USER EXPERIENCE FOR DIGITAL ONBOARDING

Examining fragmented system environments

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Abstract

As system environments become more complex, digital onboarding plays an increasingly vital role in helping new hires adapt to their digital surroundings. However, the user experience for new employees during digital onboarding in the workplace remains understudied compared to non-digital onboarding. In this Research through Design project spanning almost five months, we investigated the key aspects of digital onboarding that impact new hires’ user experience and devised strategies to overcome challenges posed by fragmented systems. Through interviews and vast data collection at a tech company, “Company X”, in Sweden, we identified pain points in the current digital onboarding process. Creative methods were employed to address these challenges, resulting in the creation and testing of a high-fidelity prototype. Feedback from new hires indicated that several of their experienced challenges had been successfully addressed. This study provides valuable insights for improving digital onboarding and user experience in fragmented system environments.

Keywords: Digital onboarding, digital employee experience, fragmentation, human-computer interaction, Research through Design, user experience

1. Introduction

Large companies and organisations invest in and implement several digital systems and solutions over time. This on the one hand is a natural part of the digitalisation of workplace environments, but on the other hand contributes to a broad system flora with fragmented systems that can be complicated to get settled in for employees, and have a negative effect on the digital onboarding process for new hires. For those who have worked for a long time in an organisation, it is a matter of course and part of the digital work environment. Still, for new hires, it can be challenging to get an overview of the fragmented system picture. This phenomenon exists for employees today. For instance, fragmented systems have been studied over the past ten years under activity-centric computing (ACC) systems (Balakrishnan, Matthews, & Moran, 2010), which have identified fragmentation. When it comes to onboarding, there is a non-digital tradition across many industries, and it is only in recent years that digital onboarding has gained traction (Balakrishnan et al., 2010; Bell, 2021).

In several research papers, non-digital onboarding is referenced in a variety of settings. Some of these studies link it to user experience (UX) and how the interaction between people and technology influences onboarding. The need for onboarding new hires for digital systems has grown due to increased multiplex and fragmented system environments (Gonzalez, Mark & Harris, 2005). While onboarding has been studied since the 90s (Bell, 2021), there are very few studies of how digital onboarding at the workplace is viewed from the user experience perspective.

Onboarding has several definitions, although there has yet to be a consensus on a definition of digital onboarding in the workplace context. Bauer and Erdogan (2011) define onboarding as: “Organisational socialisation, or onboarding, is a process through which new employees move from being organisational outsiders to becoming organisational insiders. Onboarding
refers to the process that helps new employees learn the knowledge, skills, and behaviours they need to succeed in their new organisations.”. This is the definition that will be used going forward in this study.

Non-digital onboarding is a universal approach for new hires at an organisation. Digital onboarding, however, does not seem to get much attention but is still an essential piece of the puzzle to provide all parts of the spectrum of onboarding (Google Trends, 2023).

There is a perceived lack of studies on user experience (UX) in digital onboarding. There are no concrete suggestions on how to meet the practical needs and tend to the users’ unique relationship to digital technology (Ju, Sajnani, Kelly, and Herzig, 2021; Ziden & Joo, 2020). New hires need to acclimate to their new digital surroundings at work in the best way possible, avoiding the negative parts of the artefact fragmentation phenomenon and the absence of user experience reasoning.

In the intersection of digital onboarding and fragmented digital work environments, there are few studies. Therefore, we want to; Study a context with digital onboarding for fragmented system environments and, through Research through Design (RtD), see how to support good user experience for digital onboarding. Research through Design (RtD), an approach to scientific research, will enable gathering unique insights from design practice and add emotional value through involving users (Desmet, Overbeeke, & Tax, 2001). It will also facilitate comprehension of the design field’s future-oriented issues to get an in-depth understanding of how this should be done (Godin & Zahedi, 2014). As a result, we agreed that there should be a focus on how user experience (UX) and human-computer interaction (HCI) could help develop suggestions (Benyon, 2019) for designing digital onboarding related to the case (Herrgård, 2023). Also, with consideration to activity-centric computing (ACC), try to rethink the digital components of the onboarding process and how to foster understanding so that the new hire feels comfortable in their digital surroundings.

To summarise: what needs to be known in the field related to the research topic, is how the digital part of onboarding should be conducted to ensure optimal user experience for new hires at the workplace. This RtD study places value on the importance of combining design and research practices to generate knowledge of how to foster a better experience for new hires regarding the digital aspects of onboarding. By leveraging empirical evidence, conducting user research, and engaging in creative exercises, we aim to explore how and why a user interface could be developed to address the issue at hand, as suggested by Benyon (2019). This Research through Design (RtD) study is conducted at a company we will keep anonymous and refer to as “Company X”, and is continuing the work of a pre-study also done at Company X. We decided to investigate the digital onboarding at Company X because of the findings of the challenges that was brough up regarding the digital aspects in the pre-study (Herrgård, 2023).

1.1 Research gap concerning the digital onboarding trend
The introduction of new hires, commonly known as onboarding, has evolved since the 90s to encompass a comprehensive process beyond the initial introduction period, including activities such as follow-up meetings, socialisation, learning, and confidence-building (Ju et al., 2021; Bell, 2021). Although user experience (UX) research in onboarding exists (Cascaes Cardoso, 2017), there is a research gap specific to UX in digital onboarding for new hires within
companies. The popularity of the term “digital onboarding” is evident through increasing global searches these past ten years, but specific trends in Sweden are inconclusive (Google Trends, 2023). Consequently, conducting a study on digital onboarding within a Swedish company would address this research gap. Balakrishnan et al. (2010) propose that Activity-Centric Computing (ACC) systems can address challenges in fragmented work environments and reduce cognitive overload. However, limited evidence supports the effectiveness of ACC systems in reducing artifact fragmentation. Therefore, this RtD study aims to provide further evidence to support this claim.

### 1.2 Research question
Since our goal is to work both in an analytical and design motivated manner, Research through design (RtD) is the most natural choice for this study. RtD adds emotional value through involving users in the process (Desmet et al., 2001). Based on that, our research question reads as follows: How can we understand and support digital onboarding in fragmented system environments through Research through Design?

### 2. Related research
This chapter presents relevant research to our research subject. First, we will introduce a section that explains relevant terminology related to non-digital and digital onboarding in work environments. Next, we will discuss work fragmentation, activity fragmentation, artefact fragmentation, and provide a brief overview of activity-centric computing systems (ACC). Further, a section about the pre-study (Herrgård, 2023) at Company X will be presented which affected why we investigated digital onboarding at Company X for this Research through Design (RtD) study. Additionally, we will include a brief section on learning, knowledge, and resources in the workplace. Finally, we will present a section that delves into human-computer interaction, user experience, and user-centric design. The aim is to present a better understanding of the vital aspects of our RtD study to understand how digital onboarding affects the new hires’ experience at Company X.

### 2.1 Onboarding
Onboarding is a concept that was first established in the 1990s. Onboarding often refers to organisational socialisation where employees gain skills, behaviours, and other essential knowledge in a more efficient way, to become a part of the new organisation and their environment (Britto, Cruzes, Smite, and Sablis, 2018). Accordingly, the notion of onboarding as a practice was established. It was earlier referred to as organisational socialisation when only upper management and executives were given a chance to prepare for their new jobs through a process. The rest of the organisation's employees were only given new-hire orientation (Bell, 2021). Onboarding today is used for all employees instead of a selected few (Bell, 2021). Onboarding includes working hours, new hires’ roles, access cards, salary, and bank information, connecting socially with colleagues, whom to turn to with questions, human resources (HR) functions, etcetera.
A multidimensional onboarding process may include levels of socialising, productivity etcetera, and the three main elements of onboarding are learning, confidence, and socialisation (Ju et al., 2021). In Ju et al.’s (2021) study, multiple stakeholders were involved in onboarding over a long time. They state that onboarding sometimes takes over six months. They also encourage more investigations to develop goals so better fundamental onboarding in future studies can be accomplished.

Bauer (2010) mentioned that organisations perceive effective onboarding to improve retention rates, time to productivity, and customer satisfaction. The positive consequences of good onboarding that new hires experience are job satisfaction and commitment to their organisation. Subpar onboarding can obstruct the new hire from accomplishing specific organisational goals. Therefore, performance is also connected to how well the onboarding process is conducted (Bauer, 2010). An indicator of inadequate onboarding is when new hires feel confused, alienated, or lack confidence and, as a result, feel more inclined to leave the company (Bauer, 2010).

Bauer (2010) brings up a study done at Texas Instruments, where they investigated the onboarding process. New hires who completed a refined version of the old onboarding program were ultimately productive in a shorter time than new hires who completed the previous version, and there was a difference of two months.

Snell (2006) underlines the importance for companies to have a comprehensive introduction for new hires; the majority (64 per cent) of executives hired externally will fail at their new jobs.

Because developers often change teams and their positions, they may experience cognitive overload when navigating the new systems (Ju et al., 2021). Enhancing the onboarding is, therefore, necessary to easier adjust to new surroundings and can help the developers to be happier and more effective in their new environment to perform their new roles (Ju et al., 2021).

Dominic, Ritter, and Rodeghero (2020) discuss how a company’s systems, “buddy” relationships and social contacts are all part of the lengthy onboarding process. The term “Buddy” refers to an employee appointed to the new hire that can help them with questions and thoughts and how to operate in their new work environment during onboarding (Dominic et al., 2020). A buddy might make the new hire feel more secure and comfortable instead of going to their nearest leader with everything. New hires benefit from onboarding by learning how to fit in and comprehend social norms (Dominic et al., 2020). For instance, a mentor may struggle to assist the new hire. Therefore, Dominic et al. (2020) find it essential to design an onboarding process so that recruits have the information they require to succeed. Dominic et al. (2020) state that proper onboarding is necessary to increase productivity, workplace interaction, and other factors.

