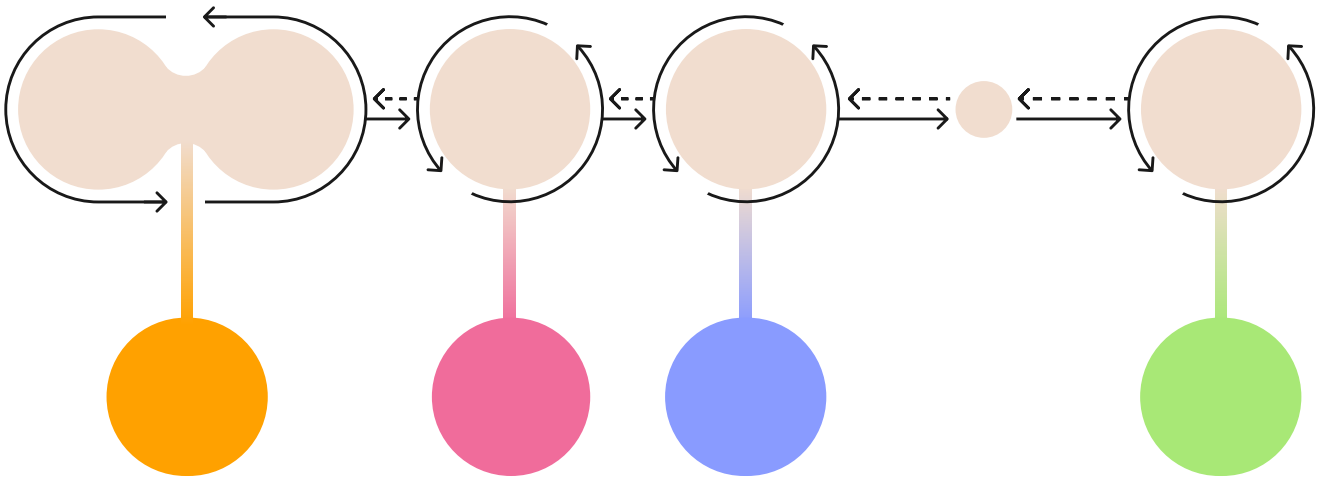
Unlocking technology adoption.

Guiding key user involvement for successful healthcare implementation.



Master thesis – Design for Interaction | Medisign

Varina Alice Wagner

Unlocking technology adoption.

Guiding key user involvement for successful healthcare implementation.

Master thesis
Delft, December 2024

MSc. Design for Interaction
Medisign specialization
Delft University of Technology
Faculty of Industrial Design Engineering

Graduate Student
Varina Alice Wagner
Student number: 5730260

Chair
Dr. ir. Armagan Albayrak
Department of Human-Centered Design
Applied Ergonomics and Design

Mentor
MSc. Fredrik Bodell
Department of Design, Organisation and Strategy
Designing Value in Ecosystems

Company mentor
Dr. Petra Kok
Reinier de Graaf Gasthuis
Rheumatologist & CMIO

Acknowledgements

Seven months ago, when this project started, I didn't know what would await me, what would be the outcome and how hard the following time would be. But I also didn't know that I would work with so many lovely and supportive people and that all of this would be over in a blink. Now, a few weeks before Christmas, everything is coming to a close and I can't believe I'm already at the end.

I would like to thank my supervisory team for your constant support, time and effort, and especially for always believing in me! Armagan, thank you from my heart for your kind words always. Your calmness was a steady companion that grounded me and helped me find my way, also in difficult times. Fredrik, I can't express how fortunate I feel to have had you by my side. Your perspective and questions helped me to go further and explore different directions and your guidance made writing a lot more bearable. Petra, thanks for the opportunity of this project, I learned a lot and grew as a person.

The Reinier will always hold a special place in my heart. Being able to explore a hospital from the non-patient side was invaluable and it taught me so much. A big thanks goes to all the motivated staff that took time out of their packed schedules to talk to me, let me accompany them and took part in my research activities. It was amazing to see your motivation and drive to make an impact in healthcare and that my work was meaningful and inspiring for you. I hope from the bottom of my heart that my research will help to improve the implementation process and that many healthcare professionals will embrace and benefit from amazing new technology that advances their workflows.

Thank you to my family and friends. I wouldn't be here without you and your support, the phone calls, the dinner nights, the coffee updates, the game nights and all the other things that make life, life. I value each and every one of you dearly and hope to always have you close to me, wherever you are!

And last but not least, Christopher. I cannot thank you enough for all your love compassion and help. Without you my journey to the Netherlands would have looked so different and I'll never forget your dedication and what you left behind to come with me. It wasn't always easy, but we made the best of it. Now we'll move on and find the best for both of us!

Thanks to everyone on my journey, I will remember you always!

Table of contents

1. Introducing the project 10
- 1.1 Context and stakeholders 10
  - *1.1.1 Current situation of digitalization in healthcare 10*
  - *1.1.2 Stakeholders in the project 12*
- 1.2 Goal of the final design 13
- 1.3 Scope of the project 13
- 1.4 Value of human-centered design & co-creation 14
- 1.5 Design approach 15

2. Exploring the patient-clinician-technology interaction 16
- 2.1 Literature review on interactions during consultation 16
  - *2.1.1 The influence of digital scribes 16*
- 2.2 Consultation observations 17
  - *2.2.1 Observation findings 18*
- 2.3 Stakeholder interviews 20
  - *2.3.1 Healthcare professionals 20*
  - *2.3.2 Patients 21*
- 2.4 Implications for the service 22

3. Exploring implementation within the RdGG 24
- 3.1 Literature research on implementation in healthcare 24
  - *3.1.1 Factors for successful implementation 24*
  - *3.1.2 The benefits of involving healthcare professionals 26*
  - *3.1.3 Conclusion 26*
- 3.2 Stakeholder interviews 27
  - *3.2.1 Healthcare professionals 27*
  - *3.2.2 Organizational employees 28*
  - *3.2.3 Technology companies 29*
- 3.3 Implications for the service 30

4. Design direction 31
- 4.1 Possible design directions 31
- 4.2 Adapting the design direction 35

5. Informing the design of the service 36
- 5.1 Characteristics of successful key users 36
- 5.2 Expert perspectives beyond the context 38
  - *5.2.1 Implementation experts 38*
  - *5.2.2 Digital scribe company from Sweden 39*
- 5.3 Co-Creation workshops 40
  - *5.3.1 Key user workshop 40*
  - *5.3.2 Organizational employee workshop 44*
  - *5.3.3 Implications for next research steps 46*
- 5.4 Technology companies' perspectives on the collaboration 47
  - *5.4.1 Autoscriber 47*
  - *5.4.2 ChipSoft 48*
  - *5.4.3 Implications for recommendation on collaboration 48*
- 5.5 What this means for the design of the service 49

6. Designing the implementation service 50
- 6.1 Ideation throughout the research 50
- 6.2 Design iterations 52
  - *6.2.1 First cycle – Distribution of responsibilities 52*
  - *6.2.2 Second cycle – Form of the service deliverable 54*
  - *6.2.3 Third cycle and final evaluation – Bringing it together 58*
- 6.3 The final implementation service 62
  - *6.3.1 Recommendations for the current implementation process of Autoscriber 68*

7. Concluding this thesis 70
- 7.1 Contribution 70
- 7.2 Limitation 71
- 7.3 Recommendations for the future 71

8. Final Reflection 73

References 74

Appendix 81

Glossary

RdGG = Reinier de Graaf Gasthuis, hospital in Delft and collaboration partner of this thesis.

Clinician / healthcare professional (HCP) Clinicians, or healthcare professionals, are medical staff directly involved in patient care, such as doctors, nurses, therapists, and specialists, focused on diagnosing, treating, and supporting patients' health.

Organizational employees Employees that support the hospital operations and patient care processes. Most are located in the "Gravin" building next to the hospital and work in departments like IT, Quality & Safety, communication, management, etc. but also (medical) managers within the hospital fall into this description.

Autoscriber A Dutch company that developed a digital scribe that summarizes patient consultations and is currently working together with the RdGG to adapt and implement it into healthcare professional workflows.

AI = Artificial Intelligence, a technology that enables machines to perform tasks that typically require human intelligence, such as learning, reasoning, and problem-solving. In healthcare, AI is to analyze data, assist with diagnostics, and automate routine tasks, supporting healthcare professionals in making faster, more accurate decisions.

LLM = Large Language Model, a type of advanced AI designed to understand and generate human language by processing text data. In healthcare, LLMs assist by interpreting medical records, summarizing clinical notes, and supporting patient interactions through natural language.

Digital Scribes Digital Scribes use electronic devices to document what happens during consultations in the electronic health record, allowing healthcare professionals to focus more on the interaction with the patient.

Implementation "Implementation is the process of putting to use or integrating evidence-based interventions within a setting." (Rabin & Brownson, 2017)

Adoption "Adoption is the decision of an organization or community to commit to and initiate an evidence-based intervention" (Rabin & Brownson, 2017)

Adaptation Changes or modifications undertaken during implementation "to suit the needs of the setting or to improve the fit to local conditions." (Rabin & Brownson, 2017)

Key users Key users, in literature often referred to as champions, can be described as motivated clinical staff that either volunteers or is appointed to take part in various implementation activities, like providing feedback or spreading enthusiasm among their colleagues, with the goal of promoting the change within the hospital.

Abstract

Even though many technologies are developed with the goal to support the healthcare sector in face of the ever-growing demands, many of them will never be implemented in hospitals. They fail either during the implementation process or when scaling up, what leads to unused opportunities, wasted time, effort, money and frustration on the side of all stakeholders. Using the implementation of a large language model during consultations at the Reinier de Graaf hospital as a case study, their current implementation process was evaluated. Through qualitative interviews and co-creation workshops many barriers in the collaboration between the organizational employees and key users on the side of the hospital, and the technology companies on the other hand were found.

This thesis explores how key users can be facilitated to turn the identified barriers into opportunities for successful implementation. A service for the organizational employees and technology companies was created, consisting of a book and poster that guide them through the most important milestones in their collaboration with key users: From forming the implementation team and finding the right key users, setting them up for the adaptation phase, preparing the department for the upcoming change and the go-live of the new technology all the way to sustaining and consistently monitoring its use.

This service was iteratively designed and evaluated with stakeholders of the context and design experts to provide a guided and empowering implementation experience. It also gives specific recommendations for the implementation of Autoscriber into the Reinier de Graaf and provides a foundation for future research into the practical aspects of how to effectively involve key users, a topic that is still explored very little by literature.

1. Introducing the project

This chapter gives a brief introduction of the context and stakeholders at play. It summarizes the goal and scope of the thesis and present an overview of the design approach.

1.1 Context and stakeholders

This chapter will give a short introduction to the context this thesis explores and introduce the stakeholder that will play an important role in the upcoming chapters.

1.1.1 Current situation of digitalization in healthcare

The healthcare sector is facing an ever-growing need of health services that opposes an already existing shortage of (human) resources (MacLean et al., 2014; Ministerie van Volksgezondheid, 2022; Samenwerkende Topklinische Ziekenhuizen, n.d.). While change is urgently needed to keep healthcare sustainable and accessible, the quick advancement that currently takes place in the medical technology industry is not implemented fast enough into the health sector (Meskó et al., 2017). Also the Netherlands are struggling to keep up to date (Wesselink-Schram, 2022) even when it's becoming clear that digitalization is a big factor in improving healthcare (Ministerie van Volksgezondheid, 2022; Samenwerkende Topklinische Ziekenhuizen, n.d.).

Healthcare workers are having high workloads, a lot of which is due to complicated and elaborate organizational processes and the need for thorough documentation that reduce the time they can dedicate to focus on their patients (Kroth et al., 2018; Murad et al., 2024). As early as 1996 Scott and Purves (1996) have described that the dyadic relationship between patients and their healthcare providers evolved to a triadic relationship, including the computer into the equation. However, the act of documentation can have a disruptive effect on the human interaction in the consultation room (Falcetta et al., 2023).

Digital transformation is needed to ensure long-term sustainable and efficient healthcare as it has the potential to improve patient outcomes and reduce costs even with the growing demand and understaffed care sector (Gopal et al., 2019). This is also acknowledged by the Dutch government and digitalization is part of the goals of the "Integral Care Agreement" (Dutch: Integraal Zorg Akkoord, IZA) that the Dutch ministry for health and 13 further parties in healthcare agreed on in 2022 (Ministerie van Volksgezondheid, 2022). Digitalization in health can be described as a shift towards using new technology like applications or software with the aim of creating new or improved workflows, improve patient care, clinician well-being, and stakeholder interactions (Svensson et al., 2023).

Especially the opportunities of introducing AI into the hospital environment are discussed all over the world. Large Language Models (LLM) can generate concise and structured summaries of medical consultations and could thereby minimize the manual typing of healthcare professionals (Falcetta et al., 2023; Van Veen et al., 2024). This would allow them to focus more on the conversation at hand and facilitate better patient-clinician (trust) relationships (Falcetta et al., 2023; Van Veen et al., 2024).

However, it is a challenge to introduce the use of new digital technology in the health sector and many implementation attempts fail. Current

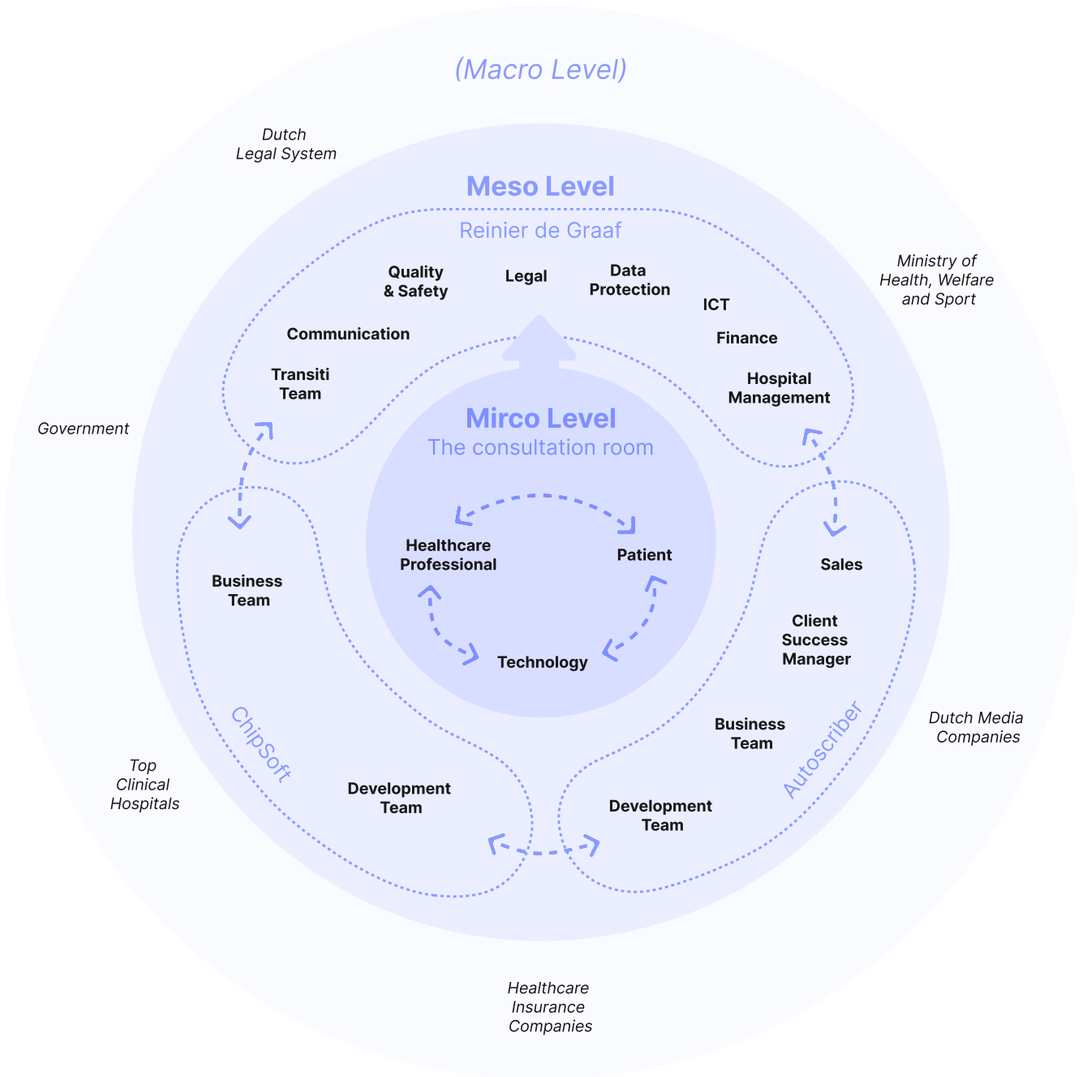


Figure 1: *Map of the technology implementation stakeholders on the three different levels: macro, meso and micro.*

processes need to be adapted and guidance on the correct use needs to be provided to not overburden medical professionals (Stoumpos et al., 2023). Personal feelings of scepsis and mistrust also play an important role and shouldn't be neglected, but can be targeted by including clinicians as future users in the development and implementation of new technology. Human-centered design can help to improve the process of implementation by promoting share-knowledge within the diverse stakeholder group and co-creating solutions in iterative steps.

1.1.2 Stakeholders in the project

Within this project, multiple stakeholders are working together towards a common goal.

Reinier de Graaf

The Reinier de Graaf Gasthuis (RdGG) is a hospital situated in Delft in the Netherlands and the collaboration partner for this thesis. With over 3.000 employees they offer acute, outpatient and operative care (Reinier de Graaf, n.d.). The Reinier adheres to its three core values in relation to employees and patients alike:

> **Sincere attention**
> The focus always lies on the human and listening to their needs and wishes.
>
> **Innovation**
> Improving care by thinking and going beyond the existing workflows and routines.
>
> **Self-involvement**
> Patients and staff are empowered by valuing everyone's contributions and promoting autonomy.

Furthermore, RdGG is one of 27 top clinical hospitals (Dutch: Topklinische Ziekenhuizen) in the Netherlands. This cooperation aims to accelerating transformation together to future-proof and high-quality hospital care (Reinier de Graaf, n.d.; Samenwerkende Topklinische Ziekenhuizen, n.d.).

Under the light of the challenges posed by the high pressure on the Dutch healthcare system, RdGG wants to reduce the burden on their employees while still facilitating a high quality of care to their patients. They aim to improve the patient-clinician-technology-interactions during consultations in the outpatient clinic by streamlining the documentation processes. In a joined effort of healthcare professionals and organizational employees, they are one of the first hospitals in the Netherlands exploring the opportunities of using a LLM service during consultations in their outpatient clinic. Together with Autoscriber, the provider of the LLM, and ChipSoft, the company developing the electronic patient record HiX, a small team from RdGG is working on an integration between Autoscriber and HiX by providing in-use insights and feedback to further tailor these products to fit their needs. Nevertheless, they are unsure how to facilitate the process of introducing Autoscriber to all their healthcare workers in the future.

autoscriber

Autoscriber is a small but rapidly growing company that has just reached the product-market-fit and started to implement their LLM in the first hospitals in the Netherlands. Their core value is close and personal contact to their clients, and because of their size they can adapt their product at a fast pace.

ChipSoft

ChipSoft on the other hand was founded in 1986 and is the market leader, providing 70% of the Dutch hospitals with their electronic health record HiX (M&I/Partners, 2021). Their focus is on consistently adapting the features of HiX, but due to the size and complexity of the company structure at a much slower pace compared to Autoscriber.

1.2 Goal of the final design

In this thesis, the introduction of the LLM is used as a case study to explore and define a service that helps RdGG to shape the introduction and implementation of new technology. By using this service, a feedback-loop between technology and healthcare workers can be created which leads to solutions that are tailored to the needs and wishes of the users. Being involved in the development raises healthcare works acceptance of the LLM, and they have an intrinsic motivation to use it as well as a sense of ownership (Lapão, 2019; Ross et al., 2016). Furthermore, it also provides a clear roadmap of the overall implementation process of the LLM within the hospital, step by step.

This leads to the following design assignment:

> "Design a service that brings the stakeholders within the hospital and the e-health companies together to support the implementation process of an in-consultation LLM at RdGG."

The goals of the service are:

- A good technology-context fit, achieved by taking the current workflow and users wishes and needs into consideration
- An improved implementation process by enhancing the collaboration between the stakeholders

By achieving these goals, the service could improve the patient-clinician-technology interaction during consultations and, most importantly, give all people involved in the service the feeling that they are being heard and that they have a positive impact on the development!

1.3 Scope of the project

This thesis focuses on the context of the RdGG. The use of Autoscriber during consultations in the outpatient clinic is a case study for the implementation of new technology into clinician's workflows. This means the thesis addresses the interactions within the micro level (the consultation room) and the meso level (adaptation process of the hospital and cooperation with technology companies) but not the macro level (legislation and governmental constrains). The research uncovered opportunities to support and elevate the existing co-creation process between the stakeholders and translates these in a service that can be used for the implementation of Autoscriber but also other technologies in the future. It also provides a set of recommendations to enhance the current collaboration.

1.4 Value of human-centered design & co-creation

Human centered design (HCD) is a practice that puts the human at its core. It shifts the focus away from the (technical) solution and towards the behavior, beliefs and needs of the people within the context (Melles et al., 2021). By collecting and providing these deep insights into users reality designers can help to create a shared understanding of the context, even if the stakeholders are from different backgrounds (Almqvist, 2017; Stickdorn & Schneider, 2011).

Sanders and Stappers (2008) found that designers that include users in their research by using co-creation can improve the fit between design and context. This co-creation entails all sort of creative activities during the development process that involve not just designers, but also people with other backgrounds or layman. Involving all stakeholders in these activities helps everyone to develop a user-understanding early on (Almqvist, 2017; Sleeswijk Visser, 2013) and involving future users improves the acceptance of the final design (Sleeswijk Visser, 2013). However, there is still a gap in literature about how co-creation in healthcare should look like and who exactly needs to be involved (Garmann-Johnsen et al., 2020).

The healthcare sector is a complex sociotechnical system as it includes dynamic interactions between social (different humans) and technical elements that influence each other (Carayon, 2006; Norman & Stappers, 2015) which causes challenges for the implementation of new technology. Norman and Stappers (2015) argue that designers should involve themselves beyond the design process and take part in the implementation by designing in small, iterative steps that evaluate the technology early and often, using prototypes or other stimuli to gather insights that shape the final solution, which is beneficial for implementation success (Greenhalgh et al., 2017). Even though this direction seems promising, there is still a gap in practice as well as research about it (Almqvist, 2017; Overkamp & Holmlid, 2016). This thesis will look at the implementation process within the Reinier with an HCD approach to achieve a better collaboration and implementation outcomes.

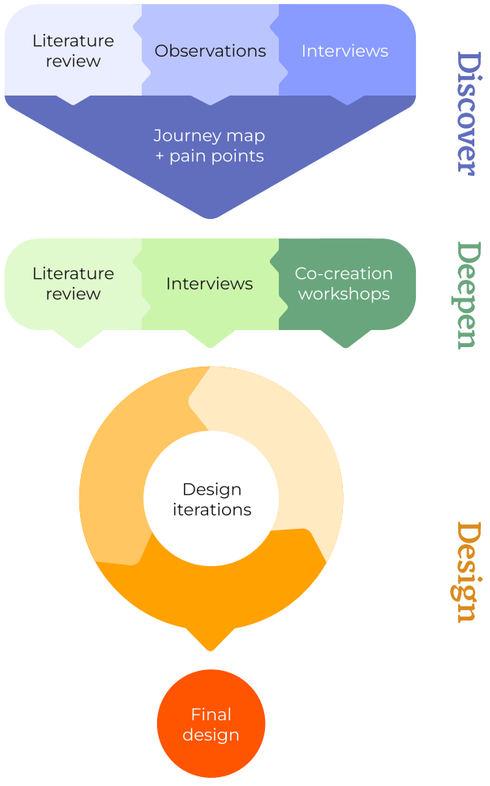


Figure 2: *The design approach.*

1.5 Design approach

The design process followed three distinctive phases:

1. Discover – *Chapter 2-4*
This phase focused on gaining overall insights into the context and the current workflow of the RdGG. With the help of literature research, context-observations and interviews with the diverse stakeholders, the design direction was refined and the key terminology explained. All insights were combined to map the current implementation journey of the RdGG and pinpoint the most important pain points. The design goal was also redefined based on the collected insights.

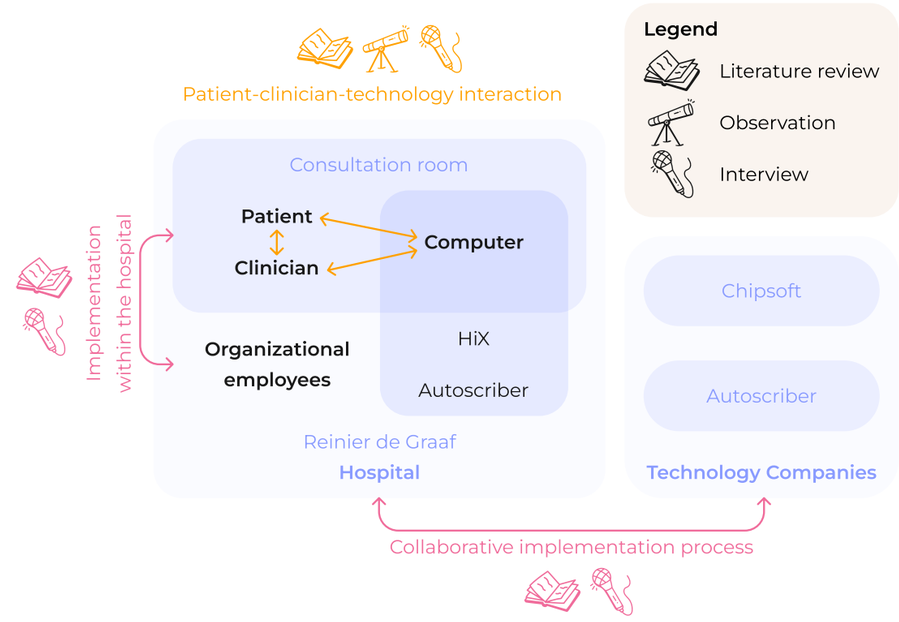


Figure 3: *The methods used to explore the context during the "Discover" phase.*

2. Deepen – *Chapter 5*
The following phase focused on broadening the understanding of the identified design direction. Through literature review, interviews with field experts and the companies as well as co-creation workshops the informational needs of the stakeholders were defined.

3. Design – *Chapter 6*
The insights gained in the first two phases were finally applied in different design approaches. In iterations the form and content of the final service design was refined and evaluated with various experts. Finally, the service design is presented and described.

2. Exploring the patient-clinician-technology interaction

As Autoscriber will be used during patient consultations, its influence on the relationship and interaction between patients and their healthcare providers was researched in more detail. For this, the insights already presented by literature were complemented with observations and interviews directly within the context of the Reinier. This will provide valuable insights into existing pain points to shape the focus of this thesis going forward.

2.1 Literature review on interactions during consultation

When thinking about consultations, two parties come to mind immediately: the patient and their treating clinician. However, this view is not correct. In our current healthcare system, the computer and the electronic health record play an important role during consultations, transforming the dyadic relationship into a triadic one (Scott & Purves, 1996; Voran, 2017).

Important factors for a good relationship between healthcare professionals and their patients are good communication skills, empathy (Brennan et al., 2023; Sobral & Figueiredo-Braga, 2016), the amount of time both parties know each other (Shaarani et al., 2017), patient-centered care and the ability to empower the patient to take part in shared decision-making (Brennan et al., 2023).

Healthcare professionals often report that they are concerned about the negative influence computers have on the human interaction. An increasing workload of administration and especially documentation tasks takes their focus and many need to finalize documentation outside of their working hours, what significantly increases the risk for burnout (Kroth et al., 2018; Murad et al., 2024). Clinicians see computer and technology as helpful tools, but at the same time they are challenging their time management and reduce their ability to fully focus on the patient (Sobral & Figueiredo-Braga, 2016). On the other hand, patients agree that technology is a helpful tool but don't feel a negative impact on the inter-human relationship and trust in clinicians expertise (Shaarani et al., 2017; Sobral & Figueiredo-Braga, 2016; Voran, 2017). Voran (2017) stresses that healthcare professionals need to be skilled to effectively juggle the technical tools they have to use, but can worry less about this negatively impacting their relationship to the patient. Nielsen (2016) suggests measurements like communicating why they use the computer and what they are doing to actively involve the patient and embracing the triad instead of trying to pretend the relationship is a dyadic one.

2.1.1 The influence of digital scribes

In the last years the advancements of AI and machine learning are covered by the news and companies like Autoscriber try to improve the delivery of care by providing healthcare professionals with AI assistance. So-called digital scribes transcribe the conversation during patient consultations and automatically generate medical documentation that can be used within the electronic health record to reduce the

administrative burden on healthcare providers (Falcetta et al., 2023). Many literature reviews still point out severe research gaps when it comes to the benefits created when used in a clinical setting, but first indications are that digital scribes are able to automate parts of clinicians workflows and lead to a more complete medical record (Falcetta et al., 2023; Yuan et al., 2023). The time healthcare professionals are able to spend focusing on their patient and having more empathetic, meaningful consultations is highlighted in all reviews (Falcetta et al., 2023; Ghatnekar et al., 2021; Yuan et al., 2023). Some barriers to implementation that were found are the difficulties of integrating digital scribes into the existing IT landscape, the time that is needed to train healthcare professionals to use the technology and difficulties in generalizing over different kinds of medical encounters (e.g. intakes and follow-ups, but also in between different specializations) (Ghatnekar et al., 2021).

