Goal: Rapid feedback on usability, clarity, and usefulness of the tool.

Participants:
• Healthcare professional (management, with and without mapping experience)
• Design student (who created digital health service)

Agenda:

0-5 min	Welcome	Purpose, tool background, and session goals.
5-10 min	Explanation	Guided demo of the prototype using example.
10-30 min	Testing	Participant uses the tool and identifies challenges from their perspective.
30-40 min	Discussion	Share insights, gaps, and suggestions for improvement. Reflect on value for understanding new roles and responsibilities.
40-45 min	Wrap-up	Summarize key takeaways and follow-up actions.

Evaluation:
Healthcare professional
• Which part of the tool felt most natural to use?
• Which part felt confusing?
• Did you understand what each visual element represented?
• What features seem redundant?
• How would you describe your overall experience using the tool?
• Were your tasks and processes accurately represented?
• Which improvements do you expect as a result of using this tool?
• What concerns do you have about using this tool in real-world settings?
• What decisions (if any) would this tool help you make?
• Could you imagine using this tool when implementing a digital service?

Design student
• Which part of the tool felt most natural to use?
• Did you understand what each visual element represented?
• What features would you remove or simplify?
• Which part felt confusing? How would you improve them?

90-Minute Testing Plan

Goal: Validate relevance and usability in a realistic scenario.

Participants:
• Healthcare professional (management, with and without mapping experience)
• Implementation management

Agenda:

0-5 min	Welcome	Purpose, tool background, and session goals. • Intro: what am I doing and why? • What do I want to get out of this/what will they hopefully gain?
5-20 min	Explanation	Guided demo of the prototype using example. • Explain all sections and how they are used/who uses them
20-60 min	Testing	Step-by-step using a realistic scenario (the Box).
60-85 min	Discussion	Share insights, gaps, and suggestions for improvement. Reflect on value for understanding new roles and responsibilities.
85-90 min	Wrap-up	Summarize key takeaways and follow-up actions.

Evaluation:
• Was the tool intuitive and easy to navigate?
• Which part felt confusing?
• How would you describe your overall experience using the tool?
• Were your tasks and processes accurately represented?
• Could this tool support communication across teams?
• What decisions (if any) would this tool help you make?
• What concerns do you have about using this tool in real-world settings?
• Are there any stakeholders who would struggle to engage with this tool? Why?
• Could you imagine using this tool when implementing a digital service?
• If you could use this tool tomorrow, how would you start use it?

Validation Session

Goal: Validate relevance.

Participants:
• Healthcare professional
• Operations/IT management

Questions:
Fit with implementation process
• How do you envision integrating the tool with existing implementation processes?
• What obstacles do you expect in adopting this tool?
• If you had the tool available to you tomorrow, how would you start using it?
• At which stage(s) of the implementation do you anticipate using the tool most?

Pains and gains
• Which specific features or functionalities do you expect to be most valuable?
• What specific improvements do you expect as a result of using this tool?
• What current challenges do you face that you hope this tool will address?
• Do you expect the tool to enable any new capabilities for you?