Digital onboarding has been previously studied because it gives information to new hires. It can be easily manageable for the new hires to receive knowledge regarding their new surroundings during in-person and online learning (Ziden & Joo, 2020). Additionally, new hires can get help adjusting to the new surroundings by involving digital onboarding and using human resources management (HRM) resources in digital technology (Sani, Adisa & Adekoya, 2022).
2.1.1 Onboarding, non-digital and digital onboarding and pre-boarding terminology

In the related research, authors write generally about onboarding. However, in this RtD study, we sometimes use the term “non-digital onboarding” to clarify when it does not include any digital elements, to distinguish it from “digital onboarding”.

The phrase “digital onboarding” has many different meanings. We decided that this RtD study would have its own definition of digital onboarding to fit the context correctly. Our definition of digital onboarding is when new hires have tasks such as learning the various digital hardware, software, and systems, setting up an e-mail account, and learning about policies and procedures at the organisation. The hardware component in this company includes the computer, phone, headset, and other items. The software and systems are about the intranet, time tool, business system, communication platform, and other items. Digital onboarding is integral for new hires to feel comfortable in their new systems, software, and processes to ensure they have the knowledge and resources to be more productive and better comprehend their new role.

Pre-boarding is a concept where the new hire gets to meet their hiring managers, socialise with new co-workers and teammates and get an outline of their new roles on the first day at work (Trippe, 2021). Pre-boarding is only possible if all the paperwork is started right after the new hire has signed their contract and completed it before their first day. This increases excitement, employee engagement, and belonging; the new hire can start immediately on their first day (Trippe, 2021). The onboarding process begins after the new hire has settled down at their new workplace and has had the chance to make some connections (Trippe, 2021).

2.2 Workplace fragmentation, activity & artefact fragmentation

Information workers manage multiple activities at work more often than before (Gonzalez et al., 2005). When supporting information workers in this type of work, it is essential to understand to what degree and how they manage several activities in IT-rich environments (Gonzalez et al., 2005). The definition of work fragmentation has two aspects; “the length of time people spend in a continuous activity, and interruptions of that activity” (Gonzalez et al., 2005, p. 321). They explain further that the fragmentation of work is determined by the amount of time spent on the task and the number of interruptions of said task. Therefore, more fragmentation occurs with less time on the task and more interruptions, as opposed to spending more time on the task with fewer interruptions. The employee needs time to acclimate to the activity. Suppose they switch too quickly to another activity in a complex project. In that case, they run a higher risk of not completing their tasks. There is a cognitive cost each time the employee returns to the task and tries to readjust to it after they have been interrupted (Gonzalez et al., 2005). Even though work-related information could be gained through these interruptions, they can still lead to stress caused by having to keep track of several tasks in multiple states.

Gonzalez et al. (2005) mention two types of interruptions; external interruptions, which are caused by the environment (e-mail notification, phone call, or a colleague walking into one’s working space), and internal interruptions, where the person in question stops the task at hand on their own.
Balakrishnan et al. (2010) mention a study that talks about two forms of discontinuity fragmentation; employees spend much energy frequently switching among higher-level activities (activity fragmentation) and digital and physical artefacts (artefact fragmentation). Activity fragmentation is explained as executing and switching between different activities, and artefact fragmentation is an activity taking place across several different artefacts (Balakrishnan et al., 2010).

### 2.2.1 Fragmentation terminology

Fragmentation in this study indicates scattered systems in a work environment and employees frequently switching between various software and systems to complete tasks or find information. It also refers to the definition of artefact and activity fragmentation found in Balakrishnan et al.'s (2010) article.

### 2.3 Activity-centric computing systems (ACC)

Activity-centric computing (ACC) systems are tools that can support and help users to filter digital clutter and are designed around their digital activities. Therefore, this tool supports the users’ actions and encourages them to structure their work around their activities (Balakrishnan et al., 2010).

Activity-centric computing (ACC) systems can provide solutions to these types of fragmentation (Balakrishnan et al., 2010). ACC systems facilitate working on an activity with the necessary artefacts in the exact location but there is not sufficient evidence that supports this claim (Balakrishnan et al., 2010). ACC systems exist in natural work environments in collaboration tools such as wikis, shared repositories, and e-mail, and this often causes artefact fragmentation due to the employees having so much to choose from (Balakrishnan et al., 2010).

### 2.4 Pre-study about onboarding at Company X

This Research through Design study is based on a pre-study also conducted at Company X. The pre-study involved nine semi-structured interviews with leaders, a survey with 31 new hires, and a workshop with six new hires and leaders (more details is provided in section 3.1). Participants in the survey expressed the need for improvement in the digital aspects of onboarding, including outdated systems, complex interfaces, and a desire for user-friendly tools and templates. The participants emphasised the importance of a better user interface (UI) and structure in the digital onboarding process. The study also highlighted the underexplored nature of the digital space compared to the physical space in welcoming new hires. Some participants felt that the introduction to onboarding was rushed and lacking in structure, while others found it educational and calm. Overall, the findings pointed towards the need for improved digital systems, user-friendly interfaces, and a more logical and presentable introduction to mitigate the challenges of fragmented systems and enhance the digital onboarding experience at Company X.

### 2.5 Learning, knowledge and resources at work

Depending on a person’s position in a network, the individual acts in various ways (Bieke & Maarten, 2012). Knowing how people apply knowledge and how they learn is more crucial
today than ever (Bieke & Maarten, 2012). Understanding how people learn and comprehend helps identify strategies for problem-solving and knowledge-creation areas, which in turn helps an organisation develop more creative and innovative solutions (Bieke & Maarten, 2012). Some emphasise the importance of having a laid-back and welcoming learning environment and that it can naturally improve the new hires’ social interactions (Bieke & Maarten, 2012).

Actors can gain access to resources by interacting with others. Social Capital Theory can examine how these resources are embedded in social ties and how individuals access them (Bieke & Maarten, 2012). Lin (2001, 24) summarises Social Capital as “Social capital consists of resources embedded in social relations and social structure which can be mobilised when an actor wishes to increase the likelihood of success in a purposive action”.

### 2.6 User experience, human computer interaction and user-centric design.

The term “user experience” has gained popularity in the field of Human-Computer Interaction (HCI) and interaction design (Hassenzahl & Tractinsky, 2006). It has made the technology humans interact with more accessible and usable, and researchers seem to think that user experience (UX) is a good option for HCI (Hassenzahl & Tractinsky, 2006). User experience is more than just meeting practical needs; user experience emphasises that each person’s relationship with technology is unique, depending on the user’s expectations, experiences, abilities, wishes, emotional state, etcetera (Hassenzahl and Tractinsky, 2006).

User experience (UX) is the user’s whole experience of their particular context. For instance, while drinking a cup of coffee, the experience is not only drinking the coffee and how it tastes, but also the environment you are in while drinking the coffee. The experience of drinking coffee can differ depending on the knowledge, past experiences, mood, etcetera. To design a good user experience, it is crucial to evaluate the context and understand the particular design, and in a more abstract way, consider the whole UX (Benyon, 2019).

As a designer, one must carefully establish how to design the system’s components, including the user interface (UI), flow, and other elements, to create a supported platform (Cascaes Cardoso, 2017). Cascaes Cardoso (2017) studied how different onboarding elements affect user engagement and experience and provided guidelines for supporting future design decisions.

Law, Roto, Hassenzahl, Vermeeren, and Kort (2009) studied the scope of user experience as a concept. Participants usually agreed that user experience (UX) is subjective, dynamic, and context-dependent: This is because users can benefit from a product in various perspectives and ways. Although, the respondents in this study have different background variables that can only explain a small part of their varying agreements about their stated definitions.

This Research through Design study uses the term user experience (UX) the same way as Hassenzahl and Tractinsky (2006) and Benyon (2019) to emphasise the users’ needs and understand the uniqueness of their wishes, experiences, etcetera. The UX term is also used to investigate the whole experience of the specific context and reach a better understanding, improving the usability which will result in a better user experience for the user. Benyon (2019) claims that why and how you develop the user interface in an artefact needs to be considered to improve usability for the user.
Human-computer interaction (HCI) has become common while designing for interactions between humans and computers (Benyon, 2019). Human-Computer Interaction (HCI) has also gained prominence as a field focused on improving usability and enhancing user experience by elaborating guidelines, methods, concepts, principles, and explains why and how the designer should develop the user interface, which stands to improve the users’ experience by guarantee better usability and learnability of the system (Benyon, 2019).

This RtD study uses Human-Computer Interaction (HCI) the same way as Benyon (2019). Another term used in this paper is “user-centred design” (UCD). UCD is the design process where the end-users influence the design (Abras, Maloney-Krichmar & Preece, 2004; Marti & Bannon, 2009). It is both a wide-ranging way of thinking and consists of various methods. The ways the end-users are involved in the process vary; the critical part distinguishing it from other processes is that the users are somehow involved. The goal is to design the product in a way that is as intuitive as possible and is used as intended by the user (Abras et al., 2004).

3. Research Methodology

This study followed a Research through Design (RtD) methodology where we chose a research problem that was worthy of investigation (Zimmerman and Forlizzi, 2007). The utilisation of the RtD method has received an expanding interest in the field of Human-Computer Interaction (HCI). The focus of RtD is on future solutions rather than the solutions of the present or the past. The methodology would help us investigate the problem holistically with an iterative approach in order to find a forward-thinking solution.

Storni (2015) talks about the essence of RtD, how knowledge can be produced using design, the type of knowledge RtD can produce, and who it is for. The observed effects originating from design in RtD can be transformed into a resource for new knowledge (Storni, 2015). The knowledge is about the interaction between the phenomenon and the design intervention that evolves them. The new knowledge gained from design in research can elicit awareness of other realities (Storni, 2015).