To fully benefit from AI's possibilities to bring relieve to the healthcare sector, a culture change to match a world that embraces technology more and more is needed (Meskó et al., 2017). However, as we can see it's not just important to develop innovative technology but also to ensure it is adopted well. The current practice of implementation in healthcare seems to be one of the biggest challenges (Ross et al., 2016; Wesselink-Schram, 2022).

2.2 Consultation observations

To gain a first impression of the context in which Autoscriber is used at the RdGG consultations in five different outpatient clinics were observed. According to Cafazzo (2020) observations are the best way of identifying the steps and actions of a service that are currently followed. The healthcare professionals were physicians of different specializations, one was a specialized nurse and one a psychologist. Each was accompanied during one to five patient consultations.

The leading research questions (RQ) were:

1. How does the current patient-clinician-technology interaction look like?
2. What is the role of the computer and Autoscriber in this, and how do they influence the given dynamics?
3. Is there a measurable difference in the usage of the screen during consultation when using the LLM?

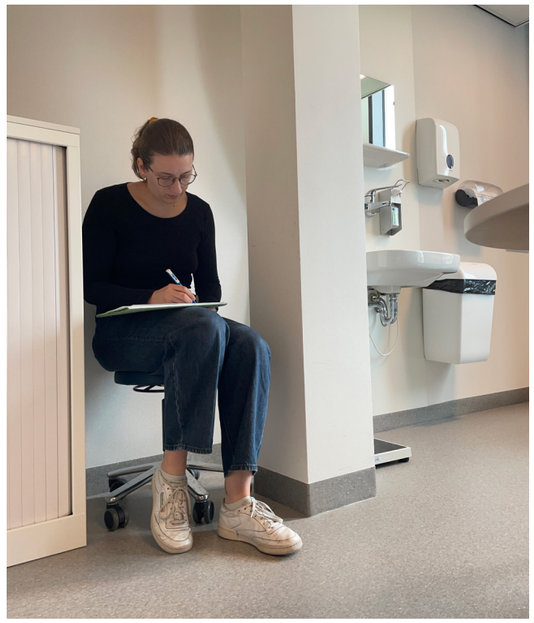


Image 1: *The observation setup.*

While observing the consultation quietly from a corner of the room (image 1), the time that the healthcare professionals spend looking at the computer was measured as well as the overall duration of the consultation (excluding the physical examination as no screen was present during this period). In this way, the amount of screen-gazing could be put into perspective to the overall duration of the appointment.

Key-moments of interaction were noted on a timeline with a focus on factors that seemed to influence the interaction, the influence of Autoscriber and unexpected but relevant further findings that helped to gain better insight into the situation. See Appendix A.2.1 for the observation sheet.

2.2.1 Observation findings

The key findings were thematically clustered to answer the research questions, leading to the following insights (See Appendix A.2.2 for a detailed view of all findings).

RQ1: How does the current patient-clinician-technology interaction look like?

When looking at the interaction between the three acting parties during consultation, there are multiple factors that come in effect.

External factors that influence the interaction are for example the limited time that clinicians usually have with their patients. On top of this it was observed that facilitating and using Autoscriber is still taking quite some time so using it is not yet relieving the burden on healthcare professionals as much as hoped. The location also plays a role, as clinicians often do not have a fixed office and change rooms frequently. The technical setup and availability of things like microphones etc. might differ per room and therefore enable or prevent the use of Autoscriber. However, it was noted that most consultations follow a standard blueprint (see figure 6 in chapter 2.4 for reference) what makes it easier for clinicians to give good care and follow all steps. External distractions like incoming phone calls can disrupt the human interaction just as much as technical issues and lead to a higher stress level for the healthcare professional.

There are also several interpersonal factors. Most clinicians focus on building a positive relationship to their patients, so they feel safe and dare to ask their questions. They are very aware of the emotional state of the other person, and the time they know each other also influences how comfortable both parties seem to be with each other. If patients are accompanied by family members or friends, this also changes the social dynamic. Though clinicians need to document a lot of information, they still ensure to look at their patients as much as possible, some even type blind. They use physical cues of active listening like nodding and body posture, and most patients don't seem bothered by them typing. It also seems that the use of Autoscriber does not directly influence the consultation after the initial question for consent.

RQ2: What is the role of the computer and Autoscriber in the consultation, and how do they influence the given dynamics?

On top of the already mentioned external and interpersonal factors, the influence of the computer and Autoscriber was observed.

It is important to note that the computer is used for more activities than just documentation during consultations. Some clinicians use it to look up relevant information like local self-help groups or similar things. They also show patients result from previous tests to enhance their understanding. Using digital means can lead to technical difficulties though, not just on the side of the hospital but also on the patient side, for example when they do not know why their camera is not working during consultations via video call.

The documentation is used as a reminder for follow-up consultations but also as legal assurance. Documentation style can differ, not just between the different specialties but also between healthcare professionals of the same profession. Some might use their notes to double-check if they are correct and complete together with their patients.

However, there are also some issues clinicians have with Autoscriber. Some did not get an introduction to the technology, so they are unsure if they use it correctly and might miss out on features or workflow optimizations. When copying the generated summaries into the patient record, they might need to translate the text back to different sorts of input like radio buttons or similar, and sometimes they need to add new texts as Autoscriber does not provide input for all needed fields. Problems with the summaries can be of technical nature, e.g. if Autoscriber is failing to generate a summary, or human nature, e.g. when clinicians choose "male" instead of "female" before starting the recording. This leads to time-consuming corrections.

RQ3: Is there a measurable difference in the usage of the screen during consultation when using the LLM?

When comparing the time spend looking at the computer with the duration of the consultation, there was no notable difference between all healthcare professionals, even though some of them can be considered novel users and others expert users. There was also no notable difference between physicians, specialized nurse and psychologist.

The two consultations in which Autoscriber was not used are considered not suitable to compare with sessions that used the LLM, as they were checkup appointments. These are too different from intakes or appointments that deal with acute problems, as they are shorter and cover less things that need to be noted in the patient dossier. You can find all times listed in Appendix X (same than detailed findings before).

Other limitations in the observation were, that only the time looking at the computer was measured but not the time of actually typing, which is the activity that Autoscriber should support, and that too little measurements were made overall so that the average times and percentages are not statistically relevant.

However, this activity supports the finding, that engaging with the computer is more than just typing and that it takes an important role within the consultation.

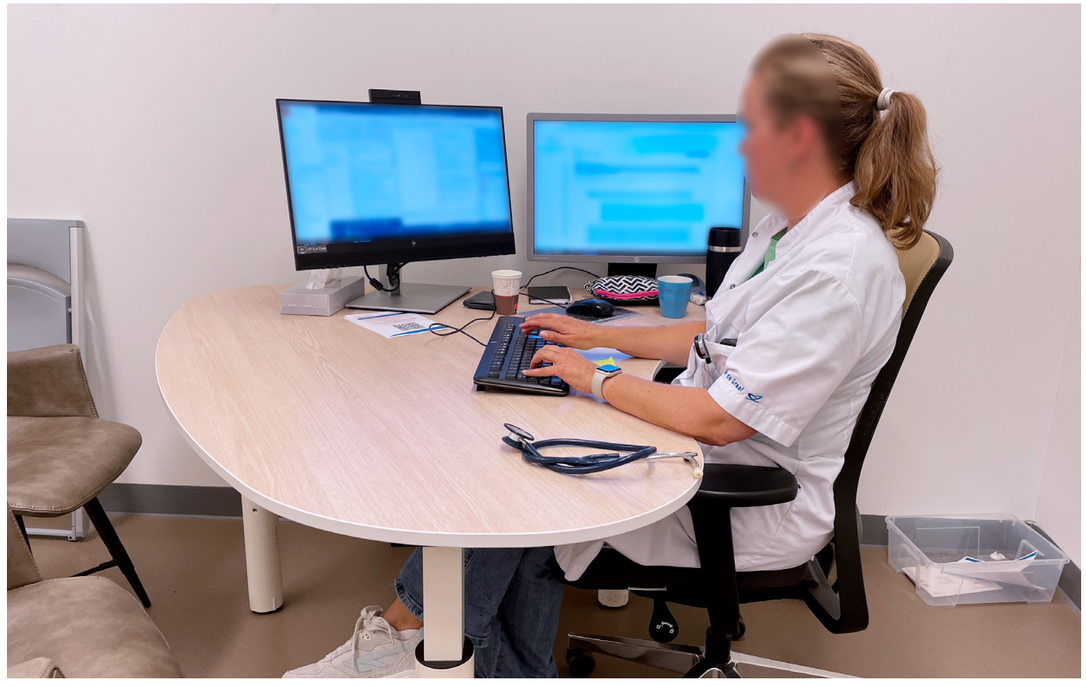


Image 2: *A healthcare professional working with HiX (left screen) and Autoscriber (right screen).*

2.3 Stakeholder interviews

Although the observations have laid a good foundation, further investigation is needed to get a thorough understanding of the context. Semi-structured interviews were chosen as means to answer the following research question:

> How does the current patient-clinician-technology interaction look like, and what influence do the computer and Autoscriber have on it?

For this, two groups were interviewed to gather insights (find the interview guides in Appendix A.3.1):

- **Healthcare professionals** of RdGG that are currently using Autoscriber
- Outpatient clinic **patients** of healthcare professionals that use Autoscriber

The interviews were transcribed, and relevant quotes were transferred to statement cards (see figure 4 for an example) and given a code as a first interpretation of the meaning. This resulted in 178 cards for the healthcare professionals (this includes insights to another research question that will be discussed in chapter 3.2) and 63 for the patients. The cards were thematically clustered according to the research questions of each interview group, and the insights will be reported in the following chapters. Finally, they will be combined to answer the research questions.

HCP	Participant 5	Timestamp 05 12
Quote I'm not using it with my patients who come back to check if the treatment has gone right, because that's always a very short talk and I think I'm quicker to write that down myself than to put our describer on		
Code Short appointments are faster by hand than when using Autoscriber		

Figure 4: *An example of a statement card. The top row states, from left to right: Participant group, number and time of quote in transcript. The field in the middle holds the original quote, and the lowest field a first interpretation of the quote within the context.*

2.3.1 Healthcare professionals

The healthcare professionals (HCP) received questions concerning the above research question as well as another one about the implementation process that will be discussed in chapter 3.2. A total of nine participants with the following roles and levels of experience were interviewed (table 1).

For healthcare professionals, providing the best care possible is the most important task. They collect a variety of different information (medical and personal) to be able to help their patients. It's important to create a safe and trusting relationship so patients feel comfortable to ask them all their questions.

Computer and technical tools are seen as a support for providing care, as they collect and contain all important information needed to make a holistic diagnosis. However, clinicians see the act of documentation and the computer itself as barrier between themselves and their patients, even though their patients tell them that they do not mind typing, as long as it stays in reasonable limits. Upon hearing that Autoscriber is used patients react either indifferent or positive as they see it as a sign for the hospital to be modern and progressive. Healthcare providers that use Autoscriber without taking their own notes report that they feel less cognitive strain and can truly shift their focus towards the patient.

Occupation	Participant number	Specialization	Experience with Autoscriber
Physicians in the outpatient clinic	HCP5	Gynecologist	Beginner
	HCP7	Nephrologist + responsible for education	Intermediate
	HCP8	Oncologist + medical manager of oncology center	Beginner
	HCP9	Urologist	Beginner
Specialized nurse in the outpatient clinic	HCP3	Nurse practitioner in the breast cancer clinic	Beginner
Psychologists	HCP2	/	Intermediate
	HCP4	/	Intermediate
ICU	HCP1	/	Not using Autoscriber
ER	HCP6	/	Beginner

Table 1: *Participant list healthcare professionals.*

In addition, the lack of time was an overarching factor that was mentioned very often. Healthcare professionals reported that they have too little time available inside and outside of consultations to be able to finish their tasks, and that documenting is very time-consuming.

See Appendix A.3.2 for an extensive report of the interview findings.

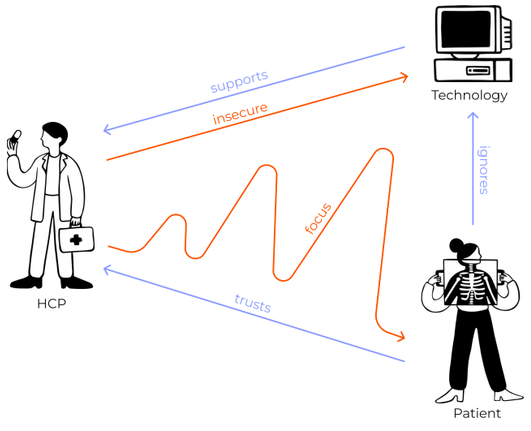


Figure 5: *Healthcare professionals feel like they constantly need to shift their focus between computer and patient.*

2.3.2 Patients

In total, five patients (P) of two different outpatient physicians were interviewed: Male 62 (P1), female 56 (P2), female 66 (P3), female 32 (mother of the patient, male 7, P4) and female 78 (P5).

Overall, it became clear that patients trust their healthcare providers and are aware of the high demands, workload and time-pressure they face. They value if communication takes place on their level, as medical terms isn't understandable for most, and they want to feel heard and taken seriously. They prepare themselves for consultations and appreciate it if their clinician does the same, so the computer is seen as an important support as it helps them to connect all the information and draw conclusions.

Using the computer and documenting is seen as a normal part of clinicians' jobs and needed for high quality care. Technology that works in the background and needs minimal attention is less disruptive and enables more focus on the human interaction. All participants were open and positive about the advances of technology in healthcare and think that they are important for the future.

See Appendix A.3.3 for an extensive report of the interview findings.

2.4 Implications for the service

When looking at the current interaction between healthcare professionals and their patients, we see that their goals are aligned. Both want to identify and treat the problem of the patient and take their own measures to achieve this goal.

However, the observations and interviews revealed some burdens on the human interaction, mostly on the side of the healthcare professionals. They aren't yet fully comfortable and proficient with the use of Autoscriber, even if they already use it for a long period of time. They don't enjoy the full benefit as the time-pressure makes them anxious, and they follow the "better safe than sorry" approach. You can find a journey map of a typical consultation and the most prominent pain points of healthcare professionals in figure 6.

These issues are a result of the current phase of implementation, as the version that is used at the moment is still in development. Nevertheless, the use of a digital Scribe during consultations seems to be a promising direction to improve the patient-clinician-interaction and even though healthcare professionals still spend a similar amount of time documenting we can see that patients already have a more positive reception of the interaction only because they know that Autoscriber is used and that their clinician wants to focus more on them.

These benefits are also recognized by literature. Digital scribes like Autoscriber could have positive effects and improve consultations by enabling healthcare professionals to shift their focus fully to the patient and leave documentation to the AI.

However, even if this scenario sounds appealing, implementing ehealth applications like this into hospitals is not trivial and literature, observations and interviews alike find several barriers that must be understood and overcome. Because of this, the next chapter will take a detailed look at implementation science and the current process of adopting Autoscriber within the Reinier.

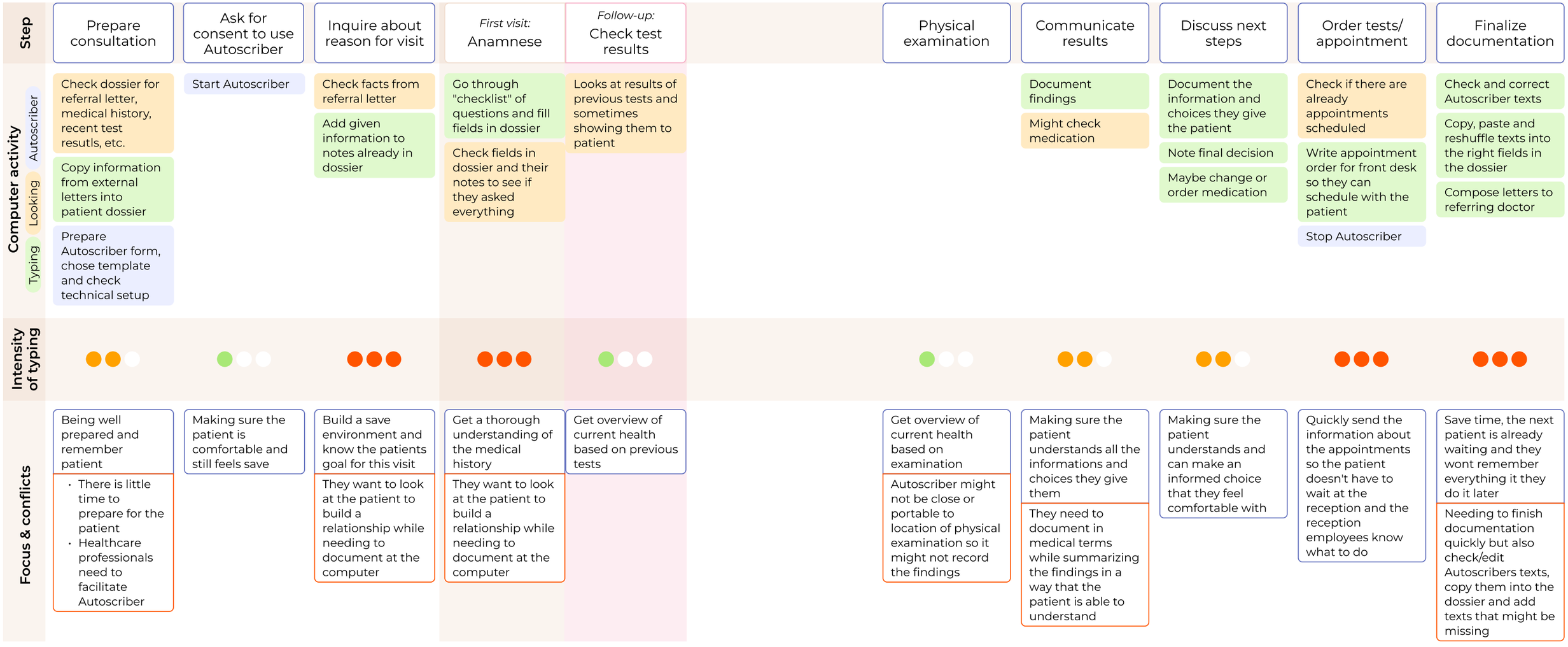


Figure 6: *The user journey of healthcare professionals using Autoscriber during consultations.*

3. Exploring implementation within the RdGG

As could be seen in the observations and interviews, Autoscriber has not been fully adopted, even by its current users. The service design aims at improving the context-technology fit as well as the stakeholder collaboration during the process, therefore this chapter will focus on exploring the topic of implementation further. A literature research was conducted to create a scientific basis that will be enhanced by context-relevant qualitative insights from interviews with the stakeholders.

3.1 Literature research on implementation in healthcare

As already mentioned in chapter 2.1.1 there seems to be a gap between the advances of technology and their successful implementation into the healthcare sector.

According to Rabin & Brownson (2017) "Implementation is the process of putting to use or integrating evidence-based interventions within a setting". When looking at this process within the health sector it becomes apparent that many new innovations are never used or abandoned during the expansion of users within the context (Greenhalgh et al., 2017). If interventions aren't implemented well they will not be effective (Proctor et al., 2011; Ross et al., 2016).

The issues that arise during implementation are intricate and appear on many levels (Ross et al., 2016). Often the complexity of the context is not evaluated sufficiently (Greenhalgh et al., 2017), especially when it comes to the already existing IT landscape and the connections within, but also existing workflows are simplified or not taken into account at all (Bente et al., 2024). Innovation is often blocked by healthcare professionals and patients that do not want to change (Meskó et al., 2017) as it is disrupting the existing workflow and temporarily increases the workload while all affected parties learn how to navigate this new situation (Barchielli et al., 2021; Gjellebæk et al., 2020; Svensson et al., 2023). However, the future users of the intervention are not only often not included in the development process (Gjellebæk et al., 2020) but also left alone when it comes to learning how to use it (Svensson et al., 2023) which leaves them overwhelmed and skeptical or even scared of new technology (Gjellebæk et al., 2020). These barriers need to be addressed by implementation strategies to successfully introduce innovations into healthcare (Ross et al., 2018).

3.1.1 Factors for successful implementation

Technology-context fit

One of the most important factors when it comes to implementation is making sure that the new technology is adapted well to the context in which it is supposed to be used. Adapting means changes or modifications undertaken during implementation "to suit the needs of the setting or to improve the fit to local conditions." (Rabin & Brownson, 2017). In order to ensure this, it is key to fully understand the complexity of the context (Greenhalgh et al., 2017; Ross et al., 2018). This will help to find possible barriers early and address them before they arise (Overkamp & Holmlid, 2017). It's also important to take into account that contexts change over time and that a continued fit is important for long-term adoption (Greenhalgh et al., 2017).

An important part of the context are the already existing workflows of healthcare professionals. If they are disrupted too much, the new technology will be abandoned and implementation fails (Ross et al., 2016; Svensson et al., 2023). Because of this, it's incredible valuable to include the future user as an expert of their experience and work practice into the process of adapting technology (Bente et al., 2024; Gjellebæk et al., 2020). To make this process as efficient as possible, users should be involved as early as possible (Ross et al., 2016).

Lastly, a focus point should be to test and evaluate new technology early, for example using prototypes. In this way a proof of concept can be created and the technology-context fit can be enhanced step-by-step (Greenhalgh et al., 2017).

Learning

It's crucial to acknowledge that healthcare professionals will need time to learn and get comfortable with new technology, even if it's design in an intuitive way (Gjellebæk et al., 2020; Ross et al., 2016). This time needs to be estimated realistically and a transition period should be planned in the implementation timeline (Ross et al., 2016). Having accessible and sufficient training and education opportunities available (Ross et al., 2016) is as important as providing (local) support in case of technical problems (Bente et al., 2024). Creating room for healthcare professionals to "learn together and co-create knowledge" (Gjellebæk et al., 2020) is described as a powerful enabler.

Communication

During implementation it's important to facilitate good communication between healthcare providers and the organizational employees of the hospital (Gjellebæk et al., 2020; Lapão, 2019). Middle managers can play an important role in this as they are close enough to healthcare professionals on one side and upper management on the other and can therefore bridge gaps and help all stakeholders to find a common-ground and knowledge base (Gjellebæk et al., 2020). However, the most important thing that needs to be clearly communicated it the goal or aim of implementing new technology (Gjellebæk et al., 2020; Svensson et al., 2023). Only if healthcare professionals understand this they are able to appraise the benefits of the intervention for themselves (Svensson et al., 2023) and don't feel like changes are just made to save money (Gjellebæk et al., 2020).

Process

Before a hospital starts the implementation, a clear roadmap and planning should be created. This should ideally be done during the development phase already (Overkamp & Holmlid, 2017; Ross et al., 2018). Clearly outlined roles and responsibilities (Gjellebæk et al., 2020; Ross et al., 2016) are just as important as including enough time to react to emerging barriers and transfer data from old to new systems (Ross et al., 2016). An iterative approach leaves enough room for these evaluation and adaptation points and minimizes the workflow interruptions for healthcare professionals (Ross et al., 2016). If parties leave the team before or during implementation, it's crucial to transfer their knowledge to the rest of the team through activities like meetings during the collaboration or in the end by preparing suitable deliverables (Almqvist, 2018). Lastly, the implementation team needs to acknowledge that the process doesn't stop as soon as the technology "goes live" and that there is a constant need to monitor, reassess and adapt the intervention to keep the technology-context fit intact (Ross et al., 2016).

Influences on the macro level

On top of the above-mentioned factors it should be mentioned that governmental decisions and external policies are affecting implementation as well (Greenhalgh et al., 2017; Ross et al., 2016). However, because of the scope of this thesis and its focus on the micro and macro level, these factors will be acknowledged but not discussed further.

3.1.2 The benefits of involving healthcare professionals

As previously discussed, including healthcare professionals into the implementation process has a multitude of benefits as a diverse group of stakeholders improves implementation outcomes in complex contexts (Bente et al., 2024). Nevertheless, not all people are equally suited and motivated to involve themselves in innovation projects. Early adopters are open-minded and more likely to embrace and sustain new technologies than their colleagues (Greenhalgh et al., 2017). Even when working with less refined, early prototype versions of an intervention, they are less likely to abandon it, enabling implementation teams to gather early feedback (Ross et al., 2016). Above this, early adopters can have a positive influence on their peers by sharing positive experience, highlighting benefits and promoting acceptance (Carpenter et al., 2018; Ross et al., 2016), thereby driving change within the organization.

Furthermore, working directly together with the future user to co-create technology has a positive effect on the acceptance of the intervention. Engaging them creates a sense of ownership, confidence, enjoyment and increased buy-in (Lapão, 2019; Ross et al., 2016). It's important to help healthcare professionals to distance themselves from their current workflow during the co-creation process (Gjellebæk et al., 2020), but this is needed to question the status quo and envision improvements (Reay et al., 2017). Acceptance is an important measurement of implementation success and describes stakeholders perception on how appropriate and tolerable a solution is (Proctor et al., 2011). It can change and should therefore be assessed at different points in time: before, during and after the new technology is implemented (Proctor et al., 2011; Sekhon et al., 2017).

3.1.3 Conclusion

The literature review revealed many things that need to be taken into account when implementing new technology, and it becomes clear that this is no trivial process. Including future users into the implementation process might increase the technology-context fit and acceptance of the clinicians. Especially working with early adopters seems to be a promising way to face implementation hurdles as they are resilient towards unrefined technology, can give feedback needed for a proof of concept and have a positive impact to their colleagues. However, literature gives no indications on how these future users should be involved in the process.

3.2 Stakeholder interviews

To gain more qualitative insights on the situation as it unfold between the Reinier and Autoscriber another set of semi-structured interviews was conducted, this time aiming at answering the following research question:

> What is the current implementation process of new technology between healthcare professionals and organizational employees of the RdGG, Autoscriber and ChipSoft?

Three groups were interviewed to gather insights (find the interview guides in Appendix A.3.1):

- **Healthcare professionals** of RdGG that are currently using Autoscriber
- **Organizational employees** of RdGG that are in some way involved in the implementation of new technology
- Employees of **Autoscriber** and **ChipSoft** that are working together with the RdGG

The interviews were transcribed and transferred to statement cards as described in chapter 2.3. This resulted in 178 cards for the healthcare professionals (combining the insights on consultation interactions discussed in chapter 2.3 and those for the implementation process), 211 for the organizational employees and 107 for the technology companies. The cards were thematically clustered, and the insights will be reported in the following chapters. Finally, they will be combined to answer the research questions.

3.2.1 Healthcare professionals

As discussed in chapter 2.3.1 the healthcare professionals received questions to both topics, the patient-clinician-technology interaction during consultations and the implementation process. For a detailed list of the participants, please refer to chapter 2.3.1. See Appendix A.3.2 for an extensive report of the interview findings.

During the conversations with the healthcare professionals, it became clear, that all of them classify as early adopters. It seems this group of people is most prone to involving themselves into innovative projects. Compared to their peers, they are more willing to contribute in early-stage pilots and their enthusiasm can lead to many interesting ideas for future use cases or features.

Concerning the implementation of new technology, one should understand that learning to use new technology needs time, as does being involved in innovation projects. With the overall time-pressure healthcare professionals face this is hard to combine with their everyday-life.

When involved as key users, clinicians think that it's important that they represent not just themselves but also their peers within the department. They report that giving feedback also takes time, and the process is further complicated by the fact that not everybody is aware how they can give feedback, or which information it should contain. Some participants voiced the wish for organizational employees or technology companies to accompany them during their consultations to better understand the context and create more targeted solutions.

Thinking about past implementations, the moment a new technology is widely introduced into a department is always the hardest moment. This can be mitigated by bringing in changes in small steps that are less disruptive. However, healthcare professionals still stress the need of initial, as well as long-term support for new technology.

There are still some struggles with the version of Autoscriber, that is currently used by the participants. Overall, it should be noted that they don't fully trust it yet, so they still take their own notes. This, together with the corrections the summaries still need, leads to healthcare professionals needing more time as opposed to actually saving time by using Autoscriber.

3.2.2 Organizational employees

A total of 7 employees were interviewed, each with a unique role within the process.

Participant number	Role
Org1	Information Architect
Org2	Communication, focus on innovation
Org3	Legal counsel, part of the innovation core team
Org4	Data protection officer
Org5	Head functional management, focus on HiX
Org6	ICT manager
Org7	Quality and safety advisor, focus digitalization & coordinator patient feedback

Table 2: *Participant list organizational employees.*

The big variety of different roles in the participants lead to interesting insights spanning the whole implementation process. Besides information about the concrete steps of the process (an overview can be found in Appendix A.3.4) the following insights have been most prominent among all participants.

Innovation is an important topic for the RdGG and driver of many new projects. However, organizational employees reported that there are discrepancies between their enthusiasm an d that of the medical staff. Many new technologies that are implemented are only used by very few, even though much time, money and work went into bringing them into the hospital. They experience this resistance as frustrating and complain that healthcare professionals don't want to adopt new ways of working, even if they would improve their workload. They would like to be able to enforce the envisioned workflows more, but are afraid that clinicians will then leave the RdGG. This situation seems very unfortunate, especially as all participants voice the importance of working closely together with the medical staff.