3.1 Pre-study at Company X

RtD, as a methodology, can draw inspiration from others’ results for research and either build upon them or take a different path by creating new solutions, proposing alternative options, and so on (Gaver, 2012). We do this by continuing the work from the pre-study (Herrgård, 2023) conducted at Company X in our RtD study, which led to new knowledge about the digital onboarding at the company. In the pre-study, the focus lied on onboarding in general at Company X, and it was determined through nine interviews with leaders (ages 38-57), workshops with six participants, both new hires and team leaders (ages 30-57) and a survey with 31 responders that were new hires (ages 25-55). All participants worked at Company X. These participants felt that their digital onboarding needed development to improve the new hires’ user experience. It became clear that the digital part of the onboarding process at Company X needed to be studied in more detail to determine how to improve the user experience specifically.
3.1.1 Differences and similarities between this RtD study and pre-study at Company X

The difference between the Research through Design study and the pre-study at Company X is that the focus lay exclusively on digital onboarding in this RtD study, during interviews, workshop, creative session and user tests of the low-fidelity and high-fidelity prototype (these methods are explained further in section 3.4 “Data collection techniques”). A similarity between the pre-study and this Research through Design study is that both focused on user experience and how to provide new solutions to improve usability and support the new hires’ experience through onboarding. Both the pre-study and this Research through Design study had similar data gathering techniques. The difference was that a survey was conducted in the pre-study with new hires regarding the onboarding experience at Company X. Meanwhile, in this RtD study, we created a low-fidelity and high-fidelity prototype and performed user tests, which was not done in the pre-study. One more similarity regarding the pre-study and the RtD study was that we analysed the semi-structured interviews following an analysis technique in Yin (2016). More details can be found in 3.6 research analysis.

3.2 RtD related to this research study

The Research through Design (RtD) methodology was covered in this research study to add emotional value by involving the users in the design process, aligning with the importance of user inclusion in the design process for enhanced usability (Benyon, 2019; Desmet et al., 2001). The design was used as a ground to gain the knowledge needed for supporting the new hires through digital onboarding, improving their experiences at the company (Desmet et al., 2001).

Research through Design (RtD) was selected as the methodology for this study, as it combines analytical and design approaches. In RtD, design aids in gathering and evaluating data (Zimmerman and Forlizzi, 2007). In our case, we used Research through Design to structure our study’s methods, where we used semi-structured interviews, a workshop and a creative session to gather data and to determine what ideas could help to improve usability for the new hires, thus gaining knowledge in how to support them. This way, we can collect data from design methods as well. We evaluated and reflected on the data to create a low-fidelity prototype and, later on, a high-fidelity prototype. Zimmerman and Forlizzi (2007) highlight the importance of iteration in RtD studies. This RtD study followed an iterative process when we created our low-fidelity and high-fidelity prototype; we conducted user tests for the low-fidelity and later high-fidelity prototype. We received feedback and suggestions, reflected on them and adjusted the prototypes accordingly. To summarise, this Research through Design study provided a design solution that could help new hires at Company X to improve the user experience with the help of the streamlined high-fidelity prototype depicting a digital onboarding portal to help them experience less work fragmentation in the digital parts of onboarding.

3.2.1 Research through Design critiques and strengths

Some critiques have been mentioned about RtD in research, for instance, that a lot of RtD research studies are poorly documented and sometimes create artefacts that lack textual support (Zimmerman, Stolterman, & Forlizzi, 2010). We had these concerns in mind during
the whole duration of the study, documented thoroughly and created our design contribution well-grounded in the data we gathered to fit the context properly.

RtD aims to produce new knowledge from the strengths of design methods and practices through scholarly research and is separate from scientific inquiry (Zimmerman & Forlizzi, 2014). RtD aims to transform the present state of the world into a preferred state with the designed product (Zimmerman, Forlizzi & Evenson, 2007). The present state of digital onboarding at Company X is viewed by new hires as fragmented, confusing and overwhelming. We want to transform the process by using a designed high-fidelity prototype in the form of a platform which will support the digital onboarding process in the fragmented system environments. By doing this we can hopefully reach a preferred state, where the new hires can thrive and have a positive experience. Therefore, we found that this methodology suits our study best, considering the positive aspects of RtD mentioned previously.

3.2.2 The relationship between RtD study and case study in our research

In this study, we used RtD as an overarching methodology and Company X as a case study to answer our research questions. A case study can be defined as an in-depth study of one phenomenon (Gerring, 2004). The value of doing a case study is being able to carefully investigate and observe the organisation from within and analyse the issue of the specific context (Yin, 2016). We wanted to solve the challenges of the digital onboarding process at Company X in its natural environment by drawing direct, analytical and organic conclusions from the context. Unfortunately, RtD does not guide how the design process should be structured. Therefore, the double diamond approach was used to create structure and complete the gap.

3.2.3 The relationship between RtD and double-diamond in our research

The double-diamond works as an iterative process, where the first part of the double-diamond is “discover” and “define”. The “discover phase” mainly focuses on identifying and understanding the user’s needs; moreover, when in the “define phase”, the problem is aligned with the users' needs. In this stage, we gathered information through interviews to accumulate insights into the non-digital and digital onboarding process and what employees and new hires would like to change to improve the user experience.

The workshop was conducted to generate new innovative ideas that could potentially solve the challenges of the digital onboarding at Company X that was presented in the pre-study Herrgård (2023), and the semi-structured interviews from this RtD study. Moreover, we invited participants to a creative session to brainstorm solutions that could be implemented in the prototype.

In the third phase, “develop”, the interview themes helped us develop a low-fidelity prototype in the creative research process. We also conducted user tests where the prototype was shown to participants who provided feedback so we could start designing the high-fidelity prototype in Figma. After we had created the high-fidelity prototype, user tests were conducted with new hires at Company X to investigate how they experienced the prototype, a digital onboarding platform, in a potential digital onboarding. Finally, we selected and refined the prototype according to the input from the user test to determine the ultimate user experience for this Research through Design study (Ball, 2019).
The double-diamond design process was used to investigate the study's convergent and divergent phases to help understand the study, and it helps the researchers to challenge their assumptions because the double diamond can provoke courage for the researcher to open up a space to create solutions (Council, 2021). In this RtD study, the double-diamond has been implemented digitally with our own twist: in a project Miro-board (for more details, see Appendix H).

The Design Council created the double diamond model because they found it essential that the design had a strategic approach (Ball, 2019). Back in 2003, there was no standardised process describing the supporting process; they came up with a solution: the double diamond process, which has been developed ever since (Ball, 2019).

3.3 Method
We have collected a vast amount of data in this RtD study through semi-structured interviews, a workshop, a creative session, low-fidelity and high-fidelity prototype testing, combined with related research. More information regarding how the data collection was performed will be presented in sub-section 3.4.

The data collection helped us to both broaden our understanding regarding the aim and answer this study's research question. We evaluated and received insights to formulate findings to better understand and support the digital onboarding process for those taking part in it at Company X.

Company X is a Swedish tech-company that is examined in this RtD study; With the aid of a pre-study conducted at the same company (Herrgård, 2023), it was established that digital parts of onboarding new hires at this company have several points of poor user experience in their systems and interfaces, resulting in fragmentation. Participants thought there was an absence of structure in the digital parts of onboarding, which made it difficult to locate specific information and had an outdated appearance on the front end.

3.4 Data collection techniques
In this RtD study we used several types of data collection techniques which will be presented in the following sub-sections.

3.4.1 Semi-structured interviews
We conducted nine semi-structured interviews to understand the users' experience of the digital parts of onboarding at Company X. The interviewees were leaders, new hires, and employees from the human resources (HR) and information technology (IT) departments. One interview was held to understand a chatbot used at the company. All of the interviewees work at Company X, (ages 34-51). In semi-structured interviews, the interviewer prepares pre-formulated questions, although they only need to adhere to them partially (Myers, 2020). Every interview starts with the same questions. Although, as the interview goes on, the conversation can lead to new questions surfacing, which will make the interviews unique compared to each other. Therefore, they will be somewhat consistent simultaneously as some improvisation will occur. The advantage of this is being able to pursue new possible insights that otherwise would have been missed. Another advantage is avoiding the risk of the interviewee not saying anything or being too talkative and going off-topic. Semi-structured
interviews benefit from both unstructured and structured interviews; some focus on the interview from the set questions and room for the interviewee to add additional insights. Semi-structured interviews combine the benefits of both unstructured and structured interviews. They provide a framework with set questions to ensure specific topics are covered, while also allowing flexibility for interviewees to contribute additional insights (Myers, 2020).

3.4.2 Workshop
In our RtD study at Company X, a workshop with 6 participants was held with both new hires and leaders from Company X and two potential new hires, all 26-56 years old. The session had one warm-up exercise, “Crazy Bird”, to get the participants into a creative way of thinking. After the warm-up, we performed a session with “Crazy Eight” where the goal was to push beyond the participants' first idea to find a wider variety of better user experience solutions regarding the challenges, we discovered in the digital onboarding at Company X. These ideas helped us in supporting the digital onboarding in the fragmented system environments when we later developed our low-fidelity prototype.

3.4.3 Creative session
In the creative session, a designer from Company X and an external participant who, through their profession, had a great understanding of user experience and human-computer interaction participated. We included an external participant mainly to decrease the risk of biased opinions. The participants were 49 and 56 years old.

The themes developed from the interview data were considered during the creative session when generating new ideas and solutions. The first exercise of this session was How Might We (HMW), where the participants used the four themes from the semi-structured interviews to work from and answer the question, “HMW solve digital onboarding at Company X?”. To try to solve the problems and generate new solutions. The following exercise was brainwriting; we used the best new solutions from HMW to refine and establish four main ideas. Ideas from the creative session were later implemented in the low-fidelity prototype.

3.4.4 Low-fidelity and High-fidelity User test
During the low-fidelity user test, feedback was provided from potential new hires, new hires and leaders at Company X. The participants were between 26-51 years old. The feedback from the user tests was implemented in our high-fidelity prototype. In the high-fidelity prototype tests, there were four new hires from the company and one potential new hire who participated in the user tests; the age span of the participants was 26-42 years. Onboarding can take more than six months (Ju et al., 2021), therefore, to be certain, each of the four new hires we included had worked at the company for less than six months, and the potential new hire was a user experience master student.

The participants received a link to the prototype and shared their screens during the test. The test leader gave them a set of tasks to complete in the prototype, and the new hires were asked about their experiences and thoughts. These were written down as notes, and afterwards, they were asked complementary questions about how it could have affected their experience during their digital onboarding. The feedback provided from the user test of the
high-fidelity prototype led to new knowledge and helped us in the iterative process of improving our prototype at Company X.

3.4.5 Low-fidelity and High-fidelity prototype
We designed a low-fidelity prototype in Miro based on the data we got from our semi-structured interviews, workshop and creative session to create a solution that could support the digital onboarding in the fragmented systems at Company X. Ideas from the workshop and creative session were implemented as functions. Further, after the input from the low-fidelity user test, as mentioned before, we brought the knowledge and feedback with us when we designed our high-fidelity prototype in Figma. The focus of this prototype was to provide the user with an easier understanding of where to find information and knowledge they need to more easily adapt into their new role and environment and reduce cognitive overload. The differences between the prototypes were that the high-fidelity prototype had additional functions compared to the low-fidelity prototype and had been refined from the feedback we received from participants from the low-fidelity user tests.

We decided to name the high-fidelity prototype “The digital onboarding portal”, as we intended it to be used as an employee portal for digital onboarding at Company X. We wanted to avoid designing a digital portal that causes artefact- and activity fragmentation (Balakrishnan et al., 2010), because it is the biggest challenge of Company X's digital onboarding. Therefore, our intention was to ensure that the potential new hires would not have to switch too much between higher-level activities and digital artefacts while using the prototype during their digital onboarding by mimicking an ACC system. Navigating new systems can become overwhelming, and the new hires can experience cognitive overload (Ju et al., 2021). Therefore, it was crucial to only have the important parts regarding digital onboarding in the new platform at Company X, this was done by keeping it as streamlined as possible and using user feedback.

The prototype was designed to resemble an activity-centric computing system discussed in Balakrishnan et al. (2010). It could reduce the effects of fragmentation during the new hires’ digital onboarding by having the artefacts needed for their activities in the exact location.

3.5 Ethics
Throughout the study, ethical standards were consistently kept in mind. In this RtD study, the planning, conducting and reporting involved obligations by ethical guidelines and rules to obtain truthfulness and thoroughness by methodological guides.

The positionality of us as researchers in this study also needs to be taken into account, which refers to our worldview, how we choose to encounter the research task at hand, and our subjective assumptions about how people relate to and interact with the world (Holmes, 2020). How the research is conducted, the outcomes generated by it, and the results are all affected by this (Holmes, 2020). We are studying at a master's program in human-computer interaction and user experience and have bachelor's degrees, one of us in cognitive science and the other in digital media production. Both of us will be influenced by our past and current education when conducting this research project.
3.5.1 The Swedish Research Council and General Data Protection Regulation (GDPR)

The study used the four primary requirements from Swedish Research Council (2002); the information requirement, the consent requirement, the confidentiality requirement, and the use requirement (Swedish Research Council, 2002) and the General Data Protection Regulation (GDPR) article 5 “Principles relating to processing of personal data” (Intersoft Consulting, 2013).

The information requirement and the GDPR was used to ensure that the participants knew the purpose, that it was voluntary, and which department we are affiliated with in this RtD study, before the participants took part in the interviews, workshops, and user tests at Company X (Swedish Research Council, V., 2002). The participants’ personal data were handled with fairness, transparency, and lawfulness, where we stored and analysed the data in Excel and Microsoft Teams with an end date of the collected data.

The confidentiality requirement was carried through to create a safe atmosphere for the whole study; the sensitive data from the interviews, the workshop, and user tests were stored exclusively in Microsoft Teams and we only used Microsoft Teams when recording the interviews. The data analysis for the semi-structured interviews were carried out in Excel and coded into themes (Swedish Research Council, V., 2002; Intersoft Consulting, 2013).

The study applied the use requirement to ensure that the data is never sold to another company and is only used for this RtD study (Swedish Research Council, V., 2002; Intersoft Consulting, 2013). The sensitive information had an end date, the participants were informed of when the data was going to be deleted (Intersoft Consulting, 2013).

Regarding the consent requirement, we sent out a written consent form to the interviewees before they were interviewed. It explained that the interview, workshop, creative session and user tests were going to be anonymised, ensuring that the interviewees could not be identified from the data. Then during the interview, workshop, creative session and user testing, we informed the participants that they could end their involvement whenever they desired without stating why. It was clear when the recording started and ended during the interviews (Swedish Research Council, V., 2002).

3.6 Research analysis

We applied the five analytic phases in the data analysis of the semi-structured interviews, where iterations between the five stages were a constant process (Yin, 2016). Firstly, free text comments, notes, and transcripts were sorted in the compiling phase. Next, we narrowed down the data, compiling categories to sort out the information in the disassembling phase (Yin, 2016). The categorisation was formed in lists in Excel where the reassembling phase finds substantive themes. The disassembling, categorising, and reassembling of themes were iterated four times. In Figure 1, a visualisation of the phases of the coded data is shown. We started compiling the transcripts’ relevant quotes (Level I) to later describe them with a few words (Level II). After this, we created categories (Level III). Lastly, we analysed the categories to generate broader themes, aiming to achieve a higher conceptual level, (Level IV) (Yin, 2016).

In the fourth phase, we mapped the themes from level III in Miro as a mind map, to sort them out into four themes. Four bigger themes emerged from the data analysis as mentioned before: “Information”, “Communication”, “User Experience” and “Socialisation/Support”. There were
six sub-themes within the four main themes, more details about all themes can be found in the results section (Yin, 2016). The five analytics phases, including Interpreting data, were reassembled to produce new knowledge in how to provide an innovative idea to strengthen the study’s conclusion of the analytic context. Finally, in the fifth phase, the data analysis culminated in the creation of new solutions aimed at enhancing the users’ experience by improving the usability, thus gaining understanding, and supporting the digital onboarding in the fragmented systems at Company X (Yin, 2016).
Figure 1: A representation of the categories and themes from the transcripts
4. Theoretical Framing

During the data analysis of the semi-structured interviews, four main themes became apparent, “Information”, “Communication”, “User Experience” and “Socialisation/Support”. These themes are briefly described in 4.2 and can be found in more detail in section 5 “Results”. To fully capture all parts of digital onboarding, the interview themes were combined with parts from Gheidar & Shami Zanjani’s (2021) framework “digital employee experience” (DEX). “Technology”, “career,” “leadership” and “business strategy” were components included from the DEX framework to complete the interview themes, where DEX filled in the gaps that we found were missing from the interview data. DEX is a holistic framework, and together with the four interview themes, we formed a new framework that was applied and used in this RtD study.

The concept of DEX focuses about to evoke curiosity, attention, or appreciation; the eight components in the DEX framework are: Business strategy, culture, technology, personal characteristics, career, physical environment, leadership, and brand (Gheidar & Shami Zanjani, 2021).

Using the concept of DEX showed a significant increase of 22% in employee engagement within their work environment (Gheidar & Shami Zanjani, 2021). Additionally, employees in organisations that prioritise their needs are four times more likely to remain in their current job positions, compared to those in workplaces where employee needs are not adequately considered. The DEX framework can help the current organisation rethink its relations with its employees (Gheidar & Shami Zanjani, 2021).

4.1 Components from the DEX Framework

4.1.1 Technology component

The technology component states that technology should be easy to learn and use, accessible even when the employee is not at the office and desirable for employees (Gheidar & Shami Zanjani, 2021). Additionally, the technology should not focus on the organisation’s technological needs entirely but, more importantly, meet the needs of the employees (Gheidar & Shami Zanjani, 2021).

Technology should be accessible by anyone in the company if needed. It should be well designed in a valuable and helpful way, and one would want to use it privately at home if possible (Gheidar & Shami Zanjani, 2021). Lastly, the organisation must have seamless channels and integrated experiences through its technology platforms and tools (Gheidar & Shami Zanjani, 2021).

4.1.2 Career component

The career component lists several needs of the employees connected to their careers. Employees need to know their professional responsibilities and be able to choose how to perform them in their work and advance in their positions and potentially to higher positions (Gheidar & Shami Zanjani, 2021). They should be surrounded by good colleagues and directors that communicate well and have a reasonable workload to prevent exhaustion and stress caused by their job (Gheidar & Shami Zanjani, 2021). Another vital aspect to consider is how
the employee views their job, is the nature of their work motivating, challenging, or exciting? (Gheidar & Shami Zanjani, 2021).

Organisations should ensure that the employees' values and interests are included in their jobs, so they can live their life how they want to. Additionally, the organisation should utilise their abilities and skills so the employees can feel satisfied with their job (Gheidar & Shami Zanjani, 2021).

Lastly, the organisation should make sure that the employees get compensation and benefits for every job they do to show them they did well, that they have flexible working options, and that their mental and physical well-being is being tended to (Gheidar & Shami Zanjani, 2021).

### 4.1.3 Leadership component

The description of the leadership component is: That leadership can influence how employees perform. Therefore, it is crucial that the leaders' way of leading is suitable for the company. Encouraging employees to be open-minded and think differently, which can lead them to a positive way of viewing things, understanding their customer's expectations, and get them to the act of thinking. Leaders need to set the tone and inspire their employees to provide engagement and passion to the team. More so, support the employees, foster digital expertise, and delegate the responsibilities in the company (Gheidar & Shami Zanjani, 2021).

### 4.1.4 Business strategy component

The business strategy component is described as follows: The organisation should have strategies that can help not only senior but also junior employees. A long-term strategy for an organisation ought to exist. Strategies have an immense influence on an organisation; the importance of digital strategies is, therefore, necessary as a ground for it. Leaders should help employees to achieve the desired aim or result in their job (Gheidar & Shami Zanjani, 2021).

### 4.2 Themes from the semi-structured interviews

#### 4.2.1 Information

The most prominent theme is information, that information, in general, was spread out too much in too many places, making it unstructured, and that caused the systems to feel messy. There was specific information that was missing during the current onboarding. Too much information and too many systems caused overwhelm and made it difficult to memorise. There was a desire for a more standardised and structured digital onboarding to give new hires the correct information and tools and that digital information in the systems should be centralised to the relevant regions.