Another important topic is the technical complexity of introducing new technology into the existing hospital IT landscape. It's important to keep the number of different systems manageable and ideally consistent for all departments. Unfortunately, this means that not all applications that are proposed by clinicians can be adopted, which might lead to frustration. It's also very important to make sure to integrate new technology well and connect it to all other systems. This is necessary to keep the disruption it causes to a minimum.

When working together with technology companies, the organizational stakeholder value a good and personal relationship. It is preferred if the RdGG has a dedicated contact person within the company that focuses on their specific needs.

3.2.3 Technology companies

Employees of Autoscriber (AS) and ChipSoft (CS) were interviewed to gain insight of the outside perspective on the implementation process of new technology. Therefore, three sub-questions were formulated:

1. What is the current workflow of their development?
2. How do they gather feedback from users?
3. How do they help hospitals during the implementation process?

On the side of Autoscriber the product manager (T1) and the delivery lead (a combination of implementation manager and customer success manager, T2) responsible for the RdGG were interviewed while the participant from ChipSoft was the team leader R&D (= research and development, T3). See Appendix A.3.5 for an extensive report of the interview findings.

1. What is the current workflow of their development?

When looking at Autoscribers relationship to the Reinier, they stress that it is not a normal client relationship. The RdGG helped them a lot during their early development phase, and they will be their first client with which they will start the implementation process.

There are a few differences when comparing the way of working of Autoscriber and ChipSoft, especially because of the size difference of the companies. Autoscriber is still a very small company and can therefore move at a faster speed than ChipSoft. While Autoscriber is guiding their development efforts based on users feedback and wishes and focuses mostly on ensuring the LLM runs stable and fast, ChipSoft is taking more business-oriented decisions, where more potential clients means higher chances to be developed, while trying to build the integration with Autoscriber as tool-agnostic as possible to support similar LLM companies as well.

2. How do they gather feedback from users?

While Autoscriber is collecting most of their feedback through an in-app feedback button, ChipSoft works with focus groups and interviews within their CMIO network. Both companies acknowledge that correctly interpreting feedback they get from healthcare professionals is sometimes difficult, as they are missing in-depth insights into the workflow. The product manager of Autoscriber voiced his wish for their team to be able to observe consultation live to gain more insight and empathy for their users.

3. How do they help hospitals during the implementation process?

Both companies agree that hospitals are a difficult environment for technical innovation. They also agree that future users of Autoscriber will need to get an extensive training on how to use the product.

While Autoscriber relies on highly enthusiastic users to share their motivation with future users and sees their personal contact to their clients as a unique selling point, ChipSoft already has a critical mass of clients. They send them updates on new features via a newsletter, but are aware that this does not always have the reach they would hope for.

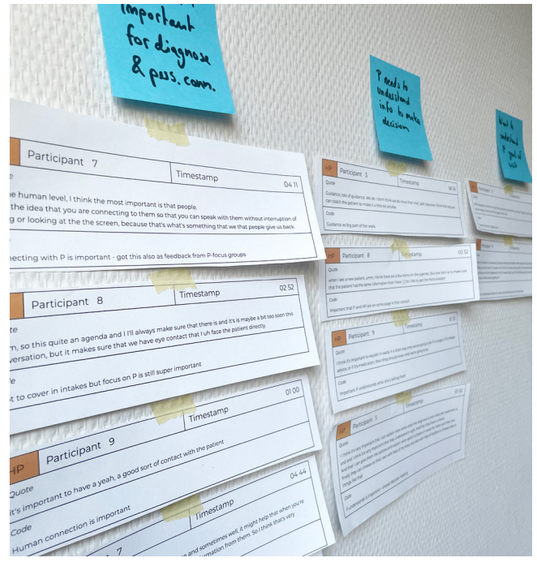


Image 3: *The thematic analysis of the statement cards.*

3.3 Implications for the service

When trying to understand the current implementation process of the Reinier and its external partners Autoscriber and ChipSoft, three very different viewpoints must be combined.

Most notable is that all parties are aware of the benefits of convincing early adopters to join innovation projects. Unlike most of their colleagues they have an intrinsic motivation to explore the possibilities of new technology and see its potential for the future. That's why they invest time and resources into helping to improve what they are testing.

Healthcare professionals that are included in the development are expected to give feedback, however, this is not as easy as it seems. There is room for improvement when it comes to communicating what "good feedback" is and how it can be given in a way that is easy and fast for the user but also easily translated into action by development teams. Surprisingly, all parties voiced a wish for developers to observe the actual workflow live, as it might help them to create better understanding and therefore better solutions. However it's collected, it's important to show users that their feedback is used and implemented, as that significantly improves their motivation to engage further and raises their approval of the final solution.

During development it's important to gather input of all health stakeholders to find consensus as needs can differ between, but also within the roles. Factors that can facilitate the use of these technologies, also by none-early adopters, are showing them positive examples, giving them a longer period of time to get accustomed to the concept, providing them with easily available support and teaching opportunities early on, integrating new solutions as well as possible into the existing infrastructure (e.g. other software) and providing researched, measurable improvements to their workflow. Small, step-by-step changes also reduce the burden as they grant the time to get used to new processes.

To facilitate good communication, not only between the hospital and the technology companies but also within the hospital, it seems having one dedicated contact person is essential and makes it easy to bring feedback and requests directly to the right place. It seems that there is a big discrepancy of how different technology companies work and what they focus on. This also differs a lot from the hospital's point of view. For a successful collaboration it might be necessary to bring everyone together to find a common ground and thereby mitigate the risk of working side by side rather than together.

Before, during and after implementation it's key to provide users with learning opportunities that can be accessed in their own time and are a fast way of learning the key features and how the technology should be implemented into the workflow. Not all users will use this as people have different ways to learn new things, but even though all current users of Autoscriber are early adopters not all of them could afford the time and effort to fully get comfortable with the software, as was already described in the interviews with the healthcare professionals. Additionally, there should be a uniform way of communicating the expected use, as this also minimizes the risks of misuse and (data) security issues.

The topics mentioned in literature like learning, communication and organizing the process were found in the reality of the Autoscriber project. This suggests that it might be useful to combine the insights and recommendations with the identified pain points specific to the context of the Reinier. In this way, the service design will have a strong and relevant basis.

4. Design direction

This chapter is collecting and assessing all collected insights to enable an informed decision about the further course of the project. The design direction was adapted to tackle the most important and promising opportunities.

4.1 Possible design directions

Looking back at the past chapters, many interesting opportunities for improvements arise, either at specific points during the implementation process or overarching the whole of it, some for single user groups, others for multiple.

One direction might be to help the Reinier to better communicate ongoing innovation projects and the possibilities to take part in them to their healthcare professionals to involve them more (Gjellebæk et al., 2020). By achieving this, the wishes and needs of more stakeholders might be captured and integrated into new solutions, the motivation to use them might be higher and more employees might be aware of upcoming changes.

Another direction is focusing on ways to communicate the benefits of new technology to the future users, as this has a big potential to increase the adoption rate (Greenhalgh et al., 2017; Ross et al., 2016; Svensson et al., 2023). This might ease the problems of the ICT department of having outdated workflows remaining within the departments and healthcare professionals will be more convinced of why investing time into learning to use this new solution will benefit them.

By better facilitating the process of learning to use new technology before, during and after implementation the adoption burden of healthcare professionals could be lowered (Gjellebæk et al., 2020; Ross et al., 2016) and organizational employees would need to worry less about possible (security) issues.

A viewpoint that hasn't been discussed in the reviewed literature is that improving the feedback process would not only benefit the technology companies, by making it easier for them to translate feedback into actions, but also the healthcare providers, as insecurities and time pressure might prevent them from sharing their experience, but their insights are needed to shape the development.

Lastly, the inclusion of early adopters or key users is a common practice within the Reinier, the technology companies and also described by literature (Bente et al., 2024; Garmann-Johnsen et al., 2020; Svensson et al., 2023). However, there is no uniform practice of how to best make use of the expert's experience. Further exploring the benefits and positive impacts key users might bring to the process could result in an improved experience for all involved stakeholders, better implementation outcomes and increased satisfaction on the side of the key users.

Phases	Need assessment	Orientation	Adaptation	Prepare implementation
Steps				
Patient	Problem influences quality of care		Experience clinicians struggles	
Key user	Experience problems in workflow Explain problem & situation	Help evaluate possible solutions Volunteer or chosen as key user	Test unrefined technology & give feedback Communicate experience to peers	Communicate upcoming changes Teach peers how to use technology
Organizational employees	Try to understand problem & situation	Define requirements for solution together with clinicians Find & chose suitable solution (in-house/market/start-ups/...) Search & chose key users	*Feedback-Loop*	Train key users Maybe give one presentations/training Connect final technology to hospital IT and define go-live plan
Technology companies	Try to understand problem & situation	Idea & development of possible solution Contact with possible clients	Pilot raw first version with key users Adapt technology based on feedback	Define go-live plan
Pain point				
Key users	**Providing workflow insights** It's hard to explain your work to outsiders and you might forget to mention things as they are normal for you.	**Limited time** It's hard to be involved during normal workdays and already existing responsibilities.	**Giving feedback** They might be unsure what good feedback is and how to give it. They should collect their peers opinion but they don't use it themselves but only hear the key users reports or see demos. **Usability of technology** Testing raw technology versions that are not yet adapted to the context needs a lot of commitment, time and effort and most times key users don't get an initial introduction.	**Prepare peers** They need to explain upcoming change to department and teach their peers. If there is no demo version available they can't get hands-on experience before to go-live and it's hard to reach every person because of busy schedules. **Given circumstances** They have high responsibilities with little guidance and this period is usually too short.
Organizational employees	**Understand problem** They need clinicians input but it might be hard to understand the workflows & they will not know if they miss important information.	**Stakeholder management** It's challenging to find a solution suitable for the whole hospital. **Finding key users** What makes a good key user and not many volunteers because of the time pressure.	**Translating feedback** Written feedback might be hard to interpret and you might loose the original message when communicating it to the technology company, what might cause suboptimal solutions. Feedback from different key users might also be contradicting.	**Teaching key users** They need to teach the key users because they should teach the department.

continued on page 34

Figure 7: *The implementation journey with the most important steps of all stakeholders and the biggest pain points of key users and organizational employees (p.32-34).*

Legend pain points: *Collaboration (pink), feedback (orange), being an ambassador among peers (blue), learning use (green) and abandoning technology (red).*

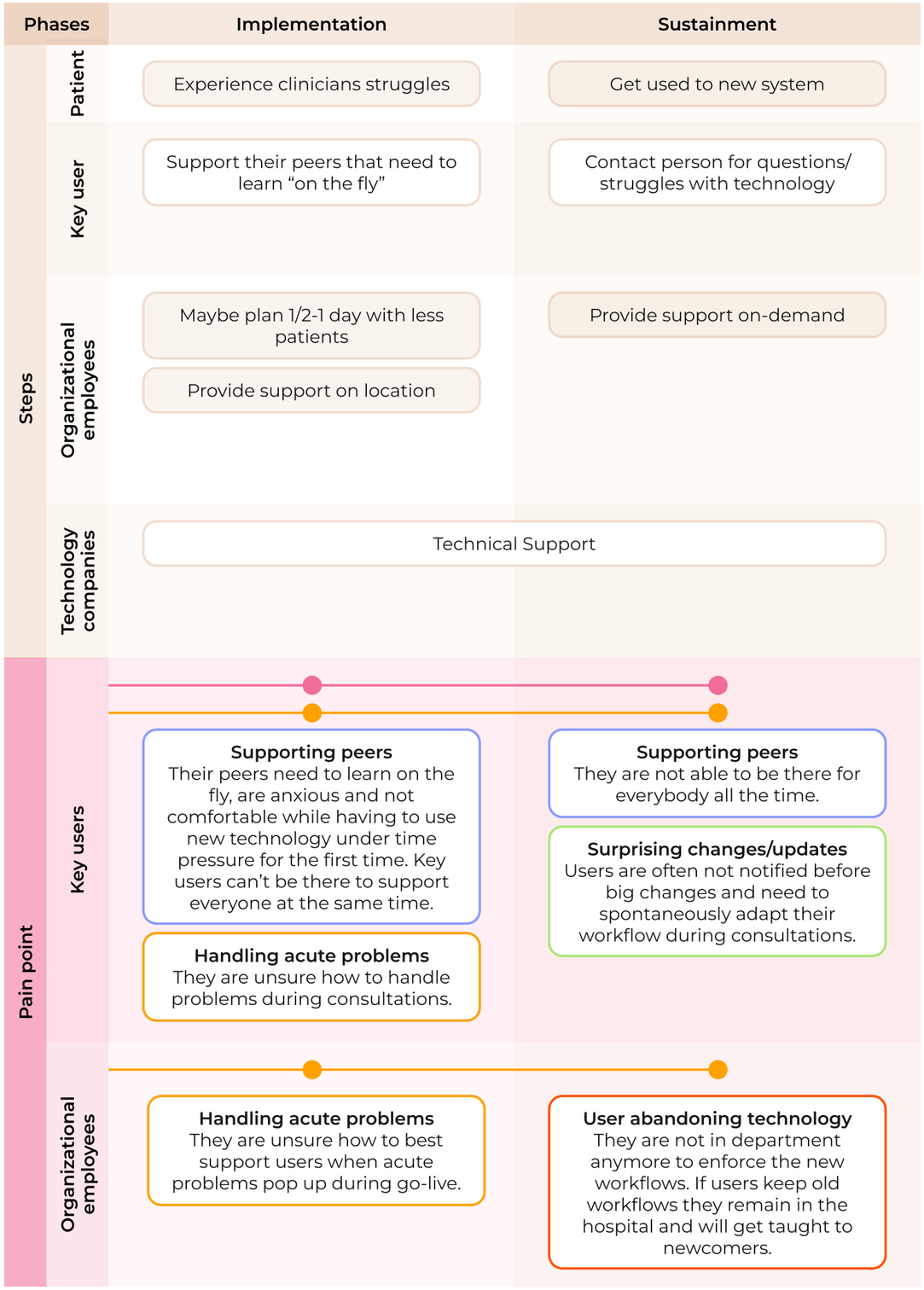


Figure 7 (continuation): *The implementation journey and biggest pain points: Collaboration (pink), feedback (orange), being an ambassador among peers (blue), learning use (green) and abandoning technology (red).*

4.2 Adapting the design direction

Each of the previously mentioned opportunities has great potential to improve the implementation process within the Reinier.

When taking a closer look at the option of enhancing key user involvement, one might notice that this could also entail the topics “communicating benefits”, “learning to use new technology” and “giving feedback”. These might all be areas in which key users could be a great way to create added value to the overall situation. Also, there are many opportunities to improve the collaboration within the Reinier to achieve a better experience for the organizational employees as well as the key users, which might also improve implementation outcomes.

As there is no “template” for the internal collaboration between organizational employees and key users, each project needs to define these relationships again. This is not only cumbersome and takes time, but also inefficient and leaves room for mistakes and shortcuts that can increase the potential for risks. By providing stakeholders with an overview of the key user involvement in the implementation process and pointing out possible barriers and how they can be mitigated, the implementation team can prepare easier and faster and achieve better results. Using the service should lead to a transformation of interaction qualities like “unstructured” and “unsure” towards a more positive experience that can be described as “guided”, “empowered” and “balanced”.

The previous design goal was adapted:

> “Design a service that can be used by the organizational employees of RdGG that guides the facilitation and collaboration with key users to effectively implement new technology together with external companies.”

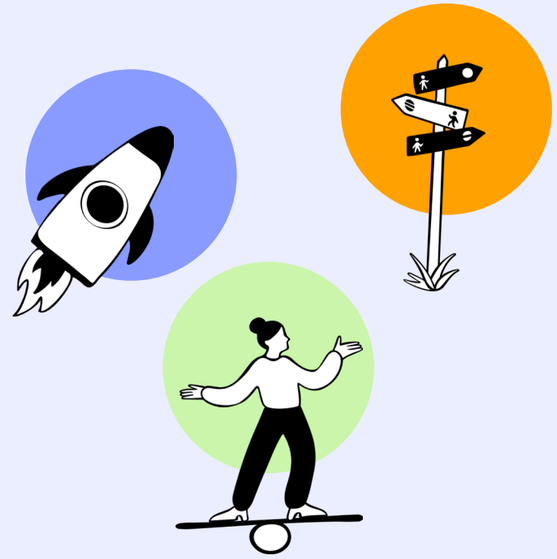


Figure 8: *The envisioned interaction qualities: Empowered, guided and balanced.*

5. Informing the design of the service

With the focus on key user involvement, additional research was needed to further specify the informational needs of the stakeholders of the future service. Through different research methods like in-depth interviews with field experts and the technology companies and co-creation workshops, the content and specifics of the design could be outlined.

5.1 Characteristics of successful key users

Since the service design is focusing on the involvement of key users during implementation, it's important to better understand who they are and what makes them successful.

Key users, in literature often referred to as champions, can be described as motivated clinical staff that either volunteers or is appointed to take part in various implementation activities, like providing feedback or spreading enthusiasm among their colleagues, with the goal of promoting the change within the hospital (Bunce et al., 2020; Miech et al., 2018; Santos et al., 2022; Siebeck & Hoving, 2024). According to Gui et al. (2020) key users work in two distinct directions: On the one hand they are communicating from organizational employees towards clinicians within their department to promote the change and on the other hand they communicate knowledge from the work floor and feedback on the technology-context fit towards the organization.

Multiple studies and reviews have been examined to explore helpful traits in implementation key users, and the overall findings can be summarized well under the six key attributes described by Bonawitz (2020). These are:

- Influence
- Ownership
- Presence at the point of change
- Grit/Resilience
- Tailored persuasiveness
- Participative and empathetic leadership style

It's important to note, that not all of these characteristics are needed to be a successful key user (Bonawitz et al., 2020). Some skills can be taught (e.g. how to be an empathetic leader of change within the department) and therefore key users groomed to their role (Bonawitz et al., 2020) while others are context dependent (e.g. if the key user is able to be physically present at the site of the change) and therefore hard to influence (Bunce et al., 2020). Having multiple key users that are working together and cover different characteristics can be beneficial for the process (Bonawitz et al., 2020; Miech et al., 2018).

However, employing key users is no guarantee for success in itself (Bunce et al., 2020; Miech et al., 2018). Each context has individual barriers that need different approaches to address them. Uncovering the tacit assumptions of stakeholders and choosing key users according to the identified needs is crucial (Bunce et al., 2020).

Lastly, even though volunteering key users might have higher ownership of the project (Bonawitz et al., 2020) appointed key users can also be just as effective, as long as they are truly convinced of the benefits the new technology provides as this is one of the most important factors for successful key users (Gotlib Conn et al., 2015).

Influence	The "ability to shape the opinions and behaviors of others". It can be divided in three different kinds:
Formal authority	Meaning that they wield authority due to their hierarchical position within the hospital or are being backed up by a person having this authority.
Informal authority	Meaning that they easily influence the behavior and attitude of their colleagues because they trust the key user's opinion and respect them.
Institutional savvy	Meaning key users are able to "instinctively navigated the social architecture and culture of their organization to overcome stakeholder resistance".
Ownership	The "feeling [of] deep personal responsibility for change efforts".
Presence at the point of change	"Possessing intimate knowledge of the people and workflows impacted by change efforts" while also making the new technology and implementation efforts visible to their colleagues and acting as a role model.
Grit/Resilience	Being persistent "in the face of setbacks".
Tailored persuasiveness	The "ability to present information in a compelling way to various audiences" depending on their informational needs.
Participative and empathetic leadership style	The "ability to elicit and validate others' perspectives" and involve them in the decision-making process so they feel heard and not forgotten.

Figure 9: *The six key user attributes identified by Bonawitz (2020).*

5.2 Expert perspectives beyond the context

As implementation in healthcare is a wide field and not just applied in the Reinier, it's worthwhile to look beyond the context of this thesis and learn from others. To learn more about different approaches to implementation three field experts were approached and asked for their experiences and learnings while a conversation with a digital scribes' company from Sweden gave insights on their approach and what was most important for them when scaling up within Sweden. Overall, it was very interesting to hear the different stories of different context which broadened the perspective and led to valuable insights for the final service design.

5.2.1 Implementation experts

Three different experts in the field of implementation were consulted and the most relevant insights summarized.

A PhD candidate from TU Delft and the LUMC in Leiden, that has experience with implementation and scaling-up technology in the hospital context, stressed the complexity of the circumstances. According to him, 70-80% of pilots are abandoned, so identifying the individual barriers and addressing them before attempting implementation is important for successful adoption. Individual stakeholders often have knowledge gaps that the implementation team should be aware of. They can be mitigated by co-creating insights together.

In the conversation with a PhD candidate of TU Eindhoven, that researched and published about the characteristics of successful key users, it became apparent that the personality of key users significantly influences their approach to their role. She pointed out that not just extroverted clinicians are suited for the job and that individuals that are more calm or pragmatic can be just as passionate about the change and drive implementation through their own approaches. There are many ways for key users to raise enthusiasm among their peers and them acting as a role model is a great facilitator.

An industrial designer and co-founder of a Dutch company that designs and implements digital shared decision-making aids shared their approach and learnings that led them to successfully implement their technology in most of the hospitals in the Netherlands. She thinks it's most important for the implementation team to understand that "implementation is more a people thing than an IT thing". They never start the process if not every single person within the department is excited about the technology and knows its benefits. If there is resistance, they try to understand peoples reasons for opposing the change and address them beforehand: "Once the clinicians are negative about it it's much more difficult to go against it" so it's important to avoid negative experiences with the technology as there might not be a second chance.

They follow multiple small steps to prepare the implementation, all with a focus on making sure that everyone is on board and involved in the process. They employ multiple people for small tasks, like reminding teams to check if a patient might be eligible for using the decision aid, thereby ensuring that single people are not overburdened, and the new workflow is normalized over time (usually six to nine months). When teaching the department how to use the technology, they rely on interactive workshops and short summaries with helpful tips and even example sentences for a variety of situations to keep the initial barrier as low as possible. In regular check-ins with the hospital, they use the usage data reports as conversation starters and to give individualized tips based on experiences in hospitals with similar issues. It's important to understand that the overall implementation process takes time and that the main focus should be on the people and trying to understand why they act as they do, which is a key skill of designers.

The insights collected in the conversations with the implementation experts suggest that the service design should focus on the human part of implementation as this is the key to identify barriers and finding successful key users. The approach followed by the decision-aid company can be taken as a best practice example and inform the design of single steps of the service.

5.2.2 Digital scribe company from Sweden

When speaking to the company from Sweden, that offers a comparable product than Autoscriber, the conversation was mostly about their key for successfully implementing in many private and public hospitals in Sweden. Their most crucial points were interactive onboarding sessions for users that include role-playing to gain hands-on experience while in a safe and guided surrounding. In this context they also ensure that the technical setup in each room is in order to avoid surprises on the day the technology goes live. As soon as the digital scribe is implemented, the company is available via chat or a support hotline to ensure quick help without the organizational employees of the hospital as a middleman. They, too, have regular follow-up appointments with their clients and follow the developments of the usage data. One of their learnings over time is that the person that initiated the implementation within the hospital can feel proud for successfully bringing in this new technology. These people will voluntarily stay in charge of it long-term.

5.3 Co-Creation workshops

To gather the wishes and needs of the stakeholders within the Reinier that will use and benefit from the implementation service co-creation workshops with the two different groups were held: One with the key users to pinpoint the responsibilities they would like to have during implementation and the support they would like to get from the organization. The other one with organizational employees to review the wishes and needs of the key users and discuss how the implementation team can achieve a positive and productive setup for all stakeholders.

5.3.1 Key user workshop

At three different dates a one-hour workshop was held with two physicians, a specialized nurse and another physician that are all currently key user for Autoscriber. Before the workshop, they got a small sensitizing prompt via mail to list all problems they have experienced while being a key user.

The workshop setup followed the path of expression (figure 10) by first talking about the present situation (1), then reviewing and reflecting on previous experiences (2 & 3) before starting to envision a desirable future (4). Following this path enables participants to express their tacit knowledge (E. Sanders & Stappers, 2012).

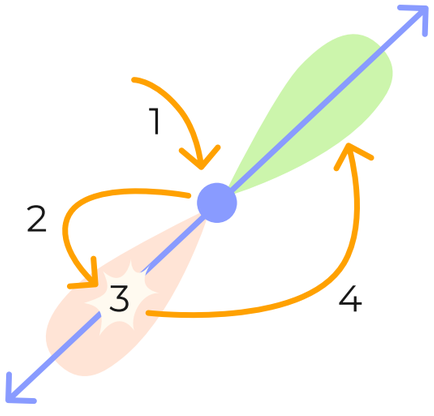


Figure 10: *The path of expression (adapted from Sanders and Stappers (2012)).*

First the researcher presented the implementation phases and highlighted the current status, then the identified pain points were summarized and explained. This was followed by an envisioning exercise and a scenario of the future was read to the participants while they were asked to immerse themselves into it (see Appendix A.4.1). The story prompted them to list the responsibilities of key users and the support they get from the organization. After hearing the scenario, the participants discussed their opinions and came to a consensus, which concluded the workshop. A thematically adapted version of this setup was piloted with a group of four chemical lab technicians to ensure the chosen methods and time schedule worked well. All sessions with the key users of the RdGG were recorded and transcribed and the resulting insights collected and thematically clustered.

All participants mentioned the same list of responsibilities for key users:

- Testing the new technology
- Giving feedback
- Motivating colleagues within the department
- Support their peers

The only deviation from the expectations the organizational employees listed in previous research is that healthcare professionals only want to help to prepare the teaching sessions and not be responsible for it on their own.

When discussing the support from the organization, different insights came together:

1. A well-structured implementation team with good communication:
   - Key users value having an implementation team with clearly communicated responsibilities and roles for all members. This way everybody knows who to contact for which problems (having a single contact person streamlines this process) and there is a team lead that supports them if needed.
   - Informing the key users about their responsibilities, the goal of the implementation and the expected timeline of the project when recruiting them is a good way of managing expectations. Seeing an overview of the phases with a short description about each phase entails have been pointed out as very helpful by all participants.
   - Giving regular (short) updates about the progress, how feedback is used and when new updates will arrive in the technology helps to keep the key users, and therefore also the department, informed. Even though clinicians get many E-Mails this is still the preferred medium as long as the update doesn't exceed a certain length ("If I need to scroll down it's too long") and meetings should only take place to discuss more complicated matters, for example when feedback from different key users is very contradicting.
2. Accounting for key users' involvement and helping them to focus on their tasks:
   - Key users should have a time allocated during their week to fulfill their responsibilities. In this way, they do not need to do it in their personal time.
   - The technical setup needed for the technology should be checked and ensured by organizational employees. Depending on the project this might include things like setting up accounts, testing cameras or ensuring that each room has a microphone available.
   - If the testing of the technology needs certain organizational circumstances like being in a specific office or a certain way to organize shifts, then this should be communicated to the person responsible for the planning. Often the head of the department can help to organize these formalities, as they might have more authority than the key user themselves.
   - Organizational employees and key users should determine together if there are steps of using the technology that don't necessarily need to be performed by the healthcare professional. This might be things like collecting informed consent from patients or similar. In the case of Autoscriber for example, clinicians need to ask for consent before starting each consultation, therefore losing valuable time to administrative tasks in an already tight schedule.

3. Learning to use the technology:
    - » Before key users start to test the technology, they should get a thorough introduction to it. This ensures that they know the intended way of working, don't miss out on features and can better evaluate how it needs to be adapted to fit their workflows. It also prevents negative feelings like frustration or being overwhelmed, which can occur when users are left alone with an unknown technology.
    - » Key users expressed the wish to talk to other key users and exchange ideas, thoughts and experiences about working with the technology. They can help each other by sharing tips and tricks and co-create an improved way of working that all future users will benefit from. Depending on the situation it might therefore be wise to employ multiple key users per department and/or connect key users across departments.

Image 4: *Especially the healthcare professionals found the overview to be very helpful and took a photo after the workshop.*

Image 5: *The visual cues used during the workshops: The implementation phases (upper row, see figure 7 in chapter 4.1 for reference) and the most common pain points experienced (small statements explaining single pain points, big images clustering them thematically).*

5.3.2 Organizational employee workshop

Another one-hour workshop with two organizational employees, one quality and safety advisor and the ICT project manager for Autoscriber, was held after completing the key user workshops. Before the workshop they also got a small sensitizing prompt via mail that asked them to write down their definition of a key user and which responsibilities they assign them.

The setup of this workshop, also followed the path of expression (as described in 5.3.1). First, the prepared definitions of key users were recapped and combined, then, similar to the previous workshops, the researcher gave a quick overview of the implementation phases and common pain points. An adapted version of the envisioning exercise (Appendix A.4.2) was used to prompt the participants to describe the support the organization will give key users in the future and how they achieve this. The session was recorded and transcribed, and the resulting insights collected and thematically clustered.

Both participants had given a fairly similar definition of key users. Most importantly, they act as a bidirectional contact person between the organizational employees and the department they work in. They are a real user with deep

knowledge of the workflows and department itself and can therefore test the new technology and give relevant feedback for its adaptation. With their use of the new technology, they act as a role model for their peers, have a positive influence and spread enthusiasm. They also support their colleagues with learning and using the new technology. The organizational employees keep the key users informed about upcoming changes etc., even after the implementation, so they can answer questions that might arise within the department.

The envisioning exercise triggered a deep conversation about the relationship between organizational employees and key users, as well as the working relationship between the RdGG and Autoscriber and ChipSoft. This led to three main insights.