#### 4.2.2 Communication

The theme of communication states that feedback is necessary in an onboarding process. Moreover, poor communication between the manager and the new hires can affect productivity negatively, which proves it important to have an open dialogue between those two. The leader must communicate what is expected from the new hires and that the tasks are followed up by their nearest leader to give the new hires motivation to do their task during their onboarding.
4.2.3 User experience
The user experience theme covers how the new hires’ user experience is affected in various ways during their digital and non-digital onboarding. A welcoming onboarding would increase excitement and morale; a buddy would make the new hires feel secure and help them learn the ropes of their new projects and roles. The first day affects their view of the company. Onboarding could be more effective by implementing pre-boarding and letting the new hire do specific tasks on their own, and the user experience would be improved if the information consumed during onboarding had varying visual elements and not just text.

The digital user experience can be described with some changes that were requested for the digital onboarding process. The mobile versions of the systems and intranet need to be improved to increase usability, a more straightforward and streamlined entranceway for the systems would make navigation more manageable, and automation of personal details in the systems would increase effectiveness and less frustration. Informative videos accompanied by text, sound, and pictures would make it easier for new hires to absorb information.

4.2.4 Socialisation/support
The theme of socialisation/support is described as the social part of onboarding between the leader and the new hires, and that it can benefit the employees’ experience. By having regular conversations and building relationships, new hires can experience an improved user experience. This can be achieved by, for instance, having icebreakers in profiles to facilitate good contact with colleagues during onboarding. New hires need to get the proper guidance and information regarding, for instance, insurance and benefits the organisation offers employees. Every employee needs to be treated equally, even if they are working as a master’s student or as an advisor. A buddy better supports the new hires during their first six months at the new organisation. An introductory lunch can create a stronger bond between employees, and there should be a place with everyone’s name and picture to avoid feeling embarrassed when talking to someone. Lunch with colleagues and managers will facilitate connection and make the new hire feel more at home in the new environment. Personal meetings with employees are essential for the experience.

5. Results
In this extensive and time-consuming project, a significant amount of data was gathered from workshops, creative sessions, and the high-fidelity prototype. The study focuses on presenting the most critical indicators, with additional details available in Appendices A, B, and G.

The project spanned approximately 130 days, with specific activities and durations as follows: interviews (nine hours), workshop (one hour), creative session (two hours), low-fidelity testing (two hours), high-fidelity testing (five hours), and prototype creation (seven days). A framework was developed to view the collected data, combining the four interview themes with four key components from the DEX framework: technology, career, leadership, and business strategy. The technology component emphasises the importance of user-friendly, accessible, and well-designed technology for both office and remote use. The career component highlights employees’ rights to know their professional responsibilities, advance within the company, manage workloads, and have autonomy in how they perform their tasks.
The leadership component plays a crucial role in encouraging open-mindedness, innovative thinking, and client-centric approaches among employees. Effective leaders set a positive tone and inspire team engagement. The business strategy component underscores the significance of organisational support for long-term strategies, benefiting both senior and junior employees. The themes derived from the interviews are detailed below.

5.1 Semi-structured interviews – digital onboarding
The participants in the semi-structured interviews included both new hires and experienced employees from the Human resources (HR) and Information technology (IT) departments, and team leaders. The interviews aimed to gather data about the digital part of onboarding at the company from different perspectives so we could better understand the digital onboarding in the fragmented system environments at Company X. Quotes from the interviews will be presented as “I” for “interviewee”.

5.1.1 Information
From the data gathering, “information” was the most prominent theme, and interviewees mentioned it in different contexts. The interviewees spoke about how fragmented information in the systems was, how unstructured it was, and that they needed information that was unavailable. Some thought there was too much information, which caused overwhelm and cognitive load. The things that interviewees mentioned the most were that there was a lack of information during their onboarding, that information was scattered on different platforms and the intranet, and that they disliked how the information was structured: I- “And so it feels like we are... in a transition between having an intranet to moving on. You do not know either... which platform should I start looking in?”. It was brought up that the user interface needed refinement and the understanding of where to find the information needed for the new hires during the digital onboarding needed improvement.

Other things that were brought up were that the intranet harboured some outdated documents with information that was not up to date, that the amount of information presented to new hires and returning employees in their onboarding was too much and caused overwhelm and made it difficult for them to remember everything. Although, one interviewee thought there was helpful information on the intranet and uses it daily in their work.

Two sub-themes from the “information” were identified. The first one is “learning,” brought up that there were many different systems to keep track of. Some interviewees also said it felt unclear whether onboarding materials were mandatory or not, which resulted in new hires not always going through all the materials regarding the onboarding.

The second one is “digital information”; interviewees pointed out that more experienced employees often find it easier to locate information on the digital platforms at the company compared to new hires.

Interviewees wished that their digital part of onboarding had a more logical and standardised path that provides them with the right tools and information. For instance, they desired videos and other variants of visual information instead of text exclusively. Meanwhile, one interviewee said it took a lot of work to know where to find specific information to complete a task that was required during onboarding. Therefore, these results gave us new
knowledge about how vital information is new hires experience during digital onboarding. We also got a better understanding of how they prefer to receive information.

5.1.2 User Experience (UX)
The theme “user experience” mainly consisted of suggestions on how to improve UX regarding the new-hires’ onboarding. What was primarily covered in this theme is how the new hires are affected by certain aspects of onboarding, such as how they are received at the company, having a buddy helping them learn, and how practical the onboarding is.

For instance, some mentioned that having a “pre-boarding” process would make the onboarding process more effective. Some thought that having a “buddy” is essential, regardless of whether they being a new leader or a new hire, for them to feel secure. Those who did not have a buddy reported feeling a lack of support and confusion during their onboarding process and wished they had someone to look to. The thing that interviewees most emphasised was the fact that a welcoming onboarding is vital for new hires' experience at the company.

Three sub-themes from “User experience (UX)” were identified. The first one is “Digital user experience.” We reached new knowledge of the most requested implementation from interviewees, which was to have instructions in the form of informative videos, text, sound, and images during their onboarding. Another request from one of the interviewees was to implement a digital board with names and photos of their colleagues, like the one at their office.

Interviewees also wanted a better user interface for the mobile adaptation regarding the digital systems at the company. It was also desired that a streamlined gateway to the digital systems would be implemented for the new hires. An interviewee mentioned automating personal data to the systems would facilitate their workflow.

The second one was “improvement potential,” where interviewees said better structure is needed to improve the user experience. Moreover, to get a better user experience, Company X need to enhance the onboarding process but keep in mind what the company already does well: I- “My main thing is that anything the digital platform does, in my opinion, shouldn't necessarily replace in-person it needs to be in addition to theirs.”.

A couple of interviewees found some of the onboarding tasks dated and that they should be able to do them themselves to make the process more effective rather than going through several people to complete the tasks. One leader finds it difficult to know what new hires expect.

Finally, the third sub-theme is “Intranet,” where the most brought up opinion is that the intranet lacks ownership, which leads to it feeling unstructured and dated. One interviewee said that interaction was needed on the intranet to give more life to it. One interviewee was skeptical of a new platform, mainly because the interviewee felt it should not be prioritised because of resources.

Some felt embarrassed because they thought the intranet did not reflect the company's potential. One interviewee felt that the intranet’s search function needs to be improved and that a better user interface and user-friendliness would improve the experience. Another interviewee suggested implementing an interactive map on the intranet so new hires can learn about the company nationally, where the staff presents information about their offices.
Thus, this led to new knowledge about what interviewees prefer to change in their digital systems to improve new hires’ experience during their digital onboarding.

5.1.3 Communication
The theme “communication” mostly covered communication between the new hire and their nearest leader, where they spoke about poor communication and that the nearest leader should be present to converse with and give feedback. Reduced motivation to complete onboarding tasks occurred from the new hire when the leader did not follow up on those tasks. New knowledge was reached regarding the digital onboarding process, where new hires did not always get a space to give feedback; it was up to them to approach their leader. A couple of new hires had trouble communicating and receiving support from their nearest leader during their onboarding; one even felt frustrated and unproductive when they were not given tasks. One interviewee found some of the tasks they were given contradictory. One non-Swedish-speaking interviewee found the expectations of Swedish skills confusing.

In summary, interviewees thought it was vital for new hires to have good and recurring communication with their leaders to improve their experience.

5.1.4 Socialisation/Support
The themes “socialisation” and “support” somewhat overlap; some notes fit under both categories. Here we present new knowledge about how interviewees prefer the new hires to receive the proper guidance and ensuring they connect with their colleagues.

Personal meetings are essential, and the new hire’s experience can benefit from socialising with their nearest leader. Some interviewees feel that onboarding today has essential elements for new hires. Some interviewees felt their experience would have improved if they had received more support during their onboarding. One interviewee did not have a “buddy” during their onboarding which led to the interviewee not having someone to lean on.

One interviewee mentioned that development and feedback are followed up regularly. One interviewee pinpointed the importance for leaders and new hires to have recurring conversations during their onboarding to build a relationship. They also suggested that implementing icebreakers in colleague profiles would facilitate making a good connection with co-workers.

One interviewee underlined the importance of not replacing in-person meetings with digital options. They would rather see employers choose parts of the onboarding that is originally in-person but fit better in a digital context and change those parts: I- “My main thing is that anything the digital platform does, in my opinion, shouldn't necessarily replace in-person it needs to be in addition to theirs.”

One sub-theme was created from “socialisation” and “support,” which was “preparation.” Some brought up that personalised onboarding would improve their experience, for instance, by catering it to their roles: I- “If you are a developer or a designer... there are some different tools that you can kind of start looking at or show me how to work with code and agile methods.”

Two interviewees pinpointed that having contact with their leader would have been nice before they started working: I- “To have a preset, uh, meeting with your team, uh, where you
can just get to say hi when you don’t have to talk expectations or salary or task or something, or you just get to meet your... your manager or the people you’re gonna be working with”.

One interviewee mentioned that the availability of computers varies depending on whether they are working from the company office or at the client’s office, which adds uncertainty for the new hires.

5.2 Semi-structured interview results- Chatbot
One employee (age 39) was interviewed regarding a chatbot at the company to get a deeper understanding of how the chatbot has been used and worked for other employees. According to the interviewee, the chatbot helps to get the information and knowledge the employees need for their job more efficiently. The interviewee thought it was easier for the employees to get specific information, and with some training, the search accuracy was improved. Despite this, the bot was not always entirely reliable. Therefore, employees consulted the interviewee about the information. This was due to the bot making up information when asked about things it could not answer; because of this, it was instructed only to answer questions it could answer from the source material it had been trained with. The interviewee was optimistic about implementing the chatbot in future onboarding, although the chatbot has yet to be utilised for onboarding at the organisation.