1. The organizational employees don't feel like they are lacking support to their key users, but there also seems to be a deep routed believe among them that most healthcare professionals do not want to change the way they are working but rather go back to "how they worked 30 years ago" and continuously find excuses to prevent innovation attempts.
2. From the viewpoint of the organizational employees the currently biggest struggle is a lack of structure within the collaboration with the technology companies and not the cooperation with their key users. Coordinating three different stakeholders with different goals and communication needs is a challenge and they miss a person that has a good overview over everyone's progress. They also stress, that this project is very atypical. Implementation has not yet started in their opinion, as they are still just working on a pilot and the development of the technology. Usually, RdGG is implementing technology that is already fully developed. Another big difference is that Autoscriber has direct contact to healthcare professionals within the hospital, as they get connected via current users. This way they can provide them with access to the trial version of the technology without the knowledge of the organizational employees. The trial version is a stand-alone version that is not integrated in HiX, the electronic patient record. However, the only version that is officially supported within the Reinier is the integrated-version that has a significantly different usability, not the trial version. This also leads to the last insight:

Image 6: *One of the co-creation workshops with healthcare professionals.*

3. Most current users within the Reinier are voluntary trial users. They are not in contact with the organizational employees, and they don't know who is currently using the trial version, so the only support these users get (if any) is from the other clinician that referred them. The organization has neither overview nor control over this situation and was not aware how big this user group became and what problems this might create for the future implementation phases of Autoscriber. They were really worried and looking for a way to gain back control.

5.3.3 Implications for next research steps

Conducting these workshops led to one significant insight:

All healthcare professionals that have participated in research activities so far are voluntary “ghost” users and not official key users.

This created a bias in the findings, as they obviously experience the current process as unstructured and not well-supported because there are neither structure nor support. Many people were very interested and motivated to try Autoscriber for themselves, so they got access to the trial version. The size of this group of ghost users grew over time and without the organizational employees knowing. However, unsupported access to a technology that isn’t yet fully developed bears certain risks:

1. If users aren’t well introduced to a technology and do not have access to support when they encounter problems, they might start to feel overwhelmed and anxious and stop using it. In the future it will be very hard to convince these clinicians that the technology is easy to use and will benefit them and they might even spread their anxiety among their coworkers.
2. An unstructured spreading of users might lose the project its momentum. Interest and enthusiasm are highest when first introducing the new technology but go down over time if there aren’t any relevant further steps taken (e.g. moving from the adaptation to the preparing implementation phase). One physician described this during the co-creation workshop: “I think when you start with it, everyone is enthusiastic: ‘Ohh, what is it and how do you like it?’ ...and well, no one is asking me about it anymore and I sometimes forget to use it myself.”
3. The users might develop a frustration towards the organizational employees because they don’t support them, even though they don’t even know about their existence. They might also be annoyed about not getting any information or updates.

Under the current circumstances, it seems most promising to help the RdGG to get back in control of their internal situation and then create a long-term plan for the collaboration with internal stakeholders and external technology companies, as this doesn’t currently exist. Based on all collective insights, this thesis can give recommendations to aid with the issues currently present in the Autoscriber project, like how to deal with ghost users and improving the collaboration with the other stakeholders. The final service design can suggest a future setup that helps organizational stakeholders to plan their implementation projects. This should entail recommendations for all phases, for example how to find suitable key users and what is most important for their efficiency, how to prepare the departments for change and what is needed to successfully sustain the use of the technology on the long-term. It should also give recommendations on facilitating the collaboration with external partners to ensure things like effective communication, efficient feedback loops and the co-creation of the teaching sessions.

5.4 Technology companies’ perspectives on the collaboration

During informal conversations with people from both technology companies, their view on the current collaboration as well as their thoughts about the future implementation were captured to be able to include different perspectives into the final service design. Both companies had just joined the outpatient clinic of a key user to observe how the technology is used, and it was interesting to see how this influenced their perspective on the project. The insights were used to reflect on the requirements on the service.

5.4.1 Autoscriber

The delivery lead from Autoscriber noted, that seeing the LLM being used live changed the company’s view on the project. They adapted their planning for the future teaching of users before implementation, because they noticed that key users weren’t aware of all shortcuts and that there are a lot of tips and tricks that they can give them to enhance their user experience. They also decided to frame their trial version differently. Seeing the differences in workflow and time-savings between the standalone version and the integrated-version, they decided to stress that the standalone version is only a “sneak-peak” to get an idea of the benefits of Autoscriber. They want to make sure future clients do not mistake it for the final product and will also only grant access to it for a limited amount of people and a short trial time.

When asked about the upcoming implementation, they stressed that it’s most important to have good key users within the departments that can spread the enthusiasm and prepare their peers. However, they acknowledge that they are unsure what defines a good key user. For now, their only requirements are that they have time to be a key user and are able to speak for their peers and have some sort of authority within the department to promote change.

Looking at the collaboration between the parties, they see it as a unique situation. Now they are working on the integration together with ChipSoft while also piloting with real users in the Reinier, this will not be the case for future clients when the integration is completed. This experimental setup is very informative for their way of working with future clients and they had many learnings. The biggest struggles that needed to be overcome are working with three parties that do not have the same focus (while the technology companies currently focus most on technical stability and the general setup the Reinier as client focuses on usability and medical correctness of the output) and finding a common way of communication. It’s crucial to find a setup that suits the (information) needs of everyone to create a base for the collaboration.

5.4.2 ChipSoft

Two developers and the team lead R&D from ChipSoft were happy to get the opportunity to see the technology used live and to see the positive impact the LLM has on the clinician-patient interaction.

They are content with the current way of communication and value having short contact ways to both, the Reinier an Autoscriber. Having highly enthusiastic key users in the team helps to drive the development by providing feedback and giving insights into the real usage situation.

For ChipSoft it's clear that for the final implementation the Reinier and Autoscriber will take the lead while they will take a backseat, as Autoscriber will need to facilitate the learning process of the users and the RdGG needs to prepare the departments. In their opinion it's most important to have a realistic planning of the implementation and not going too fast. The technology is still very new, and they will for sure encounter unexpected barriers. This is also why it's important to keep the key users closely involved and provide them with an easy way to give feedback. They also stress the need to find well suited key users that are able to spread enthusiasm: "There is nothing that works better than seeing it for yourself, seeing the advantages." (team lead R&D). Lastly, they advise preparing users well and provide sufficient teachings before implementation.

5.4.3 Implications for recommendation on collaboration

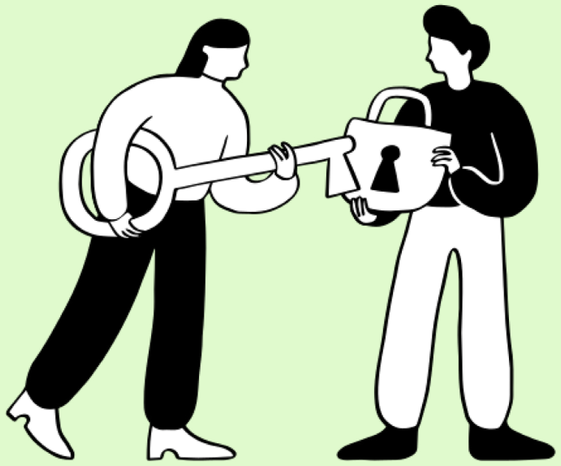
As we can see, observing the live use of the technology can stimulate deeper reflections not just on the product but also on the process of implementation. This is beneficial for the adaptation and collaboration and might therefore be a best practice also for future collaborations with different companies. It can also bring valuable insights for the teaching of all future users before implementing the technology in the whole department and it seems beneficial to promote a collaborative approach to creating these teachings. If key users and technology companies work together, they can ensure teachings to be realistic and context-sensitive.

To ensure good collaboration between all stakeholders, it seems to be important to be aware that companies might have a different focus and communication needs than hospitals. It is vital to foster open communication about everyone's needs and wishes, while also providing insights into why these things are important. This can help to find a way of working that suits all parties.

When it comes to the implementation process, all stakeholders highly value the involvement of key users but also see the need to choose the right people for this position. Giving direction and guidance on this topic is therefore valuable for everyone.

5.5 What this means for the design of the service

When designing the implementation service, many viewpoints and different needs should be considered. All parties acknowledge that the involvement of key users is an integral part of the implementation but don't have fixed parameters that help them find the right people. The service should therefore guide them in this choice and provide information on how to ensure the right conditions for effective collaboration. It is also evident that clear communication is needed between the companies and the hospital, but also within the hospital between organizational employees and key users. The service can provide an overview of these touchpoints and recommend certain actions to promote collaboration based on the combined findings of this thesis. However, some issues that are barriers in the current situation are specific to the adaptation of Autoscriber because the technology is still in active development. The research findings also enable us to give recommendations for this situation, and the implementation service should take the differences into account that occur in projects with well-developed technology vs. those in which it is still in development.



6. Designing the implementation service

This chapter describes how the research findings come together step by step to form the final design. It covers the early-stage ideations and explorations and describes the iterative process of adapting the content and visualization of the service design. Finally, it concludes with a detailed description of the final implementation service design.

6.1 Ideation throughout the research

While conducting different forms of research and generating insights, ideas for possible solutions and the form they might take emerged. The most promising directions found their way into the various iterations of the service design.

Especially literature research and interviews with different parties sparked many ideas about which content and information are important for which stakeholders. Many sources stressed the importance of the same or similar things, so including these into the service seemed only natural. This information was collected in lists and regularly updated.

Sketches of different scenarios and pain points were made to explore their value in creating empathy in the parties that didn't experience these issues and drafts of system maps were used to explore the difference between expected and actual situation within the Reinier after the co-creation workshop with the organizational employees.

There have also been thoughts about the pros and cons of varying forms of delivery. Of course, an app would be suitable to give an interactive overview of the context while at the same time being able to zoom in on specific situations and thereby giving recommendations on different levels, but the cost and time needed to develop such an app would not be in proportion to the value it would bring.

Books and folders might be able to have similar abilities to show different levels, even though they are less engaging, but when read once the risk is high that they disappear into a shelf never to be seen again. The same could hold true for a toolkit or card set. A poster however has the benefit of staying present in the working environment of organizational employees and might be consulted more often but at the same time the designer faces a tradeoff in level of detail and readability.

Moving forward from here, the idea of a poster that stays visible in the context of the user was takes as a starting point. Ideas like the setup of the implementation phases were taken from the research phase (figure 7 in chapter 4.1) and combined with the insights and recommendations gathered in the different research activities.

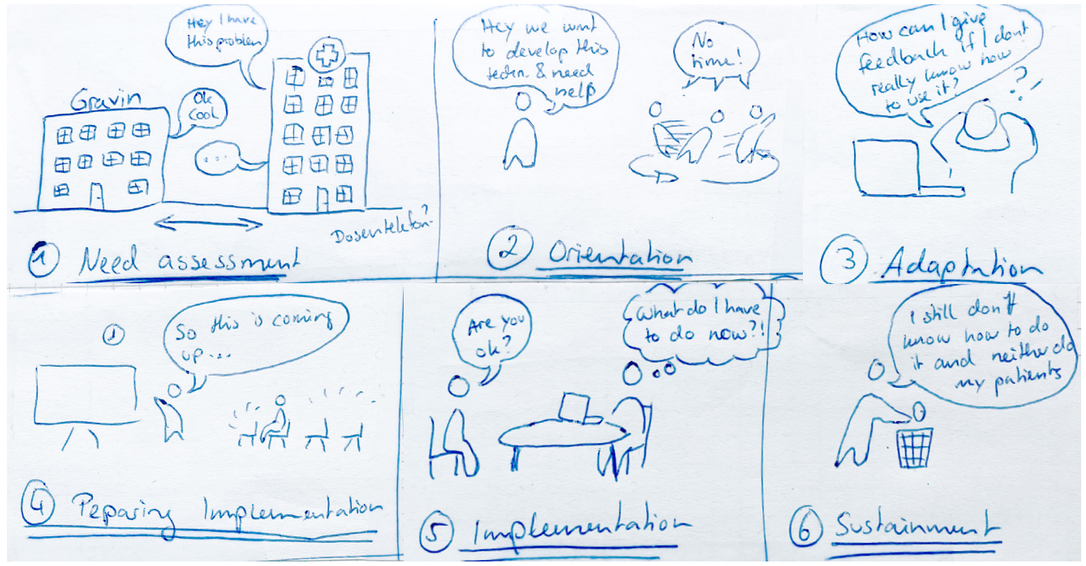


Figure 11: *Sketches of different scenarios used during ideation.*

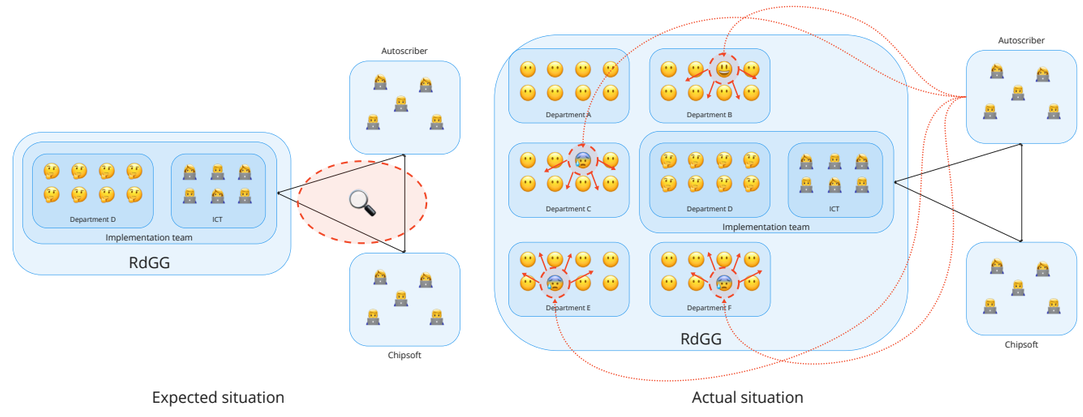


Figure 12: *System map attempts to compare expected and actual situation and explain risks of ghost users.*

6.2 Design iterations

This chapter summarizes the different iterations on the way to the final design of the service. Each cycle consisted of multiple iterations and was conducted with a different group of experts. For the evaluation visual stimuli like diagrams, sketches and prototypes (first low then high in fidelity) were used to enhance the quality of participants feedback as it's easier to talk about concrete things than abstract ideas (Crilly et al., 2004, 2006).

6.2.1 First cycle – Distribution of responsibilities

The first cycle consisted of quick iterations on the responsibilities during the implementation process and their distribution among the stakeholders (organizational employees, technology company, key users, non-key users). A diagram was used to paint an overview and the connections between all parties. Items were loosely clustered thematically, but not sorted by phases (see Appendix A.5.1). This cycle was aiming at laying a foundation that all parties agree on, and it was evaluated together with a representative of the organizational employees, technology company and key users.

The key user (ER physician) fully agreed to the overview, found it to be complete, and had nothing to add. The organizational employee (ICT project manager for Autoscriber) was struggling a bit with the level of abstraction that was chosen. The fact that responsibilities have not been ordered in phases raised some questions that could be answered in conversation. Some minor additions and modifications were made to the overview. The employee of the technology company (delivery lead) as well mentioned the abstraction level as a bit confusing and was missing a clear integration into a timeline. The need to clearly define who is part of the group "organizational employees" came up and was considered in later iterations, otherwise he found the overview to be complete.

The overview with its slight modifications and the learnings of this cycle have been foundational for all following design iterations.

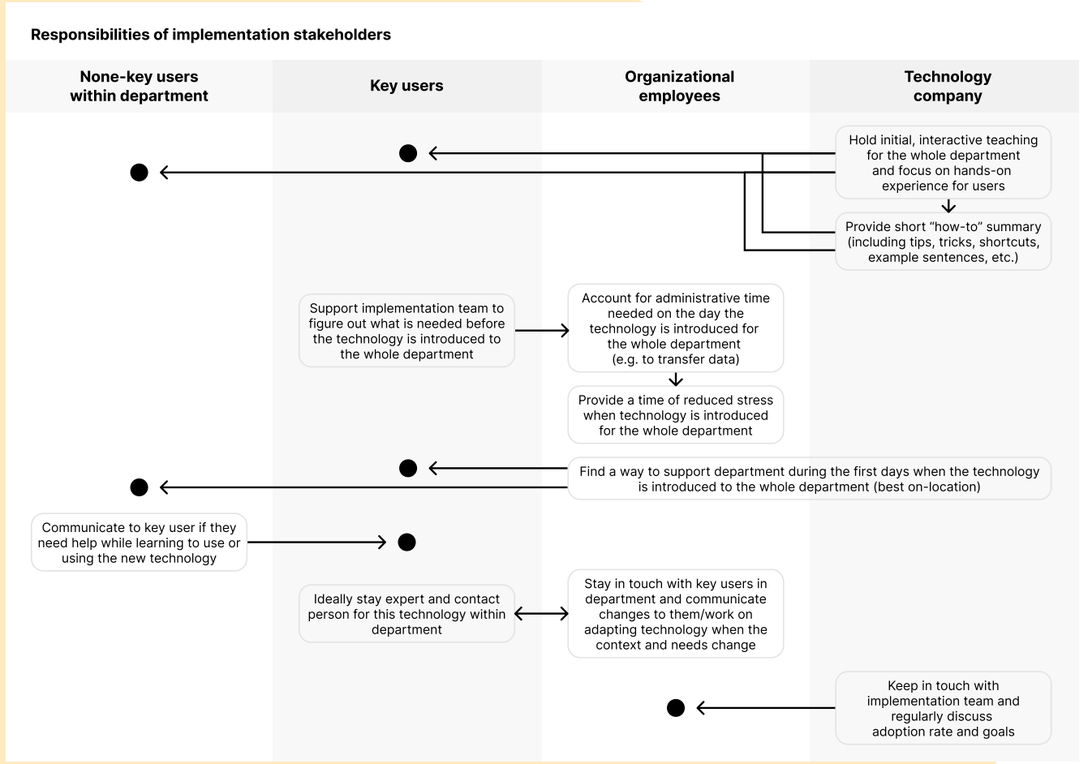


Figure 13: *Example pages from the list of responsibilities used during the first cycle (p. 52 & 53).*

6.2.2 Second cycle – Form of the service deliverable

The second cycle focused on the form of the final deliverable and the way it visualizes the information. Two iterations were made, the first with a design in healthcare professor from TU Delft and the second with a group of Design for Interaction master students, also from TU Delft.

The first iteration used a sketch of a poster format showing the implementation process. In the top the different phases were listed, together with the steps taken during these phases. Underneath it listed the stakeholders' responsibilities, proposed touchpoints and deliverables as well as barriers and facilitators of each phase.

A printed version of this poster was used as the basis for the discussion. Some limitations already emerged while creating the version used for the evaluation: It was hard to find a good balance of detail and readability as a lot of knowledge should be included in this deliverable, not all of which was also confined to only one phase or not tied to phases at all. It already seemed hard to solve these problems using only a single deliverable. These limitations were taken as conversation starters to identify where they come from and how they could be resolved.

The limitations identified during the conversation are that it proposes a big challenge that there currently doesn't exist a visualization format (e.g. service blueprint, journey map, etc.) that covers the needs of this project, so a new visualization needs to be created if a poster is the final goal. It was also confined to only one phase or not tied to phases at all. It already seemed hard to solve these problems using only a single deliverable. These limitations were taken as conversation starters to identify where they come from and how they could be resolved.

The conversation resulted in a couple of interesting ideas. The main goal of the deliverable is to give an overview of the whole implementation process and point out key moments plus action recommendations for risk aversion and a better implementation experience and therefore better implementation outcomes. Keeping this in mind, it might be more fruitful to focus on milestones and decision points of the process rather than the phases. This could help organizational employees to determine which preconditions need to be met before moving to the next step. It would be possible to still present the main overview as a poster but accompany it with a booklet that zooms in on the different milestones and provides collected insights and recommendations in a more detailed and actionable way. These descriptions should evoke empathy for the situation and point out possible risks, so the implementation team can better assess the situation at hand.

These ideas were used to iterate on the poster and sketch a version with two separate deliverables: a poster to give an overview of the process and its milestones, and a booklet that zooms in on the necessary steps that need to be taken to reach these milestones.

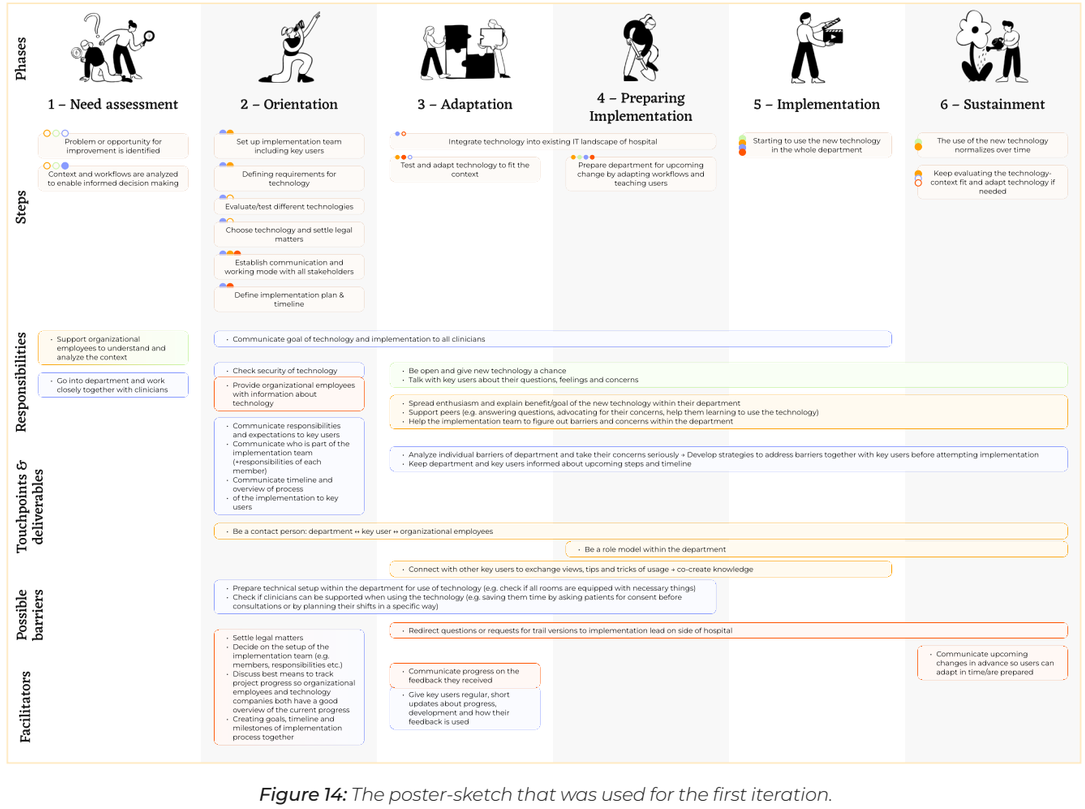


Figure 14: *The poster-sketch that was used for the first iteration.*

Going forward, the second iteration used printed out versions of the suggested poster – book combination, again in a sketchy, low-fidelity look. The poster shows the implementation phases, a timeline, the milestones and the steps towards them. Each step refers to the chapter in the book that discusses it in detail. The title and timeline of the poster can be filled in per project, and stickers of flags on the timeline can be used to indicate at which point in implementation the team currently is. For the book, only an example page was shown. In the top you can see in which phase the current step is located, under the title readers find the stakeholders involved in this step and then finally different focus points and recommendations per point.

The group of students was asked to provide feedback on the following questions: Is there a clear connection between poster and book, and do the usage cues need to be enhanced to promote use side-by-side? How well given is the readability, and do the chosen zoom levels for each deliverable make sense? What are their general thoughts about the chosen design elements and layout?

Compared to the first iteration, significantly fewer limitations were identified during the conversation. It was pointed out that the use of color can be confusing as orange, for example, is used for the steps but also to identify "key user" as an actor in different steps. The linear timeline and flags along the path promote a view of a process with "one step after another" when in reality steps might run parallel or change order completely, depending on the needs of the project. Future iterations should therefore promote a more fluid process that can be individualized.

Not exactly a limitation, but rather a question that was raised is 'Who is in charge of the poster?'. It might be worthwhile to give guidance on who should use which deliverable in which way to achieve the best outcomes.

The discussions resulted in further insights how the design can be improved. Overall, it might be easier to use icons instead of points to reference the acting stakeholder, this might increase readability as one does not have to refer to the legend all the time because the colors don't have an inherent connection to the stakeholder. For the poster, it might be interesting to explore the option to print on a material that can be written on with non-permanent markers. In this way, you can use the same poster for many projects, which is more sustainable. It might also be helpful to use exact page numbers instead of chapters. The use of concrete examples in the book might help users to have a better idea how to get started. In cases where this is not possible, concrete reflection questions could help to find the first step. In any case, the book needs to be well-structured. It should include an introduction and guidance how to use the poster and book combination, as well as a chapter defining each stakeholder group and the different roles they might take. Adding space for personal notes and learnings will increase the individual value of the book over time as it grows richer and more relevant to the context.

All these ideas were used while transforming the initial low-fidelity sketches to a high-fidelity prototype for the third cycle.

Image 7: *The group of students discussing the sketches of book and poster.*

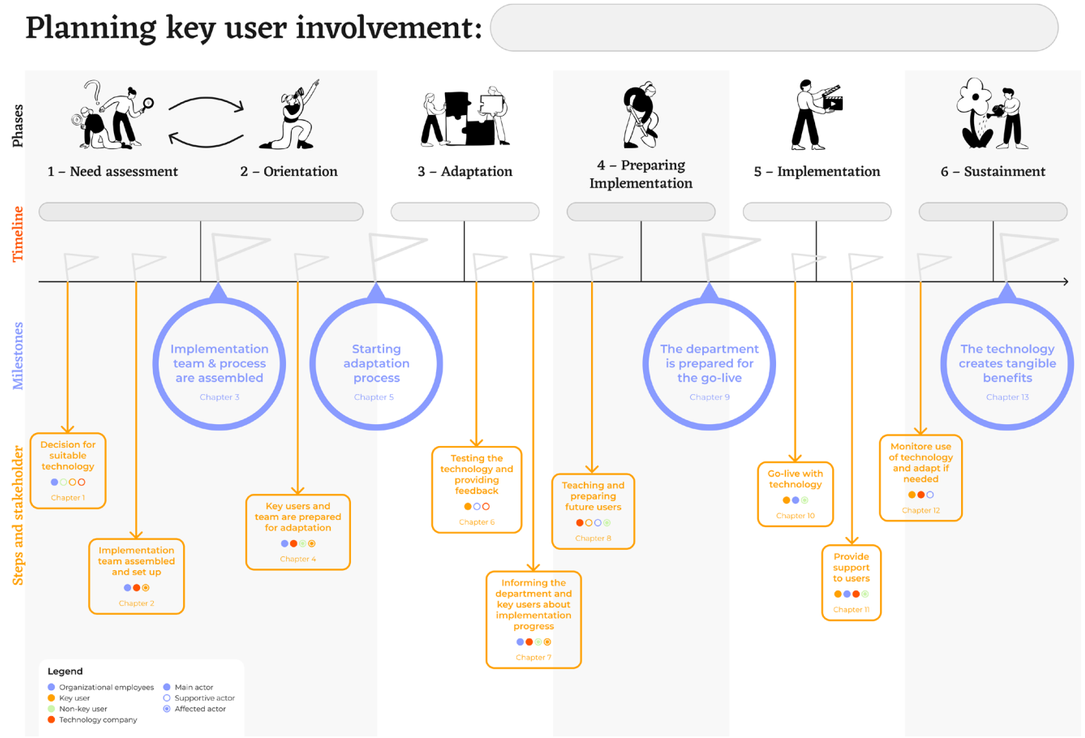


Figure 15: *The sketch of the poster used for the second iteration.*

Figure 16: *The sketch of the book used for the second iteration.*

6.2.3 Third cycle and final evaluation – Bringing it together

The third and final cycle was again evaluated together with representative stakeholders of the context, an Autoscriber (ghost) key user (as discussed in 5.3.3) from the urology and a non-key user from the ER department of the RdGG, the ICT project manager for Autoscriber as an organizational employee and the delivery lead of Autoscriber representing the technology company. The focus of the evaluation was both on the content and the form of the design.

The organizational employee and technology company were shown a digital representation of a high-fidelity prototype of the poster – book combination as the meetings were taking place online. The poster again showed the phases (with a short description), milestones and required steps with references to the pages in the book. The fillable fields (title, timeline) were kept while the flags were removed. The prototype of the book consisted of a cover, an introductory chapter (how-to, introduction to phases, stakeholders and roles), the overview page of the first milestone and one example step towards this first milestone (see Appendix A.5.2 for all pages).

As key user and non-key user will not be using poster and book, but will only be indirectly affected by them, a scenario was chosen as the most suitable way of evaluating the design. The scenario was shown using a presentation walking through the most important touchpoints they would have with the service. You can find the full scenarios for both groups in Appendix A.5.4 (key user) and A.5.3 (non-key user).

The key user was asked three questions after seeing the scenario. First, to identify the biggest differences between the scenario and the implementation of other technology in the past. Second, if they would sign up as a key user if a new project would follow this approach and third, if they would then feel well-informed and enabled to fulfill their responsibilities.