5.3 User tests of low-fidelity and high-fidelity prototype
The low-fidelity prototype was created and tested in Miro. Potential new hires, new hires and leaders from Company X (ages 26-51) could provide feedback during user tests for the low-fidelity prototype. Participants enlightened us about unclear design elements in the prototype that we either clarified or removed completely. Some examples of this were a name-bingo function that some did not find useful and a clock-function that showed the new hire’s progress during onboarding. They also gave suggestions on functions we could implement, for instance a knowledge wiki trained on the materials at Company X, a checklist for the new hire’s role and a description of the contacts. We received some positive feedback, stating that the prototype provided more clarity in the digital onboarding process and that it provided additional support to the new hire.

During the user tests of the high-fidelity prototype named “The digital onboarding portal”, participants were free to voice their thoughts and opinions, which led to new knowledge about their interaction and thoughts of the prototype. All of them mentioned that they found the prototype of the digital onboarding portal appealing in different ways and thought it would ease the fragmentation of the company’s onboarding process. It was easier to understand where to find specific information, and the purpose of the systems was more apparent than before. A few brought up thoughts on how to improve the onboarding portal by having more icons to make the purpose of certain aspects of the prototype more straightforward. Most participants thought that the prototype was well thought through, considering what they would have wanted during their onboarding at the company.

The final prototype attempts to solve the fragmented challenges at the company, and the participants seem to agree that this prototype can provide a better experience with less fragmentation. All participants thought the digital onboarding portal could be a good way to get familiar with the company even before the start date at the company.
5.4 Experience the digital onboarding portal

The prototype developed in the RtD study includes various functions aimed at helping new hires understand the company's inner workings and navigate their digital onboarding. These functions cover topics such as understanding the intranet, employee benefits portal, internal communication platform, and required software. There is also a function dedicated to providing a clear outline of the new hire’s role, a checklist of onboarding tasks, expectations from their leader, and social information and happenings within the company or department. Additional functions include finding contact information for leaders, buddies, IT employees, and HR employees, exploring office locations and departments through a map, utilizing a search bar with a trained bot for information retrieval, providing feedback on the onboarding experience, and tracking progress through a progress bar. The evolved function called “my role” allows employees to view their progress, development, and experience and provides guidance on advancing in the company. Appendix G contains visual representations of the high-fidelity prototype.

![Figure 2: The starting page of the onboarding portal](image)

6. Analysis

This section depicts the data analysis from our semi-structured interviews, workshop, creative session, and low-fidelity and high-fidelity prototypes with user tests.

6.1 Analysis of the semi-structured interviews

6.1.1 Information in digital onboarding
Studies have shown that new hires that receive the correct information through the UI may affect their motivation regarding onboarding and how they succeed in their role (Cascaes Cardoso, 2017; Dominic et al., 2020). This was confirmed in our RtD study, where interviewees said they were uncertain if some materials were mandatory. This led them not to complete parts of their digital onboarding. Additionally, interviewees mentioned feeling overwhelmed by all the new digital systems they had to keep track of, which also affected their motivation.

Understanding the needs of new hires can create a better foundation for onboarding (Ziden & Joo, 2020). Therefore, creating a digital system that caused the new hires less cognitive load was critical. Interviewees also said that depending on how long they have been working at the company can affect how easy or difficult digital information is to find. Users can experience the technologies differently depending on their relationships with them, which are determined by their abilities, emotional state, expectations, experiences, etcetera (Hassenzahl & Tractinsky, 2006). This idea originates from the essence of user experience to meet the users' particular needs (Hassenzahl and Tractinsky, 2006). The result showed that some interviewees did not like the structure of the information connected to the platforms and believed it was difficult to comprehend for new hires to find information on the company's platforms during onboarding, which resulted in a lack of knowledge and materials, according to some of the interviewees. It also resulted in artefact fragmentation (Balakrishnan et al., 2010), where they had to gather information from several digital platforms (artefacts) to complete a task (activity) during their onboarding, which the interviewees reported as tiresome and confusing. One interviewee was skeptical of a new platform, mainly because the interviewee felt it should not be prioritised because of resources.

New hires and returning employees mentioned that much material with information on the company intranet needed to be updated and that they felt overwhelmed by the amount of information presented to them during their onboarding. Ju et al. (2021) studied developers in new teams and insisted on enhancing the onboarding for new hires so they could avoid experiencing cognitive overload when navigating new systems. Something similar can be assumed in this RtD study, where interviewees experience comparable situations, and some talked about them having to keep track of many new systems. New hires could learn from in-person and digital onboarding environments (Ziden & Joo, 2020). Therefore, it can be crucial for tech companies to consider improving their onboarding process, primarily because of the number of new hires, such as developers, that could start working at the organisations every year; they can easily adjust to their new surroundings and feel more secure in their roles.

Hassenzahl & Tractinsky (2006) discussed the importance of user experience (UX) and how it can influence digital interaction to make it accessible and valuable. Therefore, it is crucial to think about the user experience while creating a new solution for digital onboarding to make it easier for new hires to adjust to the new environment.

### 6.1.2 User Experience in digital onboarding

Some interviewees mentioned not having a buddy as a new hire, and some voiced the importance of having one, regardless of their position at the company, to feel secure and welcome. Having a buddy is a part of the onboarding process and they can help the new hire manoeuvre their new work surroundings and the tools used on the project (Dominic et al., 2020).
Several interviewees brought up the importance of having a welcoming onboarding, so the new hires get the best experience possible at the company. Bieke and Maarten (2012) confirm this in their article, adding that a laid-back and welcoming learning environment enriches the new hires' social interactions.

Participants from the interviews wished to get access to the various platforms with information regarding the onboarding before the new hire starts their position, so they can have time to get accustomed to the information and feel more comfortable before their first meeting. They believe this can lead to more effectiveness and can be achieved through pre-boarding. Trippe (2021) mentioned that pre-boarding could enhance the new hires' engagement and get them more excited at their new job; it can also bring a feeling of inclusion. Implementing this at the company would be beneficial because the employees asked for it, and it has confirmed employee benefits.

Interviewees wish that the user interface of the intranet at the mobile adaptation should be more user-friendly so that they can use the platform from their phone instead of a computer.

Regarding digital user experience, the interviewees desired a more streamlined and straightforward way into the digital systems for new hires. A better structure for the digital onboarding and the intranet is also requested, as well as giving the intranet more life to it. To improve the usability of an artefact, the way the user interface is developed needs to be considered (Benyon, 2019). By applying concepts from the field of Human-Computer Interaction (HCI) when designing digital onboarding, the digital systems (artefacts) at the company could become easier to learn, help and use (Benyon 2019). Because we wanted to make sure that the artefact is user-friendly, the guidelines, methods, concepts, principles, and standards need to be elaborated (Benyon 2019). By making the requested improvements of the digital onboarding, one would be one step further into helping with the UX and HCI for the new hires at the company, partially answering the research question for this RtD study, which will be further elaborated in the discussion section.

Human resources management (HRM) can help new hires to adapt to their new environment by implementing it in a digital format (Sani et al., 2022). For that reason, we included stakeholders as human resources in our semi-structured interview to gain insight on their perspective regarding the digital part of onboarding at Company X.

This research has tried to create a solution in how to create a better digital space, where parts of HRM are implemented in digital format in a more structured and less fragmented way.

6.1.3 Communication in digital onboarding

As per the results, one interviewee said that some tasks regarding the onboarding felt contradicted. Meanwhile, a few said getting support from their closest leader was difficult. One also felt they lacked motivation when their leader did not follow up on the new hire's task. An onboarding that is not fulfilling the best standards can hinder the new hires from reaching their full potential and specific goals within their organisation (Bauer, 2010).

The new hires can easily get inclined to leave their job if they feel confused, lack confidence, and estrangement when their onboarding is inadequate (Bauer, 2010). Hence, it is essential that every aspect of the onboarding process is carefully designed to ensure it provides meaningful support to all stakeholders and contributes to a positive experience for new hires.
Regarding the onboarding process in general, most interviewees said that new hires only provided feedback about their onboarding if they took the initiative themselves.

When it comes to a non-Swedish speaking interviewee, a desire for better communication towards the expectation of Swedish skills was brought up. Unproductive feelings were mentioned in the context of not being given a task when starting their new job, which one interviewee felt frustrated about. Positive onboarding gives the new hire better engagement towards their work environment and more satisfaction in their job (Bauer, 2010). This can result in better productivity, and their new hires stay longer at their organisation (Bauer 2010). Taking the previous feedback to account in the onboarding could give new hires the positive effects of a positive onboarding Bauer (2010) speaks about.

6.1.4 Socialisation/support in digital onboarding
Not having a “buddy” during onboarding led an interviewee to not have anyone to lean on. This leads them to miss out on valuable resources one can gain from social ties and interacting with others (Bieke & Maarten, 2012; Lin 2001).

It becomes easier for new hires to learn social norms and fit in through onboarding (Dominic et al., 2020); therefore, having a buddy becomes even more critical. Thus, to maximise the utility of resources available to the new hire to ensure success, they must have the opportunity to connect with fellow employees during their onboarding.

This RtD study gathered information from interviewees that showed that essential elements are supported in the company's digital onboarding. Although, more support from the leaders can give a better user experience for the new hire, according to the interviewees' assumptions. Herrgård (2023) talked about the desire to design the intranet to be more user-friendly and create a better solution for the scattered systems within the company to generate better usability for the user.

Recurring dialogue between the new hire and their leader is something interviewees thought could help the relationship between them, especially if they met before their first day. Interviewees also voiced that more personalised onboarding for new hires would improve their experience. People can act differently depending on their organisational network position (Bieke & Maarten 2012). It is also essential to know how people learn and apply knowledge in these modern days to understand how they strategise when trying to solve a problem (Bieke & Maarten 2012). This confirms the interviewees' wishes to personalise onboarding and should also underline the effect of how new hires learn from their onboarding experience.

Herrgård (2023) mentioned that Company X is good at welcoming new hires in person, although the digital space was not as explored. One interviewee said replacing in-person meetings with digital options is not desirable. Instead, employers should look at what should be done in person and, from that, look at what can be improved by having it online.

6.1.5 Analysis of the workshop, creative session, user test and pre-study
Herrgård (2023) brought up that Company X’s in-person onboarding is good and that the digital space needs to be investigated further. Therefore, we focused on the digital space of the onboarding at Company X.

The new knowledge of the result that was gained from the workshop, creative session, and user tests (from both the low-fidelity and high-fidelity prototype) were used to influence the
design of the prototype during several iterations where suggestions and ideas were implemented as different functions. Then they were refined as more feedback was given until it was finally completed.

The tests of the high-fidelity prototype in this RtD study brought new knowledge and validated that the digital onboarding portal may help the new hires navigate the fragmented systems and software; all participants mentioned that they thought the structure was more logical than before and that the placement of all onboarding material made sense. The user experience was overall better; it was experienced as simple, smooth, easy to navigate, encourages exploration, is not as overwhelming as their non-digital onboarding, and was good to use during the entry phase. Although, one participant mentioned that one needs to be careful and use it wisely so the new hire can be guided through their digital onboarding instead of receiving too much work before they start.

Future studies should investigate how to develop better onboarding (Ju et al., 2021). This was vital for the prototype to be created and ensuring it is experienced well by participants and could be developed further. One more test would be recommended to ensure that the final prototype is optimal for Company X’s new hires and that it does not contribute to artefact and activity fragmentation but counteract it.

**6.1.6 Chatbot**
A minor semi-structured interview was conducted with an employee at the company, and they provided valuable information about how they used a chatbot to help other employees find the information they needed. The chatbot was trained on documents provided to it, and employees could ask it questions; from this, the bot would search for an answer in the source material, and if it could not provide an accurate response, it simply told the employee that it did not know the answer. When using this data, inspiration was drawn to how one could use a bot during the digital onboarding, and an imaginary bot was implemented in the prototype as a search function. Here it is imagined that the bot will be trained on source material from the most used systems at the company, and the new hire can search for the information they need in a search bar to which the bot will give output. This would provide the new hire with an easy way to find what they are looking for quicker, and it will have access to the source material provided by the bot as a link to the site.

**7. Discussion**
The primary focus of this study is to understand and support digital onboarding in fragmented system environments. The research adopts RtD methodology to specifically address the users’ needs to enhance the usability of Company X’s digital onboarding processes. The research question is “How can we both understand and support digital onboarding in fragmented system environments through Research through Design?”. To answer this question, the study aims to obtain new knowledge about the requirements for supporting digital onboarding in fragmented systems and design a high-fidelity system to address the challenges.

Insights arose from our data collection, and the biggest concern was artefact fragmentation in the new hires' digital surroundings, a hurdle that was challenging to get around, according to interviewees. This confirms Herrgård (2023) pre-study at Company X, that also pinpoints
the challenges regarding the digital parts of onboarding. Accordingly, the collected data from the semi-structured interviews, the workshop, creative session and low-fidelity user tests helped us acknowledge knowledge to design a high-fidelity prototype of a potential solution that would support the new hires in navigating the fragmented systems. The purpose of the high-fidelity prototype was to make the new hires feel supported during the digital onboarding. The goal was to design a system that minimises fragmentation and enhances the overall user experience during the digital onboarding process at Company X.

7.1 How can we both understand and support digital onboarding in fragmented system environments through Research through Design?

In this Research through Design (RtD) study, the design was used as a means to gather and evaluate data (Zimmerman and Forlizzi, 2007). Our study employed various methods which were structured using RtD, including semi-structured interviews, a workshop, a creative session, and user tests to collect data and generate ideas for improving usability, and creating an understanding of and supporting the digital onboarding process. The RtD methodology emphasises including users in the design process, with a specific focus on incorporating their emotional value (Desmet et al., 2001). The essence of user experience is vital to remember to match the new hires’ needs (Hassenzahl & Tractinsky, 2006). In our RtD study, we stated that the essence of user experience is important to ensuring alignment with the needs of new hires. The iterative nature of RtD was followed (Zimmerman and Forlizzi, 2007), with the creation of low-fidelity and high-fidelity prototypes and user tests to refine the prototypes based on feedback and suggestions. This RtD study aimed to provide a design solution in the form of a streamlined digital onboarding portal to enhance the user experience and reduce fragmentation in the system environments for new hires at Company X. RtD is seen as a means to produce new knowledge through design interventions, creating awareness of different realities and transforming the design into a resource for knowledge generation (Storni, 2015), which we have utilised throughout our RtD study. By utilising these aspects of RtD methodology throughout the research project, we could reach an understanding of digital onboarding in new hires’ fragmented digital surroundings and how to support it, thus answering our research question. It helped us understand the needs and experiences of users regarding the digital onboarding process at Company X. Benyon (2019) and Abras et al. (2004) argue for the significance of implementing user experience (UX) to ensure optimal usability for users. Throughout the RtD study, particular attention was given to new hires, aiming to gain insights into their requirements and preferences. By incorporating User-Centered Design (UCD) and RtD principles in the design process, we address the fragmented system environments at Company X. It gave us more knowledge and understanding of the perspective of new hires and their needs so their overall digital onboarding experience can be enhanced. In the following sub-sections, we detail our findings further, showcasing how we reached an understanding of the digital onboarding process and how to support it.

7.1.1 Fragmented system environments

Balakrishnan et al. (2010) conducted a study that investigated the issue of artefact fragmentation within organisations and emphasised the value of activity-centric computing
(ACC) systems in creating a less fragmented environment. The study highlighted the significance of developing effective onboarding strategies to reduce cognitive overload experienced by employees while navigating multiple systems. We believe and agree with the importance of solving the fragmented issues in an organisation and agree that it can be easier to adjust to their new digital surroundings. This allows the new hires to feel more efficient and happier judging by the interview results. Thus, we believe that our RtD study can cover the gap we mentioned in section 1.1, to develop a better digital onboarding with the help of the understanding of the users’ experience. The understanding we got from the RtD study gave us support in how to create a new solution for a better usability of the fragmented systems. We believe the key to improving the experience for the new hires is to understand the new hires’ desires and the stakeholders in the digital onboarding at this company. Guided by RtD as a methodology, we achieved this by involving users during the data collection through the whole process to add emotional value (Desmet et al., 2001). From the new knowledge of the users’ experiences, it laid the ground for our final design of the high-fidelity prototype. In summary, the findings from the data collection provided new knowledge and understanding which was beneficial for the new hires’ digital onboarding experience and hopefully for new hires at other companies in the future.

7.1.2 Digital employee experience (DEX) and the themes from the semi-structured interviews from this RtD study

The components of the digital employee experience (DEX) emphasise the importance of ensuring technology accessibility for employees, regardless of their location, while prioritising well-designed and user-friendly interfaces. It also underscores the necessity for employees to have clear knowledge of their responsibilities, the ability to choose how they work, and that they have a reasonable workload. Moreover, effective leadership is vital in supporting employees’ performance and inspiring continuous improvement. Lastly, the business strategy component highlights the significance of providing assistance to both junior and senior employees in their respective roles.

The DEX components and the four interview themes overlap in various ways. The technology component aligns with the user experience theme, emphasising the significance of user-friendly digital systems. Otherwise, new hires may experience negative effects on their motivation, effectiveness etcetera. Cascaes Cardoso (2017) confirms this, stating that the user interface impacts information retrieval and motivation in new hires.

The communication theme completes the career component because communication has shown to be important for new hires to know what to do during their digital onboarding, how to do it, and overall support.

The leadership component overlaps with support/socialisation; both talk about leaders supporting the new hires in their performance, learning how to do their new job, and having a buddy and other social connections at the workplace will also help with this.

In summary, through the components from DEX and the four themes from the semi-structured interviews, we have pinpointed what interviewees thought the most important aspects during digital onboarding at Company X were. Through DEX and the interview themes, we have created a better understanding of the digital onboarding process and we use them to support the onboarding. We have utilised this understanding to create a design that
can help support the digital onboarding in the fragmented system environments at Company X. This understanding we believe also can be used in future research to improve the digital onboarding experience for the new hires at other companies.

### 7.1.3 Digital onboarding environment and the user experience effect

Research suggests that assigning a buddy to new hires can help them navigate their tools and work environment, while also enabling valuable social connections with fellow employees (Bieke & Maarten, 2012; Dominic et al., 2020; Lin, 2001). Creating a welcoming and accepting learning environment during onboarding is crucial for promoting these social interactions (Bieke & Maarten, 2012). Based on our research, Dominic et al., (2020) and Bieke and Maarten (2012) seem correct. Having a buddy was found to be important for new hires in our interviews, as those without one reported feeling lost and confused. To enhance the digital onboarding experience, it is therefore essential to provide new hires with a reliable support system, including a buddy, accessible system structures, and a warm reception. This helps new hires feel comfortable, informed, and supported in their new roles.

The analysis emphasises the importance of providing guidelines to enhance the user interface of digital systems during digital onboarding, tailored to meet users’ needs. Utilising concepts, methods, and standards from human-computer interaction and user experience can improve usability and users’ ability to learn and utilise the system (Benyon 2019). Interviewees expressed a desire for a more user-friendly interface, including streamlined access to digital systems and improved structure for the intranet. The semi-structured interviews, a survey and a creative workshop with participants from Herrgård’s (2023) pre-study confirmed the need for a better user interface to enhance the digital onboarding experience for new hires. The final prototype created in this RtD study addressed these concerns and received positive feedback from new hires, indicating that their usability needs were met.

Ziden & Joo (2020) mentioned the importance of the physical and digital space of onboarding for new hires to facilitate understanding. It was, therefore, crucial to solve and create a solution to the challenges that were brought up. The user tests with the participants regarding the high-fidelity prototype seem to validate the challenges discussed in the interviews, workshops, and creative sessions about digital onboarding at Company X, as well as the challenges from Herrgård’s (2023) pre-study, and it seems to have met their wishes. The high-fidelity prototype appears to be able to provide a knowledge-rich digital onboarding for the new hires. We are aware that the result could have been different if this RtD study had had more iterations or if we chose to go with another methodology, methods or participants.