The participant was very happy with the overall scenario, especially the fact that they would get a timeline and that the project would be more goal driven than is currently the case. Other than that, the fact to always know who to contact in case of problems, information on how to give feedback and then getting feedback on your feedback were standing out to the key user. They like the fact that the design is giving the implementation team a checklist that they can use to see if they really thought about everything. When reflecting on their current position, they realized that they have never talked about their Autoscriber experience with their peers. Mentioning it as a key user's responsibility in the beginning of the project was therefore seen as helpful. Also, on this day, they were in a room without a microphone and couldn't use Autoscriber. Hearing that the implementation team is also reminded to check the technical setup of the department before the adaptation phase was therefore well appreciated.

The participant was also giving some perspective on some specific points. In their opinion it's not worth the effort to actively try and schedule key users in the same department during the same times to help them exchange ideas. This might overcomplicate things and is unnecessary as they regularly speak to all people within their department. "That's the thing in the hospital, you just cannot schedule everything." However, meetings with key users in other departments might be interesting, as that doesn't occur naturally. Furthermore, the interactive role-play during the teaching session could be voluntary in their opinion. This thought seems understandable as the participant is highly tech-savvy themselves.

Even though they liked the level of involvement of the proposed process a lot, they also stressed that it should keep a good balance. If it leads to too many meetings, it will slow down the process and decrease key users' motivation.

The overall opinion of the key user was very good, and they would love to see their involvement in the Autoscriber project evolve towards this process. The points that were discussed were taken into account when writing and reformulating some of the book's texts.

The non-key user was asked to identify the biggest differences between the scenario and what they experienced in the past as well. They should also describe the interactions they would envision themselves to have with the key user.

Just recently, a new technology was introduced to the ER department. The clinicians did not get any introduction, instead a manual was sent by mail and a printed version left in one of the offices. Since its introduction, only few healthcare professionals have used it. The participant used this case to compare it to the suggested service, and what stood out most was that it takes an approach with much smaller steps and a well communicated timeline. These give each healthcare professional the chance to get comfortable with the idea of the upcoming change, allow for more learning time, and overall focus more on the adjustment period needed by the people. They also found it to be a very complete approach. "It's an all-around package."

The participant stressed that they need to see the benefits of the technology for themselves before they trust that it will be able to help them. They have been skeptical if organizational employees pitched technology in the past. "When they tell us they found a solution, I think 'Yeah, I've heard it before'...First I need to see it, and then I believe it." This is why it positively stood out that a person from inside the department was involved as a key user. In this way, they can trust the technology-context fit more from the start.

In order to feel the need to talk with the key user and ask them questions, the non-key users need to know what is going on, what the technology is and why it should be implemented.

Important traits of key users are high work experience, that they are energetic, motivating and take the group along (which might be easier for an extrovert, but also an introvert can be convincing over time) and that they are able to help their peers and explain the technology well.

Based on the insights gained in this evaluation, it was made sure that the content of the book is well reflecting these points.

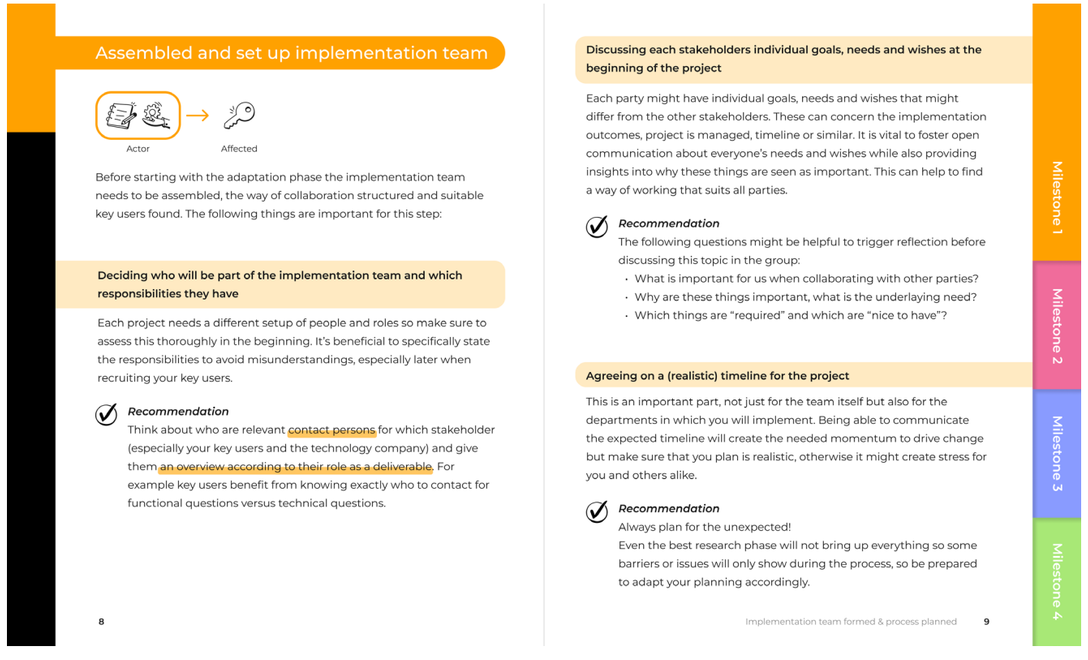


Figure 17: *An example page of the book that was used for the final evaluation session with organizational employee and technology company.*

The technology company participant was asked about their thoughts about the proposed milestones and how they would use the design when starting to work with a new client. They were also asked for problems they encountered in the past that could (not) be solved by using this service.

During the discussion, the most positive things about the current iterations were that the participant felt that the milestones help to break the complexity of implementation down to a manageable level. The layout of the book supports this and helps to quickly find your way around. It's also good to separate overview and detailed information in two separate deliverables. The connection between poster and book was experienced as straight forward and clear: "I think it's very good to have the page number there, so when I have any question, I know where to look and clarify." The interactivity with the re-writable poster was highlighted as especially helpful, as it adds a certain level of playfulness without undermining the educational value. At the same time, it also promotes a more flexible view on the process and encourages adaptations of the timeline. Following the recommendations inside the book would help them to prevent the known problem of key users that are unsure what their role entails, and which tasks fall into their responsibility.

Some phrasings of milestones and steps seemed a bit vague for the participant. However, as the connection to the book is clear they also knew how to look for more specifics and they would be satisfied as long as the information provided in the book is precise enough to take action. The participant stated that when they would want to use this service with a new client, they would break down the content of the poster for the first meetings so to not overwhelm clients that might not be very familiar with the implementation process. Once they feel more confident the team can start working with the full poster, use it in collaborative meetings to check their progress and the hospital will get their own copy for reference. The technology company sees their job in guiding their client to use the poster – book combination effectively. Nevertheless, even though the focus on key users is an important one, it is not the only thing important in implementation, this should not be forgotten. The service also envisions an ideal process that will not always be viable for company political reasons (in the hospital, the technology company or both).

Based on the findings of this conversation, the information given in the introduction chapter of the book was revised. It now stresses the fluidity of the process more and ensures readers that it's normal and okay to change the timeline or go back and forth between the different phases if needed. It also stresses that it just covers the key user involvement and that more things are needed for successful implementation outcomes, as well as the importance to take politics into account and use the reasons given by the book to convince opposing parties.

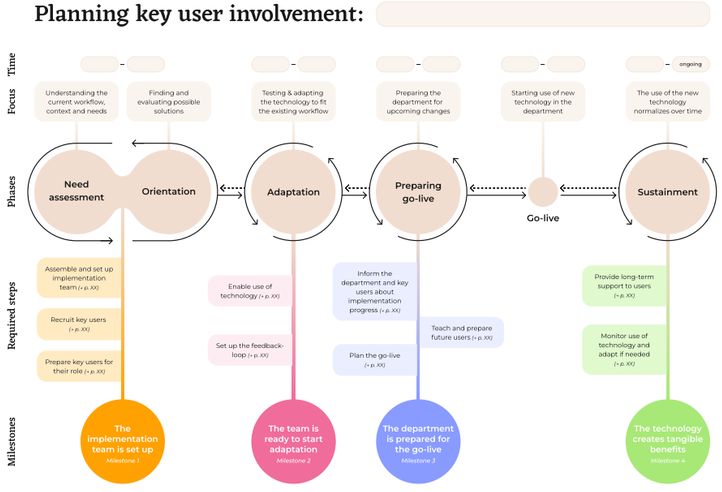


Figure 18: *The poster version that was used for the final evaluation session with organizational employee and technology company.*

Last but not least, the organizational employee was asked the same questions than the technology company employee.

As positive stood out that the poster is especially useful during initial meetings of all stakeholders to create a mutual understanding. The participant sees the importance of talking about the expectations of all parties, and the use of poster and book might be able to help with finding this common ground. They might also support project managers in understanding the complexity of implementation in healthcare and might act as a sort of checklist for them. Just like the technology company, they see the potential to help key users better understand their role in the project. The connection between poster and book with the references was also understood well.

A few things were discussed in more detail. The intention of filling in title and dates of the current project was only getting clear when explained to the participant. They also pointed out that "sustainment is ongoing until the system is obsolete." and that no system is ever used indefinitely. The explanation of the Adaptation phase should also be changed from "existing workflow" to "desired/new workflow". "That's where the tension is. Because sometimes when the workflow needs to be altered to benefit from the new technology, it's harder to achieve because of the routine of the healthcare providers."

The participant doubted that the poster and book would be helpful to enhance the current Autoscriber project as it's "not a typical project" but also acknowledges that they haven't had a chance to read the full content of the book. As a first action when presented with the design, they would read it and appraise the relevance for their context and work. Testing this was unfortunately not possible inside the scope of this cycle.

After this discussion, the proposed changes on the poster were adopted. Again, it became clear, that the design needs to stress reasons for the organization to adopt it. When reading the content of the book, users might be easily convinced, but they might not even pick it up if they think that they are already doing a good job and have little need of improving further. The employee participating in this evaluation was not aware that in other parts of the Reinier technology is introduced without any preparations, as it was described by the non-key user. Maybe it might be fruitful to target the people that manage the organizational employees when making a case for using the service design. They might be interested in creating a standard that is followed by all project managers within their hospital.

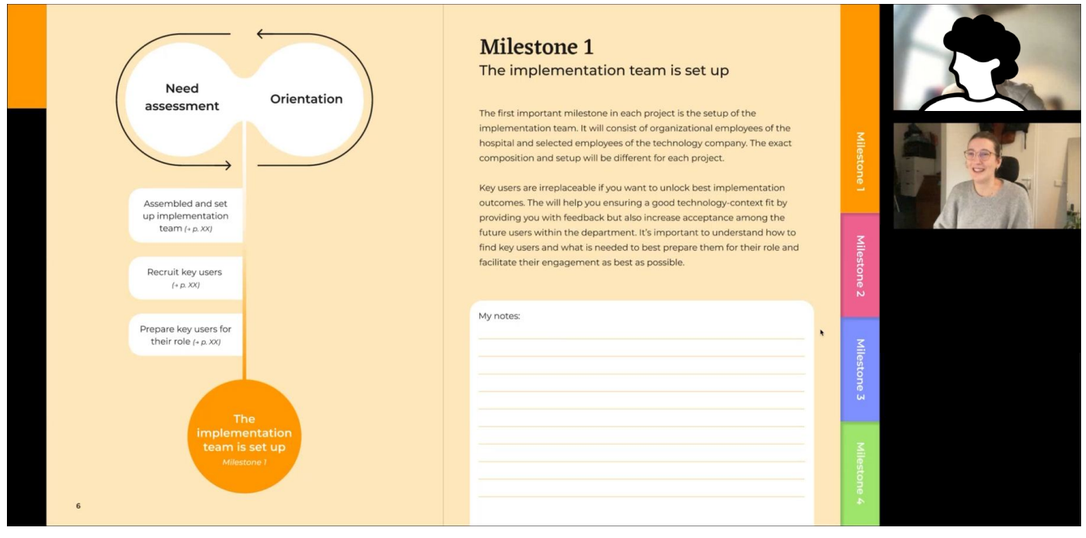


Image 8: *The evaluation session with the participant of Autoscriber.*

6.3 The final implementation service

After three design cycles, the final service is refined and combines all research findings.

The poster and book can be used by the organizational employees of the hospital and the technology company they collaborate with. No matter who brings it into the team, it should be shared with both parties to create a common understanding of the upcoming process and the involvement of key users. It can act as a conversation starter that fosters mutual understanding and open communication so the hospital and technology company can align their goals and mitigate risks and barriers before they arise to create a better experience for all involved. The poster can help to sharpen everybody's awareness of the current progress during shared meetings, while the information in the book can be consulted when planning and preparing the next steps.

The poster

The poster provides a clear overview of the entire implementation process, highlighting key phases and milestones.

Each phase comes with a short description to enable users of all levels of experience to use the poster.

Designed with practicality in mind, it's printed on rewritable material, allowing the user to customize the title and timeline for each specific project. This flexibility means they can easily adjust their timeline as needed and reuse the poster for future initiatives.

Each required step on the poster includes a page reference to the book, making it simple to dive deeper into any topic and quickly access the guidance that is needed.

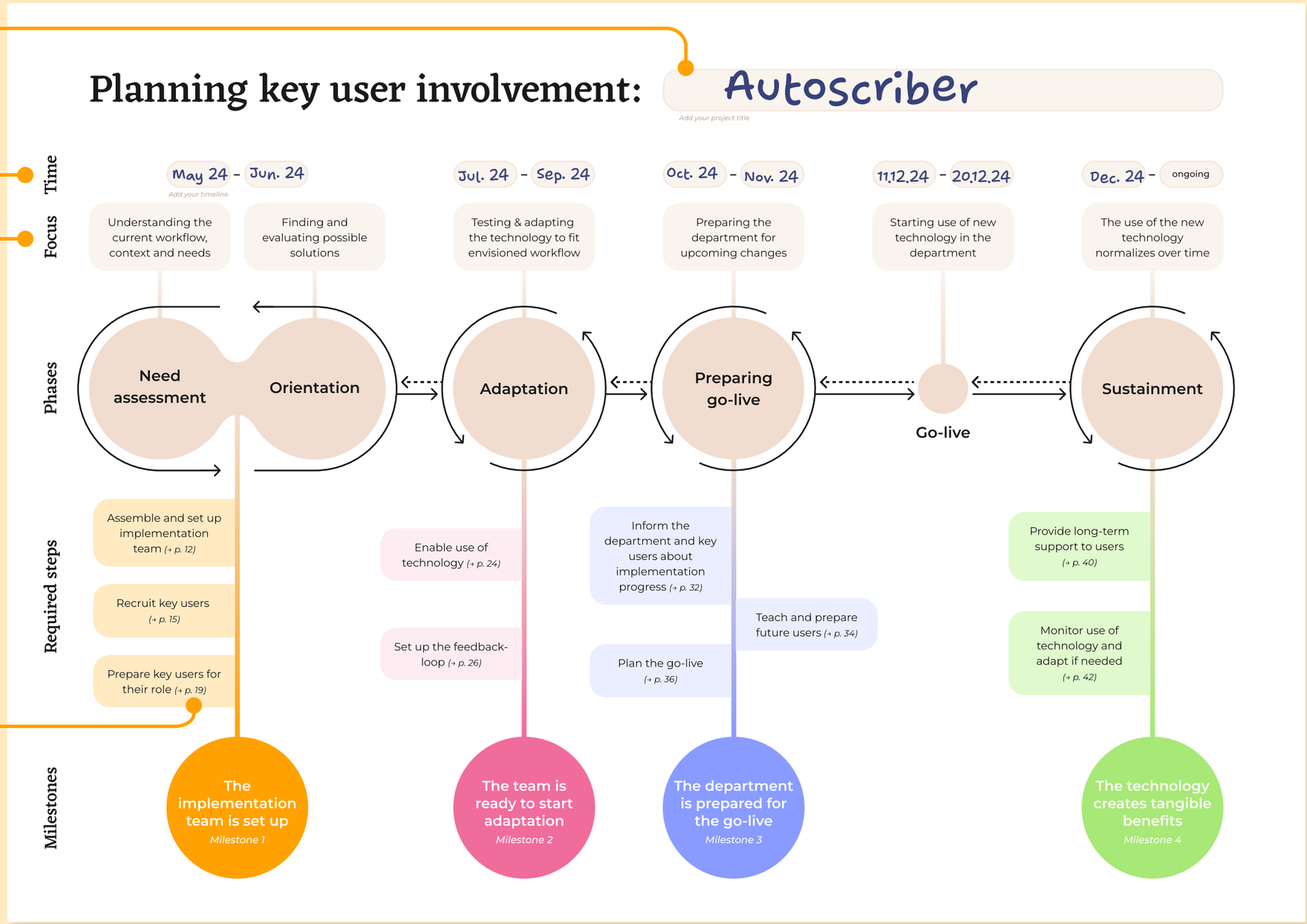


Table of Content

Introduction 3
- Unlocking technology adoption 3
- The actors and their roles 6
- The phases 7

Milestone 1 – The implementation team is set up 10
- Assemble and set up implementation team 12
- Recruit key users 15
- Prepare key users for their role 19

Milestone 2 – The team is ready to start adaptation 22
- Enable use of technology 24
- Set up the feedback-loop 26

Milestone 3 – The department is prepared for the go-live 30
- Inform the department about implementation progress 32
- Teach and prepare future users 34
- Plan the go-live 36

Milestone 4 – The technology creates tangible benefits 38
- Provide long-term support to users 40
- Monitor use of technology and adapt if needed 42

Closing Words 45

This guide was developed as part of the master's thesis "*Unlocking technology adoption. Guiding key user involvement for successful healthcare implementation.*" within the *Design for Interaction* program at TU Delft, in collaboration with Reinier de Graaf Hospital in Delft. You can find more information about the project here: http://resolver.tudelft.nl/uuid:ce1c6b9a-b6c7-4650-b1a6-e5e1a2dc2c49

We encourage you to use this guide to support your implementation process. However, please note that further research is needed to fully evaluate its effectiveness in practice.

ChatGPT was utilized to improve the text's flow and coherence, ensuring a unified tonality. The foundational insights, guidance, and recommendations are based entirely on in-depth research.

Unlocking technology adoption

In the rapidly evolving world of healthcare, technology has become an indispensable ally. From improving patient outcomes to streamlining administrative tasks, the potential for innovation is limitless. Yet, the true power of technology lies not in its design but in how seamlessly it integrates into the complex, dynamic workflows of healthcare professionals.

This is no small challenge. Introducing new tools into healthcare settings often feels like navigating uncharted waters. Despite their benefits, technologies can struggle to find acceptance, leaving valuable solutions underutilized. The key to overcoming this lies in thoughtful implementation, collaborative adaptation, and most importantly, the involvement of people at the heart of the system—healthcare professionals themselves.

This guide is designed to bridge the gap between technology and practice. It focuses on harnessing the insights and influence of key users. These individuals, often early adopters or respected peers, play a critical role in championing change, fostering communication, and shaping how technology is embraced.

Guiding key user involvement for successful implementation

Key users play a pivotal role in the success of technology implementation in healthcare. They drive change in two important ways: they foster enthusiasm and acceptance among peers within their departments, and they gather and share feedback from the work floor with the organization to ensure the technology aligns with real-world needs.

Research shows that key users that are well supported and empowered, can significantly enhance the success of implementation efforts. By combining real-world insights and actionable recommendations, this guide aims to help implementation teams to understand the complex process and plan for lasting success.

Above all, it's essential to remember that implementation isn't just about technology—it's about people. Understanding and addressing the human side of this process is just as important as the technology itself.

The actors and their roles

Actors within the hospital

Organizational employees
Employees that support the hospital operations and patient care processes. Most work in departments like IT, Quality & Safety, communication, management, etc. but also (medical) managers within the hospital fall into this description. They are in charge of the implementation process on the side of the hospital.

Key user
Key users are motivated clinical staff that volunteers/is appointed to take part in various implementation activities, like providing feedback or spreading enthusiasm among their colleagues, with the goal of promoting the change within the hospital. They are a big factor in successful implementation.

Non-key user
The other healthcare providers within the department that are not directly involved in the implementation process. They need to be convinced, motivated and well-supported to use the technology to ensure long-term success.

Actors outside the hospital

Technology company
The company that supplies the technology that should be implemented. Their setup and way of working might differ, depending on size, experience and product.

Roles

The actors are the group that is mainly in charge of the described part of the implementation process (solid outline). They are sometimes joined by supporters (dashed outline). If their actions affect another group, those affected are shown behind the arrow.

The phases

Need assessment

Projects can begin in various ways: a problem within hospital workflows may be identified by healthcare professionals or organizational staff that requires a solution. Alternatively, it could stem from an idea to optimize a workflow, proposed by either clinicians or organizational employees. In some cases, a technology company may present a product to a hospital that seems well-suited to their needs. Regardless of how the project begins, it's essential to thoroughly understand the existing workflow, the surrounding context, and the needs of the people affected. To gain these insights, collaborating closely with the healthcare professionals who work within that context is invaluable.

Orientation

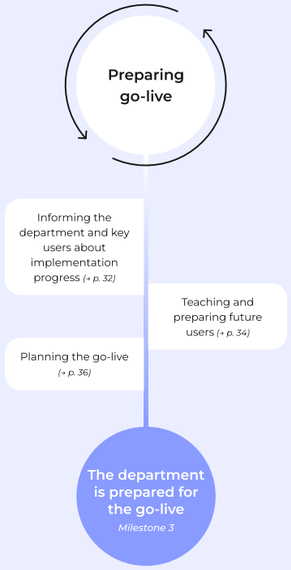
This phase goes hand in hand with the needs assessment, and it's common for both to overlap or run in parallel. Here, potential solutions are identified and evaluated against the functional and technical requirements that have been defined. With the information from technology companies and input from healthcare professionals, the technology that best aligns with the needs is chosen. At the same time, the implementation team is assembled, and key users are identified to support the process.

The book

The book offers detailed insights to support users through the implementation process.

The introduction chapter helps users to get started and outlines what they can expect from the guide.

It also introduces the key actors of implementation, how their role will be specified in the following chapters and the main phases of implementation.



Milestone 3

The department is prepared for the go-live

This milestone focuses on ensuring that the department is ready for the technology to be fully integrated. It's a crucial phase where communication, training, and planning come together to set everyone up for success.

First, it's important to inform the department about the progress of the implementation, so everyone is aware of the upcoming changes and what to expect. Keeping them informed helps reduce uncertainty and fosters a sense of involvement in the process.

Next, future users need to be trained and prepared for the new system. Providing hands-on learning and addressing any concerns will ensure they feel confident using the technology on go-live day.

Finally, careful planning for the go-live is essential. This includes scheduling, on-site support, and making sure the necessary resources are in place for a smooth launch. With all this taken care of, the department will be ready to embrace the new technology.

My notes:

Each chapter focuses on one of the four milestones, breaking it down into required steps with clear, actionable recommendations.

They start with an overview page, restating the required steps, and are easy to find thanks to an index cut in the fore edge of the pages.

The following pages introduce each required step in detail, showing the involved actors and their role and breaking each step down in multiple sub-steps with recommendations and tips for successful application.

To make it even more practical, the book includes space for personal notes and reflections for each milestone and all required steps. As users document their learnings from different projects, the guide evolves with them, becoming a richer and more tailored resource for their hospital and its technologies.

Plan the go-live

A well-structured go-live plan is crucial for a smooth implementation experience. It helps everyone in the department to stay calm, reduces stress, and ensures the technology is integrated effectively into daily workflows.

Schedule a reduced workload for the go-live phase

Allowing extra time during the initial rollout ensures healthcare professionals can focus on adapting to the technology without feeling overwhelmed. If data transfer is required, consider allocating additional time for this as well. As one professional shared, *"When the time is lacking and you're not that experienced that you can do it easily, then you're falling back into your routine."*

Recommendation:

- Consult your key user to figure out how much time might be needed for a smooth start. Some systems might only require one morning, others would benefit from multiple days. See what is possible in your project.

Organize on-site support

After the go-live, it's vital to have accessible support for functional and technical issues:

- **Key users:** Ensure they are present during most shifts to assist their colleagues. For departments that operate around the clock, such as ICUs or ERs, plan for key user coverage across all shifts to maximize availability.
- **Technology company:** Discuss the possibility of having experts on-site to address questions about the technology's functionality on the spot.
- **IT department:** If needed, involve IT employees to handle technical troubleshooting during the early days.

Adapt the level of support based on how complex and disruptive the technology is.

Pro tip: Each department will have unique challenges and requirements. Collaborate with key users to identify these needs and tailor your support to addresses them effectively.

My notes:

- Talk to head of department, they can bring people together
- We should always see that support can also be reached during the night so people in the night shifts can also ask somebody

6.3.1 Recommendations for the current implementation process of Autoscriber

Based on all collected insights, there are some concrete recommendations that can be given for the current collaboration between Reinier de Graaf, Autoscriber and ChipSoft. Of course, it is always helpful to go through the service deliverables and see which points can be applied to the current and future situation, but on top of this the following recommendations might help to make next steps in this project:

1. It might be worthwhile to invest time in revising the way of communication and collaborating. There is a certain tension, especially when it comes to the way of communicating and staying informed about the development progress. If all parties reflect on their needs, discuss them together, are able to explain where they stem from and are then also open to find compromises, this could significantly improve the experience of all stakeholders.
2. Autoscriber and RdGG are currently working on defining the feedback-loop for the adaptation phase in the next departments. For this process, it is wise to first define what sort of feedback needs to be collected and then deduce the manner of collecting this feedback based on the needs. As an example: If the feedback-need is something like a yes/no answer (e.g. “Is this summary complete?”) it can be collected easy and fast after each consultation within the application. However, if feedback should contain more explanations and detailed insights into the workflow (e.g. “Which part of the summary is the most important and why?”) then regular qualitative interviews might be more suitable. If the information need is defined first, one can ensure that the collection method suits this need.
3. As discovered, there is currently a big group of ghost-users within the Reinier. Together with Autoscriber the RdGG should make a list of these users and start involving them in the project:
    - » In a first step, the ghost-users should be informed that they are currently using a trial-version that is different from the integrated-version that will ultimately be implemented in the departments. Make sure to explain what the implementation team is currently working on and that this focus is the reason that there has not been a timeline, and they have not been supported by the ICT so far. Also stress, that you are aware of their existence and would like to work together with them in the upcoming phases of the project.
    - » Tell them that you plan on expanding into their department sooner or later (if possible, give them a timeline!) and that you would love them to be key users for the integrated-version. Then they will enjoy a more guided process with a clear goal.
    - » Think of ways that you could already involve them right now and make this option available to them. For example, they might be interesting sparring partners for your current key users.

4. When planning to scale up the use of Autoscriber it’s important to think about how to handle the people that tried it earlier but abandoned it and, worst case, are anxious to try it again. How can these people be convinced that the integrated-version has a better usability and provides the promised benefits? How can it be prevented that they spread a negative view within the department and create a big resistance? To answer these questions, it might be helpful to first identify who might be such an anxious ex-user. Then it might help to approach them with one of the current key users (ideally one from their department) and give them a demonstration of the new version to let them appraise the difference for themselves. In this way, the individual barrier might be reduced before starting implementation and communication within the department.
5. The planning of the next steps should not be too tight. Plan realistic and keep this planning flexible to adjust it to new findings that appear during the project. Especially the teaching phase should be long enough and well-prepared by informing non-key users early and giving them the timeline. Rather postpone going live than starting it when users are still not motivated or well-prepared.

7. Concluding this thesis

This final chapter reflects on the contributions of this thesis, not just for implementation science, but also the stakeholders of this project. It considers the given limitations while trying to look ahead and give recommendations for the future. It concludes with a personal reflection on the project and my personal growth.

7.1 Contribution

Main Takeaways

A central finding of this thesis is that clear guidance and well-defined structures are essential when working with key users during the implementation process. Without these, there is a significant risk of losing their motivation and, with it, the momentum needed to drive the adoption of new technologies. The importance of acknowledging that successful implementation requires time and a focus on the human aspects of change became clear. For organizational employees, this means adapting processes to accommodate everyone, from early to late adopters, giving them the opportunity to engage at their own pace and eventually become enthusiastic users. Realistic planning, adaptability to new insights, and strong communication between all stakeholders are critical elements for ensuring that implementation efforts are both effective and sustainable.

Contributions to Implementation Research

Both experts and companies have shown great interest in the findings of this thesis, showing the relevance of the topic. One notable aspect is its approach to implementation from a human-centered design perspective. While the literature acknowledges the benefits of including key users in the implementation process, there is a noticeable lack of research on the practical aspects of how to effectively involve them. This thesis makes a contribution by using qualitative insights specific to the role and influence of key users in the implementation process. By doing so, it provides a promising starting point for future research, offering both theoretical grounding and practical direction for future studies.

Implications for RdGG, Autoscriber, and ChipSoft

The focus of this research also resonated strongly with many stakeholders of the context of the Autoscriber implementation in RdGG, especially healthcare providers, which also confirms the relevance of the topic. Key areas such as identifying suitable key users and building an efficient feedback loop (issues raised by all stakeholders) are addressed in detail. Additionally, this thesis sheds light on the risks and potential of “ghost users”, a previously unrecognized challenge for the adoption of Autoscriber. By bringing this issue to their attention, the work empowers RdGG to regain control of the situation and provides recommendations for moving forward. These not only mitigate current challenges but also lay the groundwork for more structured and effective collaboration between internal and external stakeholders.

7.2 Limitation

While this thesis offers valuable insights into the implementation process, certain limitations should be acknowledged. First, the research was conducted within a very limited context, focusing on the implementation of Autoscriber at RdGG and involving a relatively small number of participants. Expanding the scope to include additional stakeholders within the Reinier or adding more case studies by following the implementation of other technologies could provide a broader understanding and strengthen the generalizability of the findings.

Second, due to the scope of this thesis, the proposed texts and recommendations of the service design book have not been evaluated fully and would therefore benefit from further iterations with implementation experts. Collaborative refinement with these stakeholders could enhance their precision, usability, and alignment with practical needs.

Furthermore, the effectiveness of the service design was only evaluated in a conversation with future users. To fully understand to which extent it can improve the implementation process a scientifically supported study would have to be carried out. The findings of such a study would propose interesting directions for future research, as well as ways to improve usability and relevance of the service and its content.

One specific challenge highlighted in this research is the issue of ghost users. While the identified pain points are rooted in the experiences of these unsupported users, the underlying needs likely reflect broader challenges common across implementation processes. Researching this group of key users that had this “extreme” circumstances might have even been beneficial because only in this way a number of possible risks of not supporting key users could be identified and addressed in the service.

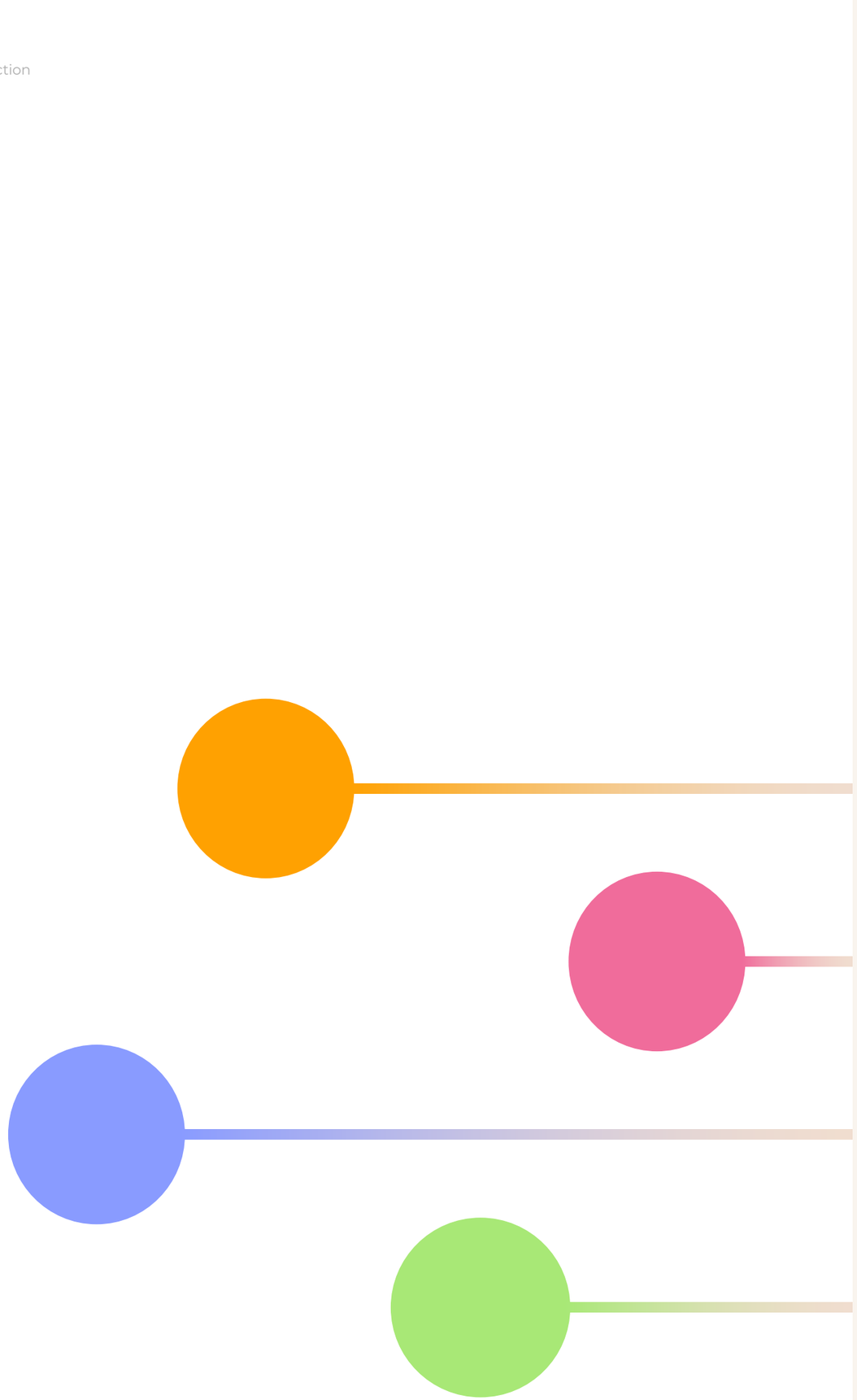
7.3 Recommendations for the future

Building on the insights gained throughout this thesis, several recommendations can be made for both further research and iterations on the service.

As already discussed in the limitations, to improve the current version of the service the texts used in the book should be iteratively revised in collaboration with implementation experts and the effectiveness evaluated in a long-term study. For this, it could be used during the implementation and scaling up of Autoscriber or any other adoption of new technology within the Reinier.

The content of the book might be enhanced by exploring other ways of enhancing empathy towards key users’ situations. This might be done by using quotes, drawings of scenarios or similar design methods. It could also be explored if more concrete examples (for things like time per phase etc.) might add value for users and if, for the use case of the RdGG, it is possible and helpful to divide the group of “organizational employees” into different subgroups like ICT, Quality & Safety and similar.

A last feature that might be nice to explore would be to create a digital version of the poster. This might be useful to make it usable during remote or hybrid meetings between the stakeholders. If the different phases, milestones and steps can be greyed out it can be used in each meeting to show the current progress as well as highlighting the upcoming steps.



8. Final Reflection

I worked on this thesis between May and December 2024 and a lot of hard work, and many thoughts went into finishing it. It has become more than just a thesis to me, it's something I truly care about and it was inspiring to see the enthusiasm I could spark in the people I spoke to and worked with. I'm convinced that approaching implementation with a focus on the humans it's affecting is a key to improving implementation outcomes and the overall experience.

Even though there still is a risk that my service will not be used because organizational employees or technology companies don't see the value of it, I think that it offers an opportunity to change once perspective on implementation. I'm convinced the service fulfills the design goal to "Design a service that can be used by the organizational employees of RdGG that guides the facilitation and collaboration with key users to effectively implement new technology together with external companies". If it's used constantly, it might enable all affected parties to feel more "guided", "empowered" and "balanced" in the process.

During my work I collected a wide variety of information on different levels and especially during the design phase it was quite challenging to find a good way to combine and represent them in the service. I'm grateful for all the sparring and thoughts from friends and colleagues that helped me find a suitable way of presenting recommendations in a digestible way, and hope that research on this topic continues and the service can grow and evolve over time.

In the beginning of the project, I encountered a few struggles due to the language barrier. Gaining ethical approval in Dutch was of course one part of this, but the biggest impact it had when looking for interview participants. However, once people met me and we talked about the project, I realized that they changed their demeanor and were happy to help me out in future research activities if their schedule allowed it. This was very motivating for me and showed that you need grit and persistence to gain a foothold. It might be interesting to see how different the project would have gone if I had been a full-time employee of the RdGG. I imagine that it might make some things easier as you would have a better understanding of the ways of working of the hospital (especially as there are differences in the way Dutch and German healthcare systems operate) but in the same time this can also create a bias that I, as an outsider, did not have.

When looking at me as a person, I have to say that I had very high expectations as I focused too much on the impact my design should have rather than my own learnings. This of course didn't prevent me from learning quite a lot, but it did put a lot of unnecessary pressure on me. Once I realized this and changed my mindset, it had a big impact on the satisfaction with my own work and effort. It's also important to acknowledge that work or university projects never exist in a vacuum. Your personal situation always affects them, and it's important to understand and accept that. I think this was my biggest learning as a person.

As a designer I can say that I grew more comfortable and understanding with the context of the hospital, and I'm sure that this, as well as a focus on key users and implementation, will shape the focus for my future. It was amazing to work with so many motivated clinicians and stakeholders, it helped me a lot, and I'm very grateful for this experience!

References

A

Almqvist, F. (2017). The fuzzy front-end and the forgotten back-end: User involvement in later development phases. *The Design Journal*, 20(sup1), S2524–S2533. https://doi.org/10.1080/14606925.2017.1352765

Almqvist, F. (2018). Service design in the later project phases: Exploring the service design handover and introducing a service design roadmap. *666-678*. ServDes2018 - Service Design Proof of Concept, Milano. https://aho.brage.unit.no/aho-xmlui/handle/11250/2592811

B

Barchielli, C., Marullo, C., Bonciani, M., & Vainieri, M. (2021). Nurses and the acceptance of innovations in technology-intensive contexts: The need for tailored management strategies. *BMC Health Services Research, 21*(1), 639. https://doi.org/10.1186/s12913-021-06628-5

Bente, B. E., Van Dongen, A., Verdaasdonk, R., & van Gemert-Pijnen, L. (2024). eHealth implementation in Europe: A scoping review on legal, ethical, financial, and technological aspects. *Frontiers in Digital Health, 6*. https://doi.org/10.3389/fdgth.2024.1332707

Bonawitz, K., Wetmore, M., Heisler, M., Dalton, V. K., Damschroder, L. J., Forman, J., Allan, K. R., & Moniz, M. H. (2020). Champions in context: Which attributes matter for change efforts in healthcare? *Implementation Science, 15*(1), 62. https://doi.org/10.1186/s13012-020-01024-9

Brennan, N., Langdon, N., Keates, N., Mattick, K., & Gale, T. (2023). Graduates' preparedness for the changing doctor-patient relationship: A qualitative study. *Medical Education, 57*(8), 712–722. https://doi.org/10.1111/medu.15020

Bunce, A. E., Gruß, I., Davis, J. V., Cowburn, S., Cohen, D., Oakley, J., & Gold, R. (2020). Lessons learned about the effective operationalization of champions as an implementation strategy: Results from a qualitative process evaluation of a pragmatic trial. *Implementation Science, 15*(1), 87. https://doi.org/10.1186/s13012-020-01048-1

C

Cafazzo, J. A. (2020). Chapter 3—Design for digital health. In A. Sethumadhavan & F. Sasangohar (Eds.), *Design for Health* (pp. 47–65). Academic Press. https://doi.org/10.1016/B978-0-12-816427-3.00003-8

Carayon, P. (2006). Human factors of complex sociotechnical systems. *Applied Ergonomics, 37*(4), 525–535. https://doi.org/10.1016/j.apergo.2006.04.011

Carpenter, D., Hassell, S., Mardon, R., Fair, S., Johnson, M., Siegel, S., & Nix, M. (2018). Using Learning Communities to Support Adoption of Health Care Innovations. *The Joint Commission Journal on Quality and Patient Safety, 44*(10), 566–573. https://doi.org/10.1016/j.jcjq.2018.03.010

Crilly, N., Blackwell, A. F., & Clarkson, P. J. (2006). Graphic elicitation: Using research diagrams as interview stimuli. *Qualitative Research, 6*(3), 341–366. https://doi.org/10.1177/1468794106065007

Crilly, N., Moultrie, J., & Clarkson, P. J. (2004). Seeing things: Consumer response to the visual domain in product design. *Design Studies, 25*(6), 547–577. https://doi.org/10.1016/j.destud.2004.03.001

F

Falcetta, F. S., de Almeida, F. K., Lemos, J. C. S., Goldim, J. R., & da Costa, C. A. (2023). Automatic documentation of professional health interactions: A systematic review. *Artificial Intelligence in Medicine*, 137, 102487. https://doi.org/10.1016/j.artmed.2023.102487

G

Garmann-Johnsen, N. F., Helmersen, M., & Eikebrokk, T. R. (2020). Employee-driven digitalization in healthcare: Codesigning services that deliver. *Health Policy and Technology, 9*(2), 247–254. https://doi.org/10.1016/j.hlpt.2020.03.001

Ghatnekar, S., Faletsky, A., & Nambudiri, V. E. (2021). Digital scribe utility and barriers to implementation in clinical practice: A scoping review. *Health and Technology, 11*(4), 803–809. https://doi.org/10.1007/s12553-021-00568-0

Gjellebæk, C., Svensson, A., Bjørkquist, C., Fladeby, N., & Grundén, K. (2020). Management challenges for future digitalization of healthcare services. *Futures, 124*, 102636. https://doi.org/10.1016/j.futures.2020.102636

Gopal, G., Suter-Crazzolara, C., Toldo, L., & Eberhardt, W. (2019). Digital transformation in healthcare—Architectures of present and future information technologies. *Clinical Chemistry and Laboratory Medicine, 57*(3), 328–335. https://doi.org/10.1515/cclm-2018-0658

Gotlib Conn, L., McKenzie, M., Pearsall, E. A., & McLeod, R. S. (2015). Successful implementation of an enhanced recovery after surgery programme for elective colorectal surgery: A process evaluation of champions' experiences. *Implementation Science, 10*(1), 99. https://doi.org/10.1186/s13012-015-0289-y

Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C., Hinder, S., Fahy, N., Procter, R., & Shaw, S. (2017). Beyond Adoption: A New Framework for Theorizing and Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care Technologies. *Journal of Medical Internet Research, 19*(11), e8775. https://doi.org/10.2196/jmir.8775

Gui, X., Chen, Y., Zhou, X., Reynolds, T. L., Zheng, K., & Hanauer, D. A. (2020). Physician champions' perspectives and practices on electronic health records implementation: Challenges and strategies. *JAMIA Open, 3*(1), 53–61. https://doi.org/10.1093/jamiaopen/ooz051

K

Kroth, P. J., Morioka-Douglas, N., Veres, S., Pollock, K., Babbott, S., Poplau, S., Corrigan, K., & Linzer, M. (2018). The electronic elephant in the room: Physicians and the electronic health record. *JAMIA Open, 1*(1), 49–56. https://doi.org/10.1093/jamiaopen/ooy016

L

Lapão, L. V. (2019). The Future of Healthcare: The Impact of Digitalization on Healthcare Services Performance. In A. Pereira Neto & M. B. Flynn (Eds.), *The Internet and Health in Brazil: Challenges and Trends* (pp. 435–449). Springer International Publishing. https://doi.org/10.1007/978-3-319-99289-1_22

M

MacLean, L., Hassmiller, S., Shaffer, F., Rohrbaugh, K., Collier, T., & Fairman, J. (2014). Scale, causes, and implications of the primary care nursing shortage. *Annual Review of Public Health, 35*(1), 443–457. https://doi.org/10.1146/annurev-publhealth-032013-182508

Melles, M., Albayrak, A., & Goossens, R. (2021). Innovating health care: Key characteristics of human-centered design. *International Journal for Quality in Health Care, 33*(Supplement_1), 37–44. https://doi.org/10.1093/intqhc/mzaa127

Meskó, B., Drobni, Z., Bényei, É., Gergely, B., & Győrffy, Z. (2017). Digital health is a cultural transformation of traditional healthcare. *mHealth, 3*(9), Article 9. https://doi.org/10.21037/mhealth.2017.08.07

Miech, E. J., Rattray, N. A., Flanagan, M. E., Damschroder, L., Schmid, A. A., & Damush, T. M. (2018). Inside help: An integrative review of champions in healthcare-related implementation. *SAGE Open Medicine, 6*, 2050312118773261. https://doi.org/10.1177/2050312118773261

Ministerie van Volksgezondheid, W. en S. (2022, September 16). *Integraal Zorgakkoord: "Samen werken aan gezonde zorg" - Rapport - Rijksoverheid.nl* [Rapport]. Ministerie van Algemene Zaken. https://www.rijksoverheid.nl/documenten/rapporten/2022/09/16/integraal-zorgakkoord-samen-werken-aan-gezonde-zorg

M&I/Partners. (2021, December 13). *EPD-marktinventarisatie ziekenhuizen 2021: Consolidatie EPD-markt zet door*. https://mxi.nl/kennis/541/epd-marktinventarisatie-ziekenhuizen-2021-consolidatie-epd-markt-zet-door

Murad, M. H., Vaa Stelling, B. E., West, C. P., Hasan, B., Simha, S., Saadi, S., Firwana, M., Viola, K. E., Prokop, L. J., Nayfeh, T., & Wang, Z. (2024). *Measuring Documentation Burden in Healthcare. Journal of General Internal Medicine*. https://doi.org/10.1007/s11606-024-08956-8

N

Nielsen, S. B. (2016). How Doctors Manage Consulting Computer Records While Interacting With Patients. *Research on Language and Social Interaction, 49*(1), 58–74. https://doi.org/10.1080/08351813.2016.1126451

Norman, D. A., & Stappers, P. J. (2015). DesignX: Complex Sociotechnical Systems. *She Ji: The Journal of Design, Economics, and Innovation, 1*(2), 83–106. https://doi.org/10.1016/j.sheji.2016.01.002

O

Overkamp, T., & Holmlid, S. (2016, May 1). *Views on Implementation and How They Could Be Used in Service Design*.

Overkamp, T., & Holmlid, S. (2017). Implementation during design Developing understanding about service realisation before implementation. *The Design Journal, 20*(sup1), S4409–S4421. https://doi.org/10.1080/14606925.2017.1352937

P

Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., Griffey, R., & Hensley, M. (2011). Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health, 38*(2), 65–76. https://doi.org/10.1007/s10488-010-0319-7

R

Rabin, B. A., & Brownson, R. C. (2017). Terminology for Dissemination and Implementation Research. In R. C. Brownson, G. A. Colditz, & E. K. Proctor (Eds.), *Dissemination and Implementation Research in Health: Translating Science to Practice* (p. 0). Oxford University Press. https://doi.org/10.1093/oso/9780190683214.003.0002

Reay, S. D., Collier, G., Douglas, R., Hayes, N., Nakarada-Kordic, I., Nair, A., & Kennedy-Good, J. (2017). Prototyping collaborative relationships between design and healthcare experts: Mapping the patient journey. *Design for Health, 1*(1), 65–79. https://doi.org/10.1080/24735132.2017.1294845

Reinier de Graaf. (n.d.). RdGG. Retrieved June 20, 2024, from https://reinierdegraaf.nl/index.php/organisatie

Ross, J., Stevenson, F., Dack, C., Pal, K., May, C., Michie, S., Barnard, M., & Murray, E. (2018). Developing an implementation strategy for a digital health intervention: An example in routine healthcare. *BMC Health Services Research, 18*(1), 794. https://doi.org/10.1186/s12913-018-3615-7

Ross, J., Stevenson, F., Lau, R., & Murray, E. (2016). Factors that influence the implementation of e-health: A systematic review of systematic reviews (an update). *Implementation Science, 11*(1), 146. https://doi.org/10.1186/s13012-016-0510-7

S

Samenwerkende Topklinische Ziekenhuizen. (n.d.). Retrieved June 20, 2024, from https://www.stz.nl/

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign, 4*(1), 5–18. https://doi.org/10.1080/15710880701875068

Sanders, E., & Stappers, P. (2012). *Convivial toolbox: Generative research for the front end of design*. Bis.

Santos, W. J., Graham, I. D., Lalonde, M., Varin, M. D., & Squires, J. E. (2022). The effectiveness of champions in implementing innovations in health care: A systematic review. *Implementation Science Communications, 3*, 80. https://doi.org/10.1186/s43058-022-00315-0

Scott, D., & Purves, I. N. (1996). Triadic relationship between doctor, computer and patient. *Interacting with Computers, 8*(4), 347–363. https://doi.org/10.1016/S0953-5438(97)83778-2

Sekhon, M., Cartwright, M., & Francis, J. J. (2017). Acceptability of healthcare interventions: An overview of reviews and development of a theoretical framework. *BMC Health Services Research, 17*(1), 88. https://doi.org/10.1186/s12913-017-2031-8

Shaarani, I., Taleb, R., & Antoun, J. (2017). Effect of computer use on physician-patient communication using a validated instrument: Patient perspective. *International Journal of Medical Informatics, 108*, 152–157. https://doi.org/10.1016/j.ijmedinf.2017.10.007

Siebeck, O. S., & Hoving, C. (2024). Characteristics of a successful nurse peer champion in the implementation of innovative technologies in hospitals: A qualitative study. *PEC Innovation*, 100339. https://doi.org/10.1016/j.pecinn.2024.100339

Sleeswijk Visser, F. (2013). *Service Design by Industrial Designers*.

Sobral, D., & Figueiredo-Braga, M. (2016). Family Physician Communication, Quality of Care and the use of Computer in the Consultation – The Patient's Perspective. *Procedia Computer Science, 100*, 594–601. https://doi.org/10.1016/j.procs.2016.09.200

Stickdorn, M., & Schneider, J. (2011). *This is service design thinking: Basics, tools, cases* (7th ed.). BIS Publishers. http://archive.org/details/thisisservicedes0000unse

Stoumpos, A. I., Kitsios, F., & Talias, M. A. (2023). Digital Transformation in Healthcare: Technology Acceptance and Its Applications. *International Journal of Environmental Research and Public Health, 20*(4), 3407. https://doi.org/10.3390/ijerph20043407

Svensson, A., Gustavsson, L., Svenningsson, I., Karlsson, C., & Karlsson, T. (2023). Healthcare professionals learning when implementing a digital artefact identifying patients' cognitive impairment. *Journal of Workplace Learning, 35*(6), 490–505. https://doi.org/10.1108/JWL-01-2023-0011

V

Van Veen, D., Van Uden, C., Blankemeier, L., Delbrouck, J.-B., Aali, A., Bluethgen, C., Pareek, A., Polacin, M., Reis, E. P., Seehofnerová, A., Rohatgi, N., Hosamani, P., Collins, W., Ahuja, N., Langlotz, C. P., Hom, J., Gatidis, S., Pauly, J., & Chaudhari, A. S. (2024). Adapted large language models can outperform medical experts in clinical text summarization. *Nature Medicine, 30*(4), 27. https://doi.org/10.1038/s41591-024-02855-5

Voran, D. (2017). Using Technology to Enhance Patient-Physician Interactions. *PM&R, 9*(5S). https://doi.org/10.1016/j.pmrj.2017.01.010

W

Wesselink-Schram, K. (2022, June 23). *Netherlands lagging behind in healthcare digitisation*. Universiteit Twente. https://www.utwente.nl/en/news/2022/6/686860/netherlands-lagging-behind-in-healthcare-digitisation

Y

Yuan, M., Bao, P., Yuan, J., Shen, Y., Chen, Z., Xie, Y., Zhao, J., Chen, Y., Zhang, L., Shen, L., & Dong, B. (2023). *Large Language Models Illuminate a Progressive Pathway to Artificial Healthcare Assistant: A Review* (arXiv:2311.01918). arXiv. https://doi.org/10.48550/arXiv.2311.01918

Image references

Icons
The icons used on page 15 and 44 of this report and in the book to represent the actors are taken from Flaticon.com.

Illustrations
All further black-and-white illustrations used throughout the thesis and the book are from Icons8.

Logos
The company logos can be found on the website of the respective companies: reinierdegraaf.nl, autoscriber.com, chipsoft.com.

Photos
All photos are taken by the author.

Appendix

A.1 Project brief 82
A.2 Observations 85
A.2.1 Observation sheet 85
A.2.2 Detailed observation findings 86
A.3 Interviews 89
A.3.1 Interview guides 89
A.3.2 Detailed interview insights – Healthcare professionals 91
A.3.3 Detailed interview insights – Patients 93
A.3.4 Detailed interview insights – Organizational employees 94
A.3.5 Detailed interview insights – Autoscriber (AS)/ChipSoft (CS) 98
A.4 Envisioning exercise 101
A.4.1 Envisioning exercise – Key user 101
A.4.2 Envisioning exercise – Organizational employees 102
A.5 Design iterations 103
A.5.1 Design iterations – 1st cycle 103
A.5.2 Design iterations – 3rd cycle | Book pages 105
A.5.3 Design iterations – 3rd cycle | Non-key user scenario 108
A.5.4 Design iterations – 3rd cycle | Key user scenario 110

A.1 Project brief

CHECK ON STUDY PROGRESS

To be filled in **by SSC E&SA** (Shared Service Centre, Education & Student Affairs), after approval of the project brief by the chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total ____ EC

Of which, taking conditional requirements into account, can be part of the exam programme ____ EC

	YES	all 1st year master courses passed
★	NO	missing 1st year courses

Comments:

The course ID4265 DfI Research Methodology (3EC) is not completed yet

Sign for approval (SSC E&SA)

Rik Ledoux Digitally signed by Rik Ledoux Date: 2024.05.16 11:51:34 +02'00'

Name Rik Ledoux Date 16 May 2024 Signature

APPROVAL OF BOARD OF EXAMINERS IDE on SUPERVISORY TEAM -> to be checked and filled in by IDE's Board of Examiners

Does the composition of the Supervisory Team comply with regulations?

YES	★	Supervisory Team approved
NO		Supervisory Team not approved

Comments:

Based on study progress, students is ...

★	**ALLOWED** to start the graduation project
	NOT allowed to start the graduation project

Comments:

- the above mentioned missing course should be finished before the green light meeting

Sign for approval (BoEx)

Monique von Morgen Digitally signed by Monique von Morgen Date: 2024.05.21 09:57:46 +02'00'

Name Monique von Morgen Date 21 May 2024 Signature

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	Wagner	7170	IDE master(s) IPD ☐ DfI ✓ SPD ☐
Initials	VAW		2nd non-IDE master /
Given name	Varina Alice		Individual programme (date of approval) /
Student number	5730260		Medisign ✓
			HPM ☐

SUPERVISORY TEAM

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

Chair	Dr. ir. Armagan Albayrak	dept./section	HCD/AED
mentor	Fredrik Karlsson	dept./section	DOS/MOD (SECTIE C)
2nd mentor	Dr. Petra Kok		
client:	Reinier de Graaf hospital		
city:	Delft	country:	NL
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)

Digitally signed by Armagan Albayrak - IO Date: 2024.05.15 14:18:14 +02'00'

Name Dr. ir. Armagan Albayrak Date 15 May 2024 Signature

introduction (continued): space for images

image / figure 1 Stakeholder overview on different levels

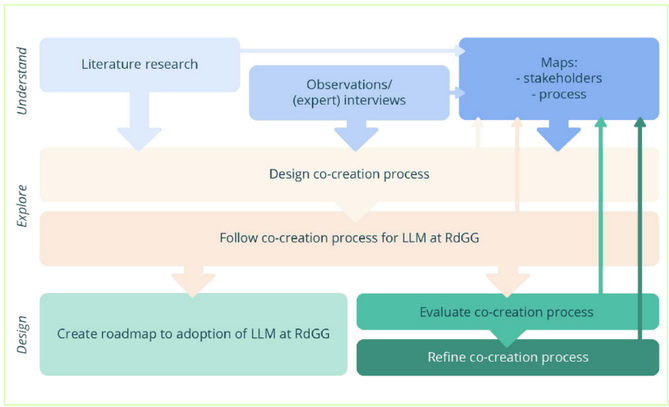


image / figure 2 Approach overview

TU Delft

Personal Project Brief – IDE Master Graduation Project

Name student Varina Wagner **Student number** 5,730,260

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

Project title Shaping the digital transformation of hospitals: A co-creation service for the seamless adoption of a large language model into the workflow of care 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 healthcare sector is facing an ever-growing need of health services that opposes an already existing shortage of (human) resources [1]. Healthcare workers are having high workloads, a lot of which is due to complicated and elaborate organizational processes that reduce the time they can dedicate to focus on their patients [2].

Digital transformation is needed to ensure long-term sustainable and efficient healthcare [1]. Especially the opportunities of introducing AI into the hospital environment are discussed all over the world. Large Language Models (LLM) can generate concise and structured summaries of medical consultations and could thereby minimize the manual typing of healthcare professionals [3]. This would allow them to focus more on the conversation at hand and facilitate better patient-doctor (trust) relationships [3].

However, it is a challenge to introduce the use of new digital technology in the health sector. Current processes need to be adapted and guidance on the correct use needs to be provided to not overburden medical professionals [4]. Personal feelings of scepsis and mistrust also play an important role and shouldn't be neglected in the process. Human-centered design processes can help to align those factors with the overall objective.

The Reinier de Graaf hospital (RdGG) aims to reduce the burden on their employees and streamline processes while still facilitating a high quality of care to their patients. They are currently exploring the opportunities of using LLM during consultations in their outpatient clinic but are unsure how to facilitate the process of introducing this service to all of their healthcare workers.

(Sources in comment)

→ *space available for images / figures on next page*

DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

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	1 Jul 2024
Mid-term evaluation	23 Aug 2024
Green light meeting	18 Oct 2024
Graduation ceremony	15 Nov 2024

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	
Number of project days per week	

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)

I'm very happy with the opportunity of this thesis as it covers basically all the topics that have been important to me and that are my reasons for specializing with a Master in Medisign.

I came to TU Delft to gain more insights into designing for healthcare and especially the hospital context, fueled by seeing so many grievances from my friends that work in this sector.

Gaining more expertise with facilitating the digital transformation in a healthy way is amazing as the need for this all over the world is great but also because I see the big struggles with it in my home country Germany.

One thing I found out during my study is my passion for designing services and/or workflows in contrast to a concrete physical or digital product, another reason why this project seems perfect to expand the skills I collected.

Last but not least, I like the concept of co-creation and empowering users to shape the way they will work in the future. I've seen the effects of it during workshops I've given in my professional career before coming here and am excited to deepen this topic.