### 7.1.4 Socialisation, support and Communication in digital onboarding

The importance of fulfilling onboarding is highlighted by Bauer (2010) as it impacts new hires’ potential for success and achievement in their work goals. Inadequate onboarding can lead to confusion, lack of confidence, and estrangement. Some interviewees in our study mentioned difficulties in obtaining support from their nearest leader, leading to frustration and feelings of unproductiveness. Our RtD research supports the idea that new hires require assistance throughout the digital onboarding process, including recurring dialogues with their leaders. This support helps new hires understand the significance of digital onboarding tasks, receive proper guidance, and stay motivated during their initial period at the company. Aligning with
Bauer's (2010) findings, the study suggests that support during onboarding contributes to a positive experience, increased engagement, and longer retention of new hires. This is part of this study's contribution to the user experience field. Socialisation, confidence, and learning are core elements of onboarding, which enhance new hires' learnability, confidence, and inclusiveness into the social aspects of their new environment (Ju et al., 2021).

7.1.5 Insights from low-fidelity and high-fidelity testing
The user test from the low-fidelity prototype produced information on how well the participants understood the prototype and feedback about the functionality and appearance. The feedback gave us valuable insights and suggestions on how to design for better usability and support in our high-fidelity prototype to solve issues surrounding the fragmented systems at Company X. Cognitive overload in fragmented systems is a reason that new hires need more improved onboarding (Ju et al. 2021). The high-fidelity prototype developed for the digital onboarding seems to meet users' needs and cause less overwhelm based on feedback from our user tests. Participants in the user tests found that the prototype's usability was improved, it was easier to use, facilitating navigation and finding information. They appreciated the ability to revisit and remind themselves of what they had learned during their digital onboarding and felt that the prototype explained the company's systems effectively.

It is vital for new hires to receive a comprehensive introduction (Snell, 2006), which the new hires seem to think that the prototype has succeeded in providing. New hires need proper onboarding to increase workplace interaction, productivity, and other factors (Dominic et al., 2020). Based on the feedback we received from the user tests, there is a strong indication that our high-fidelity prototype has the potential to make significant contributions for new hires' digital onboarding experience. This is grounded in factors mentioned before in how to improve the usability in the fragmented systems. The visual design and structure of the prototype were well-liked, although there were suggestions for improving the comprehensibility of certain functions. Interviewees also expressed dissatisfaction with the current information structure in their digital systems, finding it difficult to find necessary information during digital onboarding. This issue of fragmented artefacts and retrieval tasks was seen as confusing and tiring. Balakrishnan et al. (2010) describe this as artefact fragmentation, which can hinder new hires' access to crucial information for completing tasks. While long-term employees at Company X find it relatively easy to locate information within their digital environment, new hires face challenges due to fragmented information spread across various platforms, requiring additional time and effort to grasp. The high-fidelity prototype was seen as a positive solution to these challenges in the user tests, addressing the issue of information structure and aiding new hires in overcoming artefact fragmentation.

Bieke and Maarten (2012) emphasise the importance of understanding individual learning styles and behaviours, which aligns with our RtD study's findings. The interviewees emphasised their preference for personalised onboarding experiences, reaffirming the advantages of adapting learning approaches to individual needs, as highlighted by Bieke and Maarten (2012).

The high-fidelity prototype showcased the potential of a digital onboarding portal, providing new hires with easier access to relevant knowledge, reducing fragmentation, and cognitive overload. Related to the research question, the designed high-fidelity prototype in
this RtD study is an example of how a digital onboarding process can be supported. The filtered onboarding portal was specifically catered to the crucial aspects, knowledge, and information needed for new hires during their initial six months at the organisation.

The high-fidelity prototype fills the gap identified in the pre-study (Herrgård, 2023), contributing to the development of effective digital onboarding solutions.

Finally, this RtD study has provided us with valuable understanding in how to create a solution that meets users’ needs and supports an improved usability, accommodating the challenges of fragmented systems during Company X’s digital onboarding process.

### 7.2 Limitations

The intention of conducting a RtD study with the aid of Company X was to get a deeper insight into digital onboarding challenges to give us better implications on what works well and not so well in digital onboarding. Due to the scope of our RtD study, it was determined that focusing solely on Company X was appropriate because then all focus would be on one organisation instead of studying several organisations and getting weaker results. Also, due to the perceived lack of earlier studies on the current research topic, we would have to study several organisations on a deeper level to generalise our findings, which we decided not to do because of the time constraints.

The double-diamond approach had some sources that mention some criticism regarding the approach (Design Council, n.d.). However, we saw the positives to using the double diamond as a structured visualisation to guide us through the RtD study, even though it is not specifically related to RtD. They helped to view the research in both a holistically broadening and narrowing down manner.

Because this RtD study aimed to understand and support digital onboarding in fragmented system environments and what is needed to support this, the most important target user group was new hires at Company X. New hires were involved in every part of the design process, together with other stakeholders related to digital onboarding. Although, due to circumstances regarding Company X, only a minor part of the participants in the semi-structured interviews were new hires. This was compensated by quantitative and qualitative data from Herrgård (2023) and our user tests of the low-fidelity and high-fidelity prototypes to strengthen our RtD study. Still, we would have liked to involve more new hires in the interviews to make the results even more reliable. This RtD study was conducted at a tech company in Sweden; The study’s findings are therefore limited to our case at Company X. Because of this, it becomes difficult to confidently generalise the findings to other contexts. For future research, we suggest doing more qualitative studies on various types of companies in Sweden and other countries, investigating further how user experience can support new hires during digital onboarding in fragmented system environments. This way, more contributions to this phenomenon will be available, and connections between these studies will become apparent. Then quantitative studies could be conducted, testing hypotheses that could produce more generalised findings on how to construct and design digital onboarding and workplace systems to avoid fragmentation that applies to most workplaces in Sweden or perhaps even the rest of the world.
The design contribution is specific to the margins of the company and its new hires' needs. We urge more of these contributions in the potential studies mentioned before so potentially identifiable patterns can be found between these as well.

8. Conclusions

We conducted a RtD research project at a tech company, along with the methodological principles through design. Here, fragmented system environments were studied where user experience during digital onboarding was the focus. By working with research through design, we arrived at a potential solution to the challenges posed: “the digital onboarding portal”. The interview data was analysed, and four themes arose from the data to be further used in the theoretical framework together with the digital employee experience (DEX) framework. This framework was kept in mind during the entire process by keeping the research project within the limits of the aim of this Research through Design study.

The framework was created to cover Company X's digital onboarding aspects. However, for future research, this framework needs to be developed if they decide to take this RtD study further and investigate how to develop and improve new hires' experience at the company even after their onboarding ends and how they learn from each other at the workplace.

Later, creative methods were utilised to find potential solutions to the interviewees' concerns and fulfill their needs. Lastly, together with data from our RtD study, a high-fidelity prototype was developed, based on related research, semi-structured interviews, workshop, creative session, and user test of the low-fidelity and high-fidelity prototype. The data collected demonstrated how to improve usability and learnability through the understanding of the new hires' needs.

The high-fidelity prototype, “The digital onboarding portal,” was developed and tested with new hires to determine the prototype’s most essential qualities to the user experience and ensure that these qualities did not cause further fragmentation. Participants from the high-fidelity user tests thought the digital onboarding portal could empower a better user experience, help them navigate the fragmented systems, and influence their skills to adapt to their new roles.

We recommend an additional user test to address the constructive criticisms and ensure that the design effectively lessened the two types of fragmentation. Although time constraints prevented the completion of the second user test of the high-fidelity prototype. We believe that conducting it would have significantly enhanced the overall user experience because of enhancing the usability of the digital onboarding at Company X. This aligns with Ju et al.'s (2021) perspective on the continuous improvement of onboarding experiences, and our RtD study has made valuable contributions towards this goal.

Being colleagues is a process of socialisation that continues beyond onboarding; even after the new hire is onboarded, they are still in progress. What does the continuance of learning look like after onboarding? How do colleagues learn from each other? How can a digital tool be developed to support the new hires’ continued competence growth? How can we reach a generalised agreement on how digital onboarding should be conducted at workplaces? We suggest that future research explore these questions.
This RtD study has addressed our research question, by contributing both with a knowledge contribution and a design contribution; the contribution adds to the research gap that we now have more knowledge about digital onboarding in fragmented system environments, and we uncovered essential aspects of digital onboarding through studies conducted within the specific Company X concerning user experience when designing the first time for new hires. Finally, we provide suggestions and show opportunities for supporting the fragmented systems of digital onboarding at Company X along with design alternatives.

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References


Appendix A

Workshop results

Eight participants took part in a workshop where six were employees at the company, and two were design students acting as potential new hires, the age span was between 26-56 years.

The workshop gathered different insights about how to enhance a better user experience for the new hires when using the digital aspects of onboarding at the company.

Bell (2021, 2) said that onboarding today includes all new hires at an organisation and not only upper management as before. Bauer & Erdogan (2011) mention the importance of using onboarding to help new hires to succeed in their new role at the company. This shows the significance of the insights from the workshop from this Research through Design study, where insights from employees were gathered.

Participants from the workshop mentioned that new hires could assemble an introduction kit where they can choose from a checklist with different company merchandise. The new hire should also receive a checklist with tasks to facilitate social connections with colleagues; an example could be booking lunch with their team leader or a colleague.

One respondent pinpointed that the introductory seminar for the whole company should be more accurate and local than it is today. Then they get to meet the people they work with. They also wished for a place where the people who work on the same project can communicate and help each other to increase closer collaboration.

A potential chatbot was brought up where the new hire can ask general questions. An alternative idea to this from another participant was a “need help zone” channel online or in the office to step into where the new hire can ask for help from their colleagues.

One participant discussed a help function connected to the “buddy” and that the layout should be streamlined to fit new hires. Another idea they had was that employees could volunteer in a function where they are put into themes depending on