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 RdGG decided to use a LLM to improve the patient-doctor-computer-interactions during consultations. They want to shape the transition towards this goal according to their employees wishes and needs. Design and the co-creation of services can help to uncover those needs and facilitate processes that leverage intrinsic motivation and provide a sense of ownership of all people involved. In this way, a feedback-loop between technology and healthcare workers can be created. It is unclear though how a process like this would need to look like.

This thesis aims to use the introduction of the LLM as a case study to explore and define a transition service that helps RdGG to shape the introduction and adaptation of new services. A service like this would facilitate seamless process workflow integration and high acceptance of the LLM as well as motivation of the healthcare workers. It also provides a clear roadmap of the digital transformation and the integration of the LLM within hospitals, step by step.

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:

Design a co-creation service that brings the stakeholders within the hospital and the ehealth companies together to create a seamless adoption-process of an in-consultation LLM at RdGG.

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)

Understand:
I'll do a literature review to gain a first understanding of the underlying concepts of the context – Digitalisation in healthcare, AI/LLM within health and co-creation & workflow optimization in health. With the help of observations and interviews I'll get to know the current care process as well as procedures to introduce new technology at RdGG. Expert interviews will help me gain more insights on how best to facilitate the co-creation process. Constantly updated maps of the relevant stakeholders and processes will help to keep an overview and direction for the research.

Design:
In this phase I'll transform my insights into a coherent co-creation process that I'll follow to gain insights on the adaptation of the LLM into RdGG context. The journey map of the service will be defined.

Refine:
Based on my findings I'll further refine the proposed service process and create a tangible roadmap for the introduction of the LLM.

A.2 Observations

A.2.1 Observation sheet

Observation Template	Doc./dep.	LLM ○Yes ○No	Date ___.___.24	#
	E.g. introduce LLM, take notes, review summary, integrate in health record			
Timeline start consultation → end consultation Action doctor Reactions patient				
Influences on interaction *What and how?*	*Time*	*PC use*	*% PC–patient*	
	Good			
	Pains			
	Unexpected			

A.2.2 Detailed observation findings

RQ1: How does the current patient-clinician-technology interaction look like?		
Theme	**Subtheme**	**Description**
Outside factors	Time	Healthcare professionals have very little time available per patient and documentation is part of it. Because of this, they start documenting already during the consultation and finish it immediately after the patient leaves.
		Working with Autoscriber still takes time because of additional work the healthcare professional needs to put into the texts and if it's reacting too slow healthcare professionals will discard it and document on their own.
	Place	The consultation room and its setup play a role as well, as they set the scene of the human interaction. Healthcare professionals usually switch rooms regularly. Big differences are the location of the place for the physical examination (from "at the desk" to "room next door"), the computer setup (amount and positioning of screens, might also lead to technical problems) and the layout & features of the room itself (size, decor, window, ...).
	Further influences	Consultations always roughly follow a certain blueprint, dependent on specialization (even though the basic steps are the same) and the appointment type (intake, checkup or follow up).
		Sometimes external distractions like incoming phone calls, mails or messages from the support staff disrupt consultations and leave the patient waiting.
		Technical problems, especially mixed with the tight schedule, can lead to an increased stress level of the healthcare professional.
Interpersonal factors	Interpersonal relationship	The main focus of healthcare professionals is that patients feel safe and trusts them, but also that they understand all the information they give them.
		They are very aware of the emotional state of their patients and will adjust their actions to this (e.g. stop typing).
		Their relationship is influenced by how long and well they already know each other.
		If patients are accompanied by family/friends, these also influence the consultation directly or indirectly, and some healthcare professional also value the "outside" view on the patients' circumstances.
	Typing and eye contact	All healthcare professionals value looking at their patient to show them that they are fully available for them and give physical cues of active listening like nodding, leaning in and facial expressions.
		When they must type, they still try to look at the patient as much as possible, some even type blind. None of the patients seems bothered by the healthcare professionals' activities on the computer at any point.
	Influence of Autoscriber	Even though Autoscriber is introduced and visible during the consultation to all patients, they react either positive or indifferent to it and do not pay any attention to it during the consultation.

RQ2: What is the role of the computer and Autoscriber in the consultation, and how do they influence the given dynamics?	
Theme	**Description**
Use of computer	Healthcare professionals use the computer for far more than documenting the consultation. They check the dossier before the consultation to prepare and during the consultation to check things like the medical history, medication, appointments and tests that have been done and their results. Some might have a "checklist" of questions/topics they want to cover in the consultation.
	They even occasionally use it to show patients things in the dossier or use the internet to explain or recommend things.
	Technical problems can arise due to the computer setup or mistakes on both the healthcare professional and patient side and influence the experience of the consultation for both parties.
Documentation	Healthcare professionals report that they document consultations, so they and their colleagues know what has been done, as a legal insurance and to compose letters to referring physicians.
	The style of documentation can vary between healthcare professionals and is very personal. This also creates very different views on the length and style of texts composed by Autoscriber. Most healthcare professional rewrite or adapt the given texts to match their preferences or use them as inspiration to compose their own texts.
	The psychologist used their self-written summary during the consultation to read it back to the patient and check if they covered all important parts, so the documentation becomes a valuable part of the consultation.
Trouble with Autoscriber	Some healthcare professionals did not get any form of introduction to working with Autoscriber. They might experiment a little in the very beginning, but soon settle for one template and stick with that.
	HiX requires different forms of input from healthcare professionals, from fields over checkboxes to markers on images, and the texts Autoscriber generates are not of much help in these situations. One healthcare professional mentions that "Autoscriber has to fit HiX" to make it valuable.
	Autoscriber doesn't always provide texts for all required fields and tasks of the healthcare professionals, so they need to add their own input in any case.
	Sometimes errors arise for various reasons (caused by healthcare professionals themselves or Autoscriber) so time-consuming corrections are needed.

RQ3: Is there a measurable difference in the usage of the screen during consultation when using the LLM?

Participant	Experience	Using Autoscriber				Not using Autoscriber	
		Length consultation	⌀ length	% time spend on computer	⌀ % on computer	Length consultation	% time on computer
1 – Physician	Beginner	8min	12,5	28 %	39 %	/	/
		15min		27 %			
		16min		15 %			
		11min		85 %			
2 – Sp. nurse	Beginner	7min	15min	50 %	25 %	7min	5 %
		23min		20 %			
3 – Psychologist	Beginner	49min	49min	43 %	43 %	/	/
4 – Physician	Intermediate	12min	11min	44 %	47 %	2min	89 %
		11min		36 %			
		12min		42 %			
		8min		26 %			
5 – Physician	Expert	6min	6,5min	38 %	33 %	/	/
		7min		34 %			
		7min		38 %			
		5min		29 %			
		7min		26 %			

A.3 Interviews

A.3.1 Interview guides

Organizational employees

Process:

How does the process of introducing new technology into doctors workflow look like overall?

- How do you approach the process?
- Are there different stages?
- Where do (the ideas for) new projects come from?
  - Did you initiate any projects?

People involved

- What is your part in the process
  - Who do you work together with? On what? How?
- How are healthcare professionals involved in this?
  - How do you communicate with them? About what?
  - Why are you involving them?
- Who do you think is making final decisions in this process? Is there a certain hierarchy?

Experience

- What is most important for you?
- How do people react to new technology that is introduced?
- What are “learnings” you had during the time you work on this? E.g. how to approach certain people or what methods do not work well or something similar?
- Did a project ever “fail”?
  - Why?
  - What happened?

Wants/needs?

- If you could wish for something to change, what would it be?

Additional

- Is there anything I did not ask but you think is important for me to understand this topic better?

Healthcare professionals

Doctor-Patient(-Technology) Interaction

- What is most important for you when you have a consultation with a patient?
- What role do you think the computer plays in your interaction?
  - Is this changed when you use Autoscriber?

Autoscriber

- What is your experience with Autoscriber?
- How did you get to know Autoscriber?
- How and for what do you use it?
  - If not using: Why are you not using it?
  - Based on what do you decide to (not) use it?

New Technology

- While working in RdGG was there ever new technology introduced that changed your workflow?
- What is your involvement when it comes to implementing new technologies into your workflow?
  - No inv.: Would you like to be involved to share your ideas and thoughts?
  - Who do you think is involved in the process?
  - Are these people reachable? Do/would they listen to you?
  - If inv.: How are your ideas/thoughts used?

- » What is an example for a situation where you were (not) part of this process (and what do you think about it)?

Wants/needs?

- » If you could wish for something to change regarding the implementation of new things into your workflow, what would it be?

Additional

- » Is there anything I did not ask but you think is important for me to understand this topic better?

Patients

General

- » How do you feel during consultations with your doctors?
- » What is important for you to feel save and trust a doctor?

Computer influence

- » Is there anything that stands out to you in a positive or negative way? For example loud noises that are always distracting the conversation, incoming calls, nice light and decoration in the room or something like that?
- » How do you feel about your doctors activity on the computer during the consultation?
- » What are the differences in consultations in which AI is used to make a summary and those who don't?
    - » How do you feel about that? (safety, trust, comfort)

Wants/needs?

- » If you could wish for something to change regarding your consultations with doctors, what would it be?

Autoscriber/ChipSoft

Workflow

- » Can you give me a high level overview of how the team works on the development/integration of Autoscriber? For example working mode, who is bringing in new ideas, who is taking big decisions etc.
- » Can you tell me more about the companies role in bringing Autoscriber to the final user and the adaptation process of hospitals?

Feedback

- » What is the current way of collecting feedback from users to guide the development?
    - » Do you feel like this covers your need for user input?
- » Why are you working together with hospitals and doctors?
- » What is most important for you regarding the feedback from users?
- » How does the feedback button in Autoscriber work?
    - » (do they get the whole conversation? are they manually working on it or is it automated? How do they decide what they need to act on and what can be ignored?)

Wants/needs?

- » If you could wish for something to change regarding the workflow of developing Autoscriber to be a good fit for the hospital, what would it be?
- » And what would you change about the process of bringing Autoscriber into the hospitals?

Additional

- » Is there anything I did not ask but you think is important for me to understand this topic better?

A.3.2 Detailed interview insights – Healthcare professionals

RQ: How does the current patient-clinician-technology interaction look like, and what influence do the computer and Autoscriber have on it?	
Theme	**Supporting quote**
Healthcare professionals want to enable the best care possible, so they try to gather as much information (medical and personal) as possible.	"I'd like to get to know my patients. So to know what is important for someone, what makes a day beautiful day, what do you enjoy? What is it that you think I can do for you. Or what do you want me to do for you?" (HCP8)
It's important to create a safe and trusting relationship to the patient so they are not afraid to ask questions.	"Well, important is that the patient is at ease, that he has the safety to trust me and to tell the whole story." (HCP5)
The computer and technical tools are supporting the healthcare professionals.	"I'm really glad that we have a computer and that we're able to see what I did or what my colleagues did" (HCP9)
Documentation and computers are seen as a barrier between themselves and the patients by some.	"You can use the computer screen as a sort of a barrier between you and the patient. And that barrier is something I like to minimalize." (HCP8)
Patients tell them that they don't mind typing as long as it stays in a reasonable limit.	"They think it's important that I write it down correctly" (HCP5)
Patients are either indifferent or excited about their caregiver using Autoscriber and the use of new technology is seen as modern and progressive.	"[...] to my surprise, patients either love it 'I went to the right hospital because you're so advanced' or patients ignore it." (HCP8)
When Autoscriber is used without taking notes as well the user feels less cognitive strained and can shift their focus towards the patient.	"I think it's bringing a sort of peace and quietness in the consults because you're only looking to the patient." (HCP9)

RQ: What is the current implementation process of new technology between healthcare professionals and organizational employees of the RdGG, Autoscriber and ChipSoft?		
Theme	**Description**	**Supporting quote**
Imple-mentation starts with early adopters	The current users of Autoscriber can all be described as early adopters	"I like to consider myself as an early adopter, so I wasn't really afraid of using the new technology." (HCP8)
	Not all healthcare profes-sionals are equally suited and willing to participate in early-stage pilots and many prefer to stick with their cur-rent, well-learned workflows	"[...] then you have to use it and well, you're not experienced. So that takes more time. Well then they say ok, let me do it in the old way. It also went good." (HCP7)

continued on page 92

Theme	Description	Supporting quote
Imple-mentation starts with early adopters	There are factors that are beneficial when trying to convince non-early adopters to use new technology like hearing of positive experiences, measurable im-provements in the workflow or solutions that are well-integrated into the existing workflow	“So, I think what always helps is re-search and that there are studies done before and afterwards.” (HCP3)
	Early adopters often come up with further ideas for features or even new use cases for the technology they are testing.	“Yeah, when the Autoscriber knows to put it in the right boxes and as soon as it’s in its box a link goes to the desk or even to the laboratory already that our nurse is not in between it to make the order.” (HCP5)
Cooperation between healthcare professionals, organiza-tional employees and technology companies	When thinking about the composition of the innovation or implementation team it’s important to find a way to include all people that will be affected by the change to a certain degree, have one person that is responsible, motivated and visible as a contact person and one contact person for this group within the ICT department.	“Now I’m testing it, but I think you have to have your whole team behind you to do it for everybody. I don’t do it for me alone.” (HCP3)
	Giving feedback takes time and healthcare profession-als are unsure how and when to give good feedback, though they are more moti-vated to give it when they experience that it is used.	“But yeah, sometimes because of time management I don’t do that. And then I think the system won’t be trained. So, I’m aware that I have to give this feed-back, but I don’t always have time for it.” (HCP5)
	Some healthcare profes-sionals would like to invite people from ICT or the tech-nology companies to observe their workflows to enable them to build well-fitting so-lutions.	“[...] that the ICT comes to me and, like you, are sitting next to me during my outpatient clinic and you can experi-ence into what problems I walk and that they can think for me proactively.” (HCP5)
	The first period of the imple-mentation process is the hardest, gradual and small changes are better that big ones and healthcare profes-sionals need time to actually learn to use the new tech-nology under less pressure (e.g. by scheduling less con-sultations).	“So, the startup is always the bump.” (HCP3) “I don’t think one day was enough, but it was nice to start with. There was time.” (HCP9)
	Even after the implementations healthcare professionals need access to people that support and teach them new technologies.	“Afterwards there were support people in every department, every day and well during time there was less support, and I think after two or three months they were not available in the department anymore and then you could call the ICT department.” (HCP9)

Insights specific to the pilot of Autoscriber:

1. One of the most mentioned advantages of Autoscriber is that it usually compiles very com-plete summaries and mentions things healthcare professionals themselves might forget about. This is especially handy during longer consultations. In short consultations most still prefer to take notes themselves as they feel it’s quicker than proof-reading the LLMs texts.
2. Many struggle with the style of Autoscriber’s texts. Some find them too short, others too long and many spend a lot of time rewriting what the system gives them and thereby negat-ing the time-saving effect. This is in line with the findings of the observations in chapter 3.1.
3. Autoscriber isn’t yet used to its full potential as most still take their own notes, just adding the LLM to their original workflow. This is due to a lack of trust because the system still fails often and has minor issues within the texts.
4. For the implementation there should be a quick way of getting familiar to the features and possibilities of Autoscriber. Healthcare professionals learn differently but it’s still handy to have a source available if needed.

A.3.3 Detailed interview insights – Patients

RQ: How does the current patient-clinician-technology interaction look like, and what influence do the computer and Autoscriber have on it?	
Theme	Supporting quote
Patients generally trust their healthcare provider to do their job well and keep their information save.	“I think everything what she’s doing that is your job and I think she’s good and I trust her.” (P5)
Patients prepare for appointments and value if the healthcare provider does the same.	“That the doctor is prepared so they know in advance what your name is, or they have read something.” (P2)
The medical language isn’t always easy to understand, so patients value if communication is taking place on their level.	“And for us it’s fine because we know what the doctor is saying. But I think it’s very difficult for people who maybe don’t understand the medical world.” (P4)
Feeling confident or anxious during consultations is mostly related to the severeness of the illness and how used patients are to visit consultations.	“It depends always if you have real complaints then it’s sometimes more... how do you say, more exciting? What is it? But now I’m used to it.” (P1)
Most important is that patients have the feeling that they are listened to and taken seriously.	“That they listen to me and that there is an interaction. So I see that they are listening. I see that they understand.” (P3)
Patients wish for healthcare providers to look at their complains in a holistic view and the com-puter helps them to connect all the information and draw conclusions.	“I think it’s good that they know things about you, and I think the computer helps them with that because yeah, well, they see a lot of patients every day.” (P1)
The physical space of the hospital can have an influence on the patient’s experience (e.g. modern or age-appropriate interior, windows, fresh air, etc.).	“Different because it’s all about the children in the children’s room and this is very white, very clean. So, I think for him, he likes the children’s more.” (P4)

continued on page 94

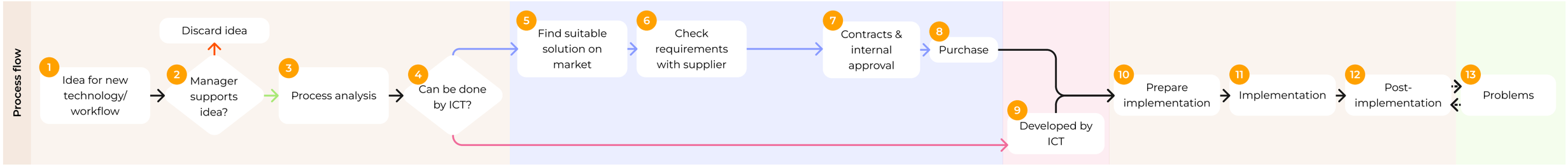
Theme	Supporting quote
Patients are aware of the high demands and time-pressure on healthcare providers.	“Doctors have to do a lot of administration.” (P2)
Patients feel that using the computer is a normal part of the job and needed to give high quality care.	“It’s fine. She’s doing her job. I can’t have a problem with her job, then it is better I don’t come [to the consulta-tion].” (P5)
Computers and AI are seen as supportive tools.	“When it helps her then it helps me.” (P3)
Technology that works in the background reduces the barrier between patient and healthcare provider and take less focus away from the consultation.	“She’s telling there is AI that does the recording, but it’s not in the room. It’s just acting in the background. So that’s a nice thing. Most of the tools are distracting or make you lose focus, and this one enables you to keep focus.” (P2)
Patients are positive and open towards the use of new technology and think it’s important for the future.	“I am open for all the new things that are coming. [...] That is very important for the future.” (P5)

A.3.4 Detailed interview insights – Organizational employees

The figure on this page shows the process journey. In the following paragraphs you will get detailed explanations about what each step entails, also from the viewpoint of the different stakeholders. You’ll also get more information about additional focus points, personal (emotional) experience and needs and wishes that were uttered. Refer to table 2 on page 28 for the job functions of each participant.

1.
   - Basically every employee can come up with an idea for new technology
   - Ideas come from single people, departments or even bigger, interdisciplinary groups like care tables
   - Sometimes applicants have a specific application in mind but it’s also possible to come with loose ideas
   - **Experience**
     - »The motivation to help solve the problem is higher if the healthcare professionals come to the ICT with their own problems (Org5)
     - »Some “problems “ have already been fixed, the applicant just didn’t know the product/function exists (Org5)
     - »Unrealistic expectations for “magical” solutions of the healthcare professionals are frustrating (Org5)
   - **Needs/wishes**
     - »Wishes for every employee to know and feel comfortable to connect to the ICT department with their troubles (Org6)
2.
   - Managers of the departments that would implement idea decide if they want to spend resources and money on it
   - If they don’t approve implementation will not be possible, therefore the idea will be rejected
3.
   - They have a good overview of the IT landscape of the RdGG (Org1, Org5, Org6)

   - Discusses problem with the healthcare professional and try to understand the underlying problem (Org1, Org5, Org6)
   - Ask for demonstrations of the current process (Org1, Org5, Org6)
   - If change affects the whole hospital they discuss it in cross-departmental meetings with key users (Org1, Org5, Org6)
   - If applicant approaches Org4 with a specific application in mind:
     - »Discusses the process and application
     - »Triggers reflection by asking questions
     - »Helps to fill in a questionnaire that helps to get an overview of the data that will be processed
   - Org7 uses questionnaires as a quick way of gathering feedback and preferences from healthcares professionals and also patients
   - **Additional focus**
     - »Likes to foster a deeper understanding for the whole process in the applicant, even if they are not the end user but the owner(Org4)
     - »Want to see a demonstration of the problem to discover possible improper use or lack of knowledge of certain features(Org 5)
   - **Experience**
     - »Isn’t always included in the beginning (Org1)
     - »Important to understand the underlying problem, not just look at the idea the applicant has to solve it (Org1)
     - »People inside the department are not communicating well enough about their problems because they don’t have the time for it(Org5)
   - **Needs/Wishes**
     - Needs applicants to be honest about the process(Org4)
4.
   - The ICT department adjusts or connects applications to fit their digital landscape but does not develop new applications or products
5.
   - Check if a similar problem has already been solved in a different department or applications that have already been approved could be used to solve the problem (Org1, Org6)
   - Not needing to go through the process of approving and connecting new technology saves time and resources (Org1, Org6)
   - The ICT department has an “ICT menu”, a decision aid that helps to quickly find approved applications that fulfill certain criteria (e.g. video calls, connection to HiX, etc.) (Org1, Org6)
   - If an existing solution is used they help with the implementation process (Org1, Org6)
   - If there is no suitable solution available in the Reinier or on the market they’ll search for a co-creation partner to develop a new solution (Org1, Org6)
   - **Experience**
     - »Values close collaboration with external partners (Org1)
6.
   - Composes and send a list or technical and functional demands to the supplier (Org1)
   - Technical demands depend on the kind of application (e.g. is it a standalone-product, in the cloud, etc.) (Org1)
   - Functional demands are derived from the process analysis and needs of the healthcare professional (Org1)
   - Open questions will be addressed together with the supplier (Org1)
7.
   - Draft or check the contracts (Org1, Org3)
   - If there are privacy concerns they check the data management plan together with the privacy and the information security officers (Org1, Org3)
   - If the contracts are in order they get the final approval of the hospital board (Org1, Org3)



8.
- If the hospital board approves the application is purchased

9.
- The process is shaped according to the needs of the project
- Each department has a responsible ICT contact person and small projects are handled between these parties
- For big or complex projects (e.g. solutions that are highly connected to the existing infrastructure or those that cause a big change in workflows or processes) a project group is formed
- Project group team is composed depending on needs of project and includes key users of the concerned departments (Org3, Org5, Org7)
- Key users represent the future user group and are responsible for collecting needs and feedback during development (Org3, Org5, Org7)
- Additional focus
  - »Staying on top of the workload, treat all applicants equally and creating save solutions (Org5)
  - »Risk management by looking at all differences between old and new workflow and identify possible pitfalls (Org7)
- Experience
  - »Finding good solutions is only possible when the healthcare professionals think together with the ICT department (Org5, Org7)
  - »There are many different roles that might be affected which makes finding uniform solutions hard, but even people with the same role might have completely different views and wishes (Org5, Org7)
  - »Developing hospital-wide solutions is most difficult as it's harder to get representative input from all departments (Org5, Org7)
  - »Solutions that target a bigger user or patient group are prioritized (Org5, Org7)
  - »The involved healthcare professionals are early adopters so even when they know their colleagues well they will not represent the department realistic (Org5, Org7)
- Needs/wishes
  - »Most workflows consist of many people working together and can fail if one does a mistake so everybody needs to take care and work mindfully (Org5)
  - »Real-life insights from actual users are important and the key users need to know and represent all their colleagues (Org5)

10.
- For small projects the concerned department will be in charge of the implementation
- If the new technology is supplied from outside the hospital and is either big or very complex a project group is formed to support implementation
- Project group teaches key users and they are responsible for carrying this knowledge into their department and teach their colleagues
- For some applications learning opportunities are created (e.g. e-learnings)
- The operations team will connect the application to the existing systems if applicable (Org1)
- Experience
  - »There is not much feedback on how employees receive his reporting (Org2)

11.
- The new technology is brought into the existing workflow and healthcare professionals learn to use it
- Details of process depend per project
- Big demonstrations might be scheduled to teach application of new technology
- News about new technology will be communicated inside (intranet, information screens on the floor) and outside (news and media) of the Reinier (Org2)
- They support project leads to prepare for interviews (Org2)
- Experience
  - »Sometimes solutions are easy on the technical side but changing workflows is way more complex (Org1)

12.
- After the implementation the project group leaves and the process/machine owner is in charge
- Hospital-wide applications are owned by the ICT department
- The owner is responsible for maintenance and making sure that the product-context-fit remains intact over time
- Checks in with owner and asks for demonstrations to see if changes during development affected data security (Org4)
- Experience
  - Many things never get used and ICT needs to accept that (Org5)
  - »It's problematic if some healthcare professionals don't use new technologies out of personal preference and then teach newcomers an outdated way of working (Org5)
  - »Things will only be used if the benefits are clear and that sometimes takes time (Org5)
  - »New things need new habits for both healthcare professionals and patients (Org5)
  - »Sometimes new things only get adopted after some time and they see higher adoption rates if departments push the use in contrast to project groups that leave after implementation(Org5, Org7)

13.
- If problems arise the owner tries to figure them out with the users
- If problems are too complex a new project leader is involved to examine it in detail
- Experience
  - »If data security changed during implementation and poses risks the board needs to decide if they need to be fixed or if they are calculated risks (Org4)

Additionally, to the information on the singe steps some overarching insights have been collected:

Experience
- Organizational employees are aware of the time-pressure and high administrative burden on healthcare professionals and that learning to use new technology and the needed change in behavior take time. (Org5, Org6, Org7)
- Sometimes they must turn down the wishes and ideas of healthcare professionals which is hard for everyone. (Org1, Org4)
- They are aware that healthcare professionals don't really think about innovation in their daily life but by using enthusiastic and in-spiring people that share their positive experience more people could be convinced of the benefits of new technology. (Org2, Org3, Org7)
- Creating solutions that are well connected to already existing work-flows and software is key to facilitate feasible workflows for healthcare professionals. (Org7)
- Top-down decisions aren't good and can cause a lot of resistance but sometimes they are needed, especially for big changes like transferring to a new and better suitable patient health record pro-vider for example. (Org6)
- A lot of changes are pushed down from governmental decisions and can add up to become a big administrative burden for the healthcare professionals. (Org5, Org6)
- A lot of people are involved in new technology project, both in ICT and the hospital, but there is a physical division between the stake-holders (the Gravin and the hospital are separate buildings). (Org5)
- Healthcare professionals' acceptance of newly implemented tech-nology isn't always measured. (Org7)
- By being present and connecting to as many employees as possible they achieved a trust-relationship, and the data security team achieved being accepted and included earlier. (Org4)
- Even though they sometimes build special applications for certain user groups most workflows are more similar than healthcare pro-fessionals want to admit and can benefit from one-fits-all solutions. (Org5)
- When working with external partners it's valued to have a good col-laboration and fixed contact persons with a focus on the RdGG. (Org6)

Additional focus
- Innovation is an important topic for the Reinier. (Org2, Org3)
- Building a trust-relationship with the healthcare professionals by personal contact, so they know he's on their side and wants to help. (Org4)
- They are on the active lookout for improper use of technology as people aren't always aware for what they need approval. (Org4)
- It's important to be included from the start and take decisions to-gether. Org1, Org4
- It's important that all relevant stakeholders are involved in the pro-cess, and it helps to be well connected. (Org3, Org5)
- They know new technology will change the workflows of healthcare professionals and want to shape change in a helpful and enjoyable way. (Org7)
- The IT of the hospital needs to stay coherent, purposeful and man-ageable (for the benefits of ICT, healthcare professionals and pa-tients) and changes need to be taken considerate (or they will cause new problems) and with a balance of speed and safety (Org1, Org5, Org6)

Needs and wishes
- Hopes healthcare professional will still double-check the output of Autoscriber in the future and not get lazy (Org4)
- Wish that the hospital could enforce the intended way of working more but enforcing rules might lead to loosing staff, so the hospital doesn't do it (Org5, Org7)

A.3.5 Detailed interview insights – Autoscriber (AS)/ChipSoft (CS)

RQ1: What is the current workflow of their development?		
Theme	Company	Insight
General insights	AS	Their process flow with new clients is first offering a short-term demo version, then conducting a pilot with a few specialties before starting the implementation process one specialty after another.
		RdGG is the first client they start the implementation phase with.
		They changed from a research-driven setup during early development to a feedback driven setup since they reached the product market fit.
		Showing the stand-alone version during trials might lose them momentum as clients might not be able to envision the user experience of working with the integrated-version.
		They use a CMIO to conduct in-depth client interviews for them to profit from experts better understanding each other.
		The product manager wishes for his team to be able to experience live how healthcare professionals work with their product to gain better user understanding and empathy.
Driver of development investments	AS	The main driver is the idea of improving the healthcare sec-tor.
	CS	Business decisions are influenced by number of possible clients and size of applicable use cases.
The size of the company influences their modus of operation	AS	The company is small, has a startup mindset and moves fast, also because of the high competitor-pressure. Decisions are taken together, and all departments communicate well with each other.
	CS	Big company and market leader with a well-established portfolio. The team leader R&D is the main decisionmaker and head of development.
Main focus of the current de-velopment	AS	The main focus is on delivering a stable and fast product that entails as little work as possible for healthcare profession-als.
	CS	The main focus is on supporting as many different applications as possible, not just Autoscriber.

RQ2: How do they gather feedback from users?		
Theme	Company	Insight
General insights	AS	They gather feedback through a button within the application, by talking/mails with users during pilots and usage data and feel it covers their need well.
		At the moment they use key users within each client setting as feedback points, but they want to establish nation-wide accepted templates per specialty with one responsible per-son as feedback point.
		Going through each piece of feedback, evaluating it and translating it into action is done manually. They experienced that if healthcare professionals see that their feedback is actually used and incorporated, they are more convinced of the product.
	CS	Feedback is gathered in different, high-level rounds with CMIOs and representatives of their clients.
		New developments are usually piloted with a small number of clients to gain first user feedback.
User feedback can be hard to interpret	AS	They find it hard to find a shared understanding of what “good feedback” entails.
	CS	Sometimes written or verbal feedback is hard to correctly interpret and translate into fitting needs. Seeing problems arise during use is seen as the best way to understand the situation.

RQ3: How do they help hospitals during the implementation process?		
Theme	Company	Insight
General insights	AS	They are aware that Autoscriber is disrupting the current workflows of healthcare professionals.
		They invest time and resources in researching the effect of Autoscriber.
		They utilize early adopters to spread positive experience and convince other healthcare professionals.
		They discovered that convincing non-early adopters might be easier if they offer possibilities for customization.
	CS	They want to enable healthcare professionals to adjust HiX to their needs without the need of the ICT department.
		They question if Autoscriber can be sustainable as it will not result in reduced costs but “only” better job-experience which might not be incentive enough for hospital finance departments.
	AS & CS	They acknowledge that hospitals are a difficult environment for introducing new technology.
		They see the need for providing training possibilities to healthcare professionals.
Communication with clients	AS	The focus on personal contact is their unique selling proposition and they therefore assign each client their own contact person.
		The way of getting in contact with clients depends on their size. They are usually in direct contact with small hospitals but for most big companies the electronic health record provider is in charge of convincing their clients.
		Their contact person within each hospital can be of very different roles (e.g. an organizational employee, a manager, a healthcare professional, etc.).
		They don’t have a “classical” client-relationship with RdGG as they helped them during their early development phases.
	CS	They see their relationship with RdGG as special because the enthusiasm and engagement of the Reinier contact person was a main reason for ChipSoft to get involved.
		They are sending a newsletter to inform about new developments and features, but it doesn’t (always) reach the right people.

A.4 Envisioning exercise

A.4.1 Envisioning exercise – Key user

I would like you to imagine yourself sitting at your desk here in the Reinier. On your desk is one of these calendars that turn one page per day and it shows todays date: the XX of October 2024. As you’re looking at the calendar, by itself it flips to the next day, XY October, then it turns to the next and the next. It starts turning faster, we’re already in December, then next year May, July, September, then the year after. It’s so fast now that you can’t make out the date anymore…until it suddenly stops. It’s showing the XX of October again, but not 2024 but 2034, 10 years from today.

When you see this date, you remember that today is the day of the conference. You’re one of the experts in your field by now, your career is going great. Helping to implement Autoscriber back in 2024 was just the beginning. Over the last years you’ve been involved in quite a few successful implementations of really innovative new technology at the Reinier and this work has been internationally recognized by now. That is also the reason why you’ve been asked to give a talk at this international conference about innovation in healthcare. You leave your office and make your way to the auditorium in which already quite a lot of people are gathered. You see a few colleagues here from the Reinier but also from other Dutch hospitals. When they see you, they smile and wave at you. Next to them you see groups from France, England and Finland, in one corner even a few Americans.

You take your place and the conference begins. The moderator greats everyone and is giving a short introduction about the importance of new technology to tackle todays problems. Then he’s looking over at you and says: “That’s why we’re extremely happy to have an expert here today that will tell us about their ‘recipe for success’!”. Under loud applause you enter the stage and take the microphone.

You start your speech by referring back to the implementation of Autoscriber and the problems that the Reinier still faced at this point. Then you tell them how the mindset of the organization started to change after that. There was more budget and time available and the whole hospital, from the people in the ICT all the way up to the board, had really started to value the involvement of key users more. You tell them how important it was to clearly define the responsibilities the key users had, and you start to list the most important ones:

> *Which responsibilities do you tell them about? Feel free to open your eyes and note it down now or keep your eyes closed as I continue.*

Another important lesson you learned was that certain things should not be in the responsibilities of the key users.

> *What do you tell them is not part of a key users role?*

As you slowly come to the end of your speech you also mention that the success you had wouldn’t have been possible without the great support you got from the implementation teams and the ICT department. You say: “The point where things really changed, is when they started to support us with…”

> *What support was most meaningful for you? Was it one big thing, or many small things? How did you get this support from your team?*

As you end your speech everybody cheers, a few people even stand up. It’s very clear that you held a very motivating speech, and they are eager to take your advice home and start bringing positive change

into their own organizations.

Once you get home you want to take some notes about the main points you mentioned in your speech so the communications department can write an article about it.

Take a few minutes and write down the main points:

- *What are the responsibilities of key users…*
- *…and what tasks are not part of their role?*
- *What is the most important support you get from your organization and how do you get it?*

A.4.2 Envisioning exercise – Organizational employees

[Introduction same as for key users]

You take your place and the conference begins. The moderator greats everyone and is giving a short introduction about the importance of new technology to tackle todays problems. Then he's looking over at you and says: "That's why we're extremely happy to have an expert here today that will tell us about their 'recipe for success'!". Under loud applause you enter the stage and take the microphone.

You start your speech by referring back to the implementation of Autoscriber and the problems that the Reinier still faced at this point. Then you tell them how the mindset of the organization started to change after that. There was more budget and time available and the whole hospital, all the way up to the board, had really started to value the involvement of key users more. You tell them how important it was to give key users few and clearly outlined responsibilities, but even more important than that is offering them support so they can put all their focus on the task at hand. You start to list the most important things you did:

> *Which support do you tell them about? How did you bring this support to the key users? Feel free to open your eyes and note it down now or keep your eyes closed as I continue.*

As you slowly come to the end of your speech you also mention that the success you had wouldn't have been possible without clearly structuring the implementation process. A team of experts set it up and communicated it to all implementation teams. You say: "The point where things really changed, is when…"

> *What happened that made the teams more successful and enabled them to support their key users? Was it a change in setup? A different mindset? New rules? And how did it come to be?*

As you end your speech everybody cheers, a few people even stand up. It's very clear that you held a very motivating speech, and they are eager to take your advice home and start bringing positive change into their own organizations.

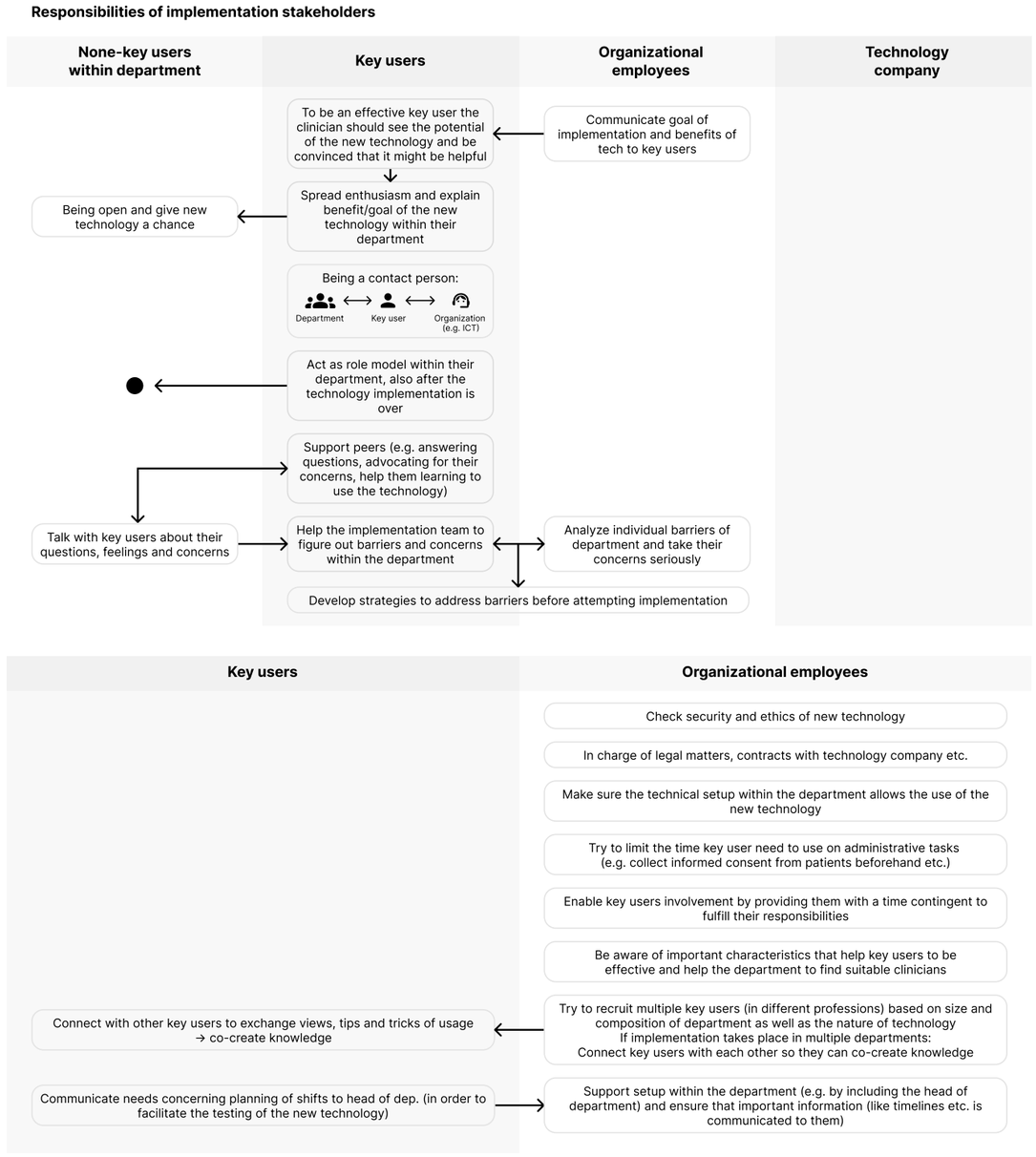
Once you get home you want to take some notes about the main points you mentioned in your speech so the communications department can write an article about it.

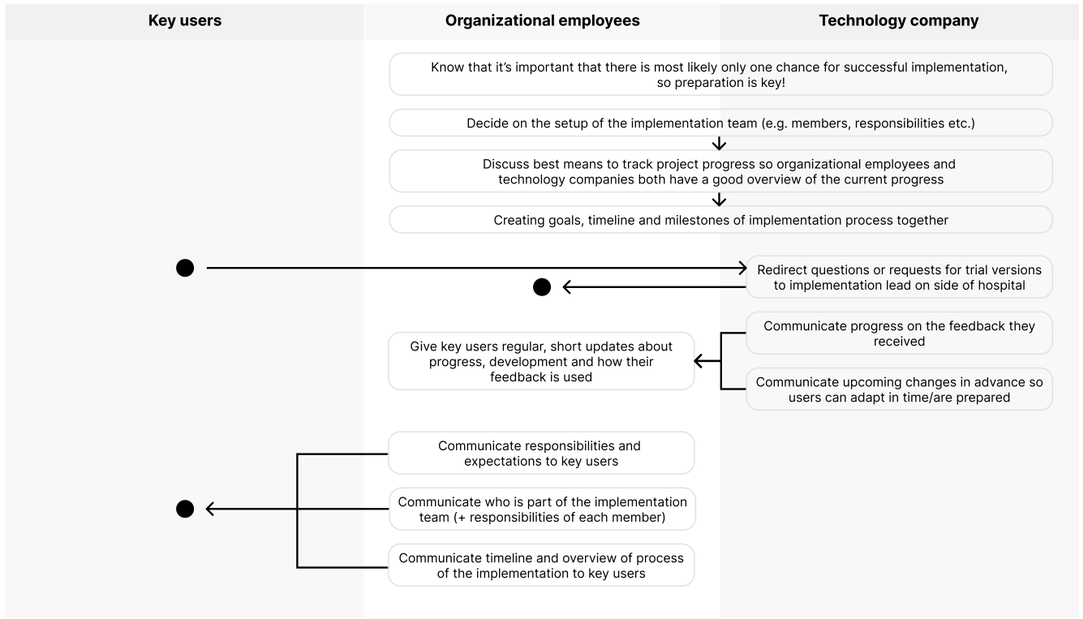
Take a few minutes and write down the main points:

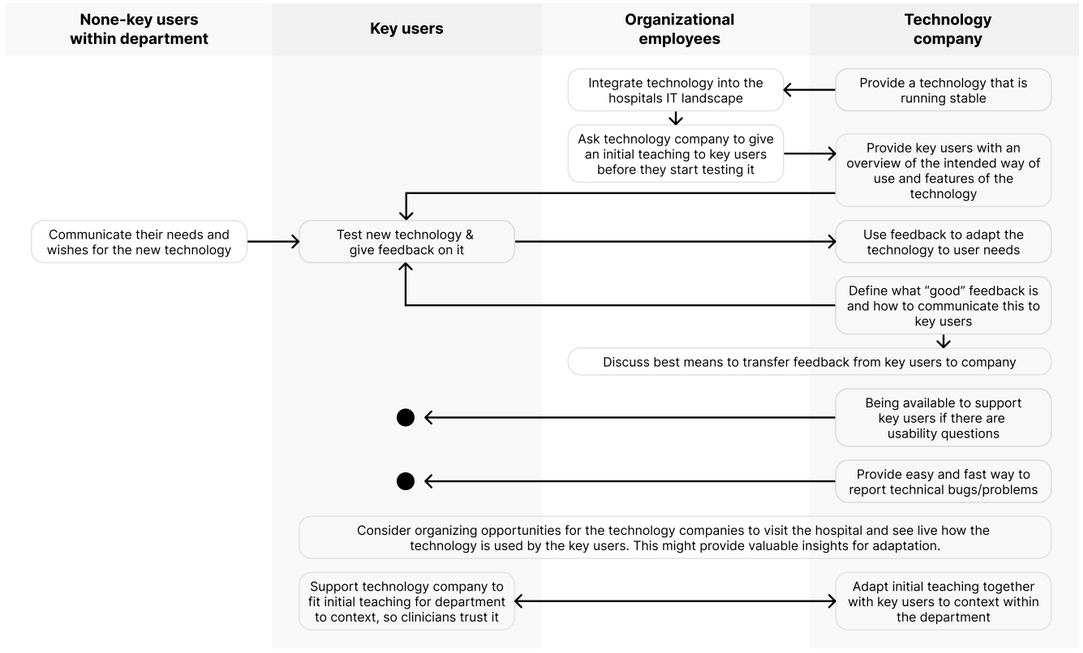
- *What is the support the implementation leads need to give to their key users?*
- *How did the organization empower the implementation leads to successfully set up the process and support all stakeholders?*

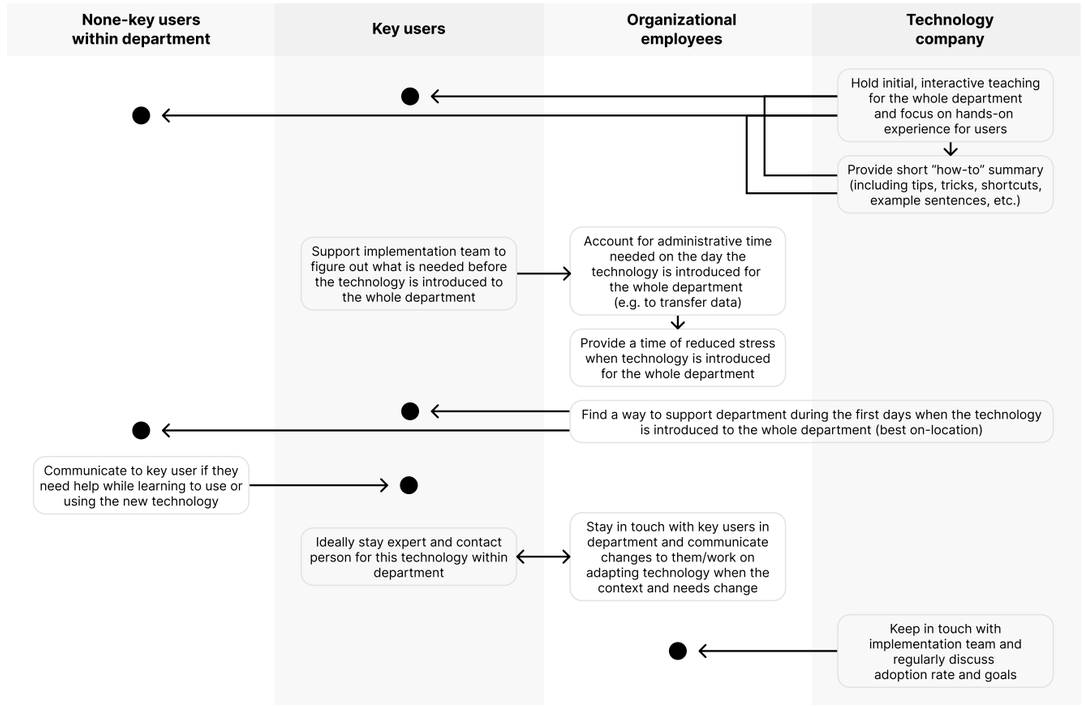
A.5 Design iterations

A.5.1 Design iterations – 1st cycle









A.5.2 Design iterations – 3rd cycle | Book pages

Table of Content

Introduction 1
- How to use this book 1
- The phases 2
- The actors and roles 4

Milestone 1 – The implementation team is set up 5
- Assembled and set up implementation team 6
- Recruit key users 8
- Prepare key users for their role 9

Milestone 2 – The team is ready to start adaptation 10
- Enabling use of technology 12
- Setting up the feedback-loop 13

Milestone 3 – The department is prepared for the go-live 14
- Informing about implementation progress 16
- Teaching and preparing future users 18
- Planning the go-live 20

Milestone 4 – The technology creates tangible benefits 22
- Provide long-term support to users 24
- Monitor use of technology and adapt if needed 28

Dieses Buch ist entstanden als part master thesis blabla Dieses Buch ist entstanden als part master thesis blabla Dieses Buch ist entstanden als part master thesis blabla Dieses Buch ist entstanden als part master thesis blabla

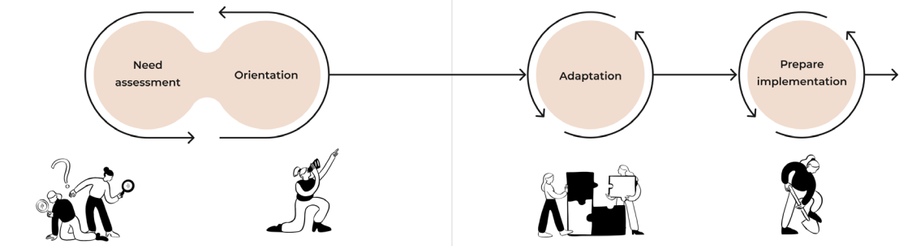
How to use this guide

Welcome to your guide to key user involvement during implementation. It will help you reach the most important milestones when introducing new technology in healthcare professionals' workflows. However, as this guide focuses on the engagement of key users it will only describe those steps, that directly affect them. Your overall process might therefore be more complex than what we describe in this book.

When adopting new technology, it's important to understand that this process should not just focus on the technology but on the **people** that are supposed to use it. Humans need time to adjust to change and it's important to pave the road before introducing new things. This is especially important because starting unprepared might create negative feelings and anxiety which can significantly impact implementation outcomes and adoption rates.

But not to worry, this guide, consisting of a book and a poster, is here to help you plan your way to successful implementation. The **poster** will help you gain an overview over the whole process. It is printed on whiteboard-foil so you can fill in title and timeline of your own projects – over and over again. Each milestone and required step refer back to this **book** where you can find detailed insights in setting up each phase. Each chapter also offers plenty of room for your own notes and learnings so with each project it will grow richer and more specific to your context.

The phases

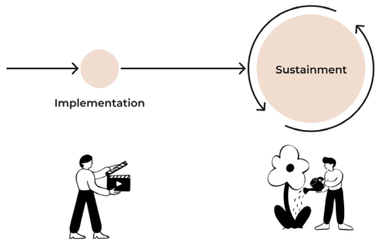


Understanding the current workflow, context and needs. Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis . Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis .

Finding and evaluating possible solutions. Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis . Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis .

Testing and adapting the technology to fit the existing workflow. Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis . Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis .

Preparing the department for upcoming changes. Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis . Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis .



Starting use of new technology in the department. Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis . Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis .

The use of the new technology normalizes over time. Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis . Lorem ipsum dolor sit amet. Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis .

The actors and roles

This guide will talk about the involvement of four major groups:

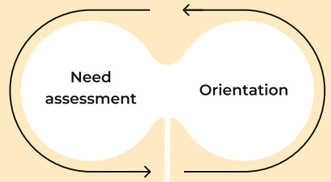
Organizational employees
Employees that support the hospital operations and patient care processes. Most work in departments like IT, Quality & Safety, communication, management, etc. but also (medical) managers within the hospital fall into this description. They are in charge of the implementation process on side of the hospital

Technology company
The company that supplies the technology you want to implement. Their setup and way of working might differ, depending on size, experience and product.

Key user
Key users are motivated clinical staff that volunteers/is appointed to take part in various implementation activities, like providing feedback or spreading enthusiasm among their colleagues, with the goal of promoting the change within the hospital. They are a big factor in successful implementation.

Non-key user
The other healthcare providers within the department that are not directly involved in the implementation process. The need to be convinced, motivated and well supported to use the technology to ensure long-term success.

The roles
The **actors** are the group that is mainly in charge of the described part of the implementation process (solid outline). They are sometimes joined by **supporters** (dashed outline). If their actions affect another group those **affected** are shown behind the arrow.



Assembled and set up implementation team *(↑ p. XX)*

Recruit key users *(↑ p. XX)*

Prepare key users for their role *(↑ p. XX)*

The implementation team is set up
Milestone 1

Milestone 1
The implementation team is set up

The first important milestone in each project is the setup of the implementation team. It will consist of organizational employees of the hospital and selected employees of the technology company. The exact composition and setup will be different for each project.

Key users are irreplaceable if you want to unlock best implementation outcomes. The will help you ensuring a good technology-context fit by providing you with feedback but also increase acceptance among the future users within the department. It's important to understand how to find key users and what is needed to best prepare them for their role and facilitate their engagement as best as possible.

My notes:

Assembled and set up implementation team

Before starting with the adaptation phase the implementation team needs to be assembled, the way of collaboration structured and suitable key users found. The following things are important for this step:

Deciding who will be part of the implementation team and which responsibilities they have

Each project needs a different setup of people and roles so make sure to assess this thoroughly in the beginning. It's beneficial to specifically state the responsibilities to avoid misunderstandings, especially later when recruiting your key users.

Recommendation
Think about who are relevant contact persons for which stakeholder (especially your key users and the technology company) and give them an overview according to their role as a deliverable. For example key users benefit from knowing exactly who to contact for functional questions versus technical questions.

Discussing each stakeholders individual goals, needs and wishes at the beginning of the project

Each party might have individual goals, needs and wishes that might differ from the other stakeholders. These can concern the implementation outcomes, project is managed, timeline or similar. It is vital to foster open communication about everyone's needs and wishes while also providing insights into why these things are seen as important. This can help to find a way of working that suits all parties.

Recommendation
The following questions might be helpful to trigger reflection before discussing this topic in the group:
- What is important for us when collaborating with other parties?
- Why are these things important, what is the underlaying need?
- Which things are "required" and which are "nice to have"?

Agreeing on a (realistic) timeline for the project

This is an important part, not just for the team itself but also for the departments in which you will implement. Being able to communicate the expected timeline will create the needed momentum to drive change but make sure that you plan is realistic, otherwise it might create stress for you and others alike.

Recommendation
Always plan for the unexpected!
Even the best research phase will not bring up everything so some barriers or issues will only show during the process, so be prepared to adapt your planning accordingly.

A.5.3 Design iterations – 3rd cycle | Non-key user scenario

Bringing new technology into the workflow

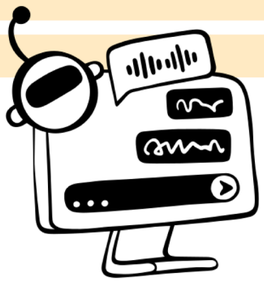
Start of project | Test phase | Preparation & learning | Start of use | Going forward

In one of your regular meetings:
People from the Gravin / head of department tell you that they found a way to solve a problem / improve a workflow.

To do so they would like to implement a new technology

Therefore, they are looking for people that are interested in helping to adjust technology so it fits into the department

A few people are interested



Bringing new technology into the workflow

Start of project → Test phase | Preparation & learning | Start of use | Going forward

In one of your regular meetings:
You're told that they now start to test and adapt the technology

One of your colleagues is the key user, so if you have any thoughts, concerns or questions you should talk with them

They also tell you how long this will take & when they expect to have it available for everyone

Once in a while you get updated about the progress and timeline in department meetings

Occasionally the key user talks about their experiences in meetings

Bringing new technology into the workflow

Start of project → Test phase → Preparation & learning | Start of use | Going forward

You're invited for a teaching lesson for the new technology

The technology company comes into your department and together with the key user the explain the use specific to your workflows in the department

They give a lot of practical tips and tricks and hand you a short cheat-sheet with instructions

They go to every clinicians office / workplace and everyone tries it for themselves in a small roleplaying scenario

If somebody struggles the instructors / key user help them on the spot

Maybe you get access to a demo version in which you can get familiar with the technology in your own time without the fear of "breaking" something

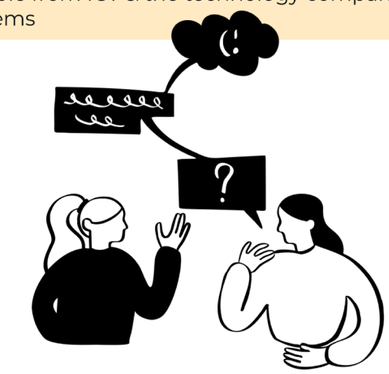
The key user offers to help you if you want

Bringing new technology into the workflow

Start of project → Test phase → Preparation & learning → Start of use | Going forward

On the first day there are less patients scheduled than usually (or more people available during one shift) so you have more room to start using technology for the first time live

In the first week(s) the key user, some people from ICT & the technology company are around your department and help you with problems



A.5.4 Design iterations – 3rd cycle | Key user scenario

Bringing new technology into the workflow

Start of project → Test phase → Preparation & learning → Start of use → Going forward

You get told who to contact if you ever encounter more problems and that key user stays responsible for technology

The key user keeps checking in with everyone in meetings and personally to see how using the technology is going and if you need help going forward

Bringing new technology into the workflow

Start of project → Test phase → Preparation & learning → Start of use → Going forward

In one of your regular meetings:
People from the Gravin / head of department tell you that they found a way to solve a problem / improve a workflow with the help of a new technology.

Therefore, they are looking for people that are interested in helping to adjust technology so it fits into the department

They give you an overview of a rough timeline and what would be the responsibilities

You decide to become a key user and get time blocked in your schedule to fulfill your new role

Bringing new technology into the workflow

Start of project → Test phase → Preparation & learning → Start of use → Going forward

You get an introduction to the technology and they explain what the goal of the test-phase is

They tell you how to give feedback and what good feedback should contain so they can use it

Another colleague, that is also a key user, and you are scheduled on the same days / shifts so you can talk about the technology

They make sure that you're able to use the technology with the technical setup inside your department

You get updated regularly about the progress, timeline and how your feedback is being used

Your colleagues in the department are informed that this project is going on and that you're the key user, so if they have any thoughts, concerns or questions they should talk with you

In some department meetings you tell your peers about your experiences with the technology

Bringing new technology into the workflow

Start of project → Test phase → Preparation & learning → Start of use → Going forward

You're are asked to work together with the technology company to create an interactive teaching session for the new workflow in your department

Once this is done, the technology company comes into your department and together with the you the explain how to use the technology to your peers

The session includes a lot of practical tips and tricks and everybody gets a short cheat-sheet with instructions

They go to every clinicians office / workplace and everyone tries it for themselves in a small roleplaying scenario -> if there are struggles you and the instructors can help right away

Maybe the department gets access to a demo version in which they can get familiar with the technology in their own time without the fear of "breaking" something

You offer to help them if they have any troubles or questions

Bringing new technology into the workflow

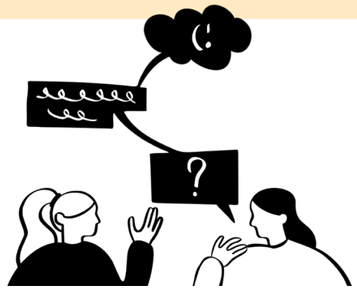
Start of project → Test phase → Preparation & learning → Start of use

Going forward

On the first day there are less patients scheduled than usually (or more people available during one shift) so everybody has more room to start using technology for the first time live

In the first week(s) the you, some people from ICT & the technology company are around the department and help your colleagues with problems

If there are multiple key users in your department, then you're scheduled during different shifts so somebody is always around



Bringing new technology into the workflow

Start of project → Test phase → Preparation & learning → Start of use → Going forward

You stay a key user for the technology in your department, of course with a reduced workload

Your main responsibility is to keep using the technology and tell ICT if it needs to be adapted to stay relevant in your changing workflow

Your also keeping an eye out for your peers, support them with using the technology and are a contact person for their thoughts concerning it

You get told who to contact if you ever encounter technical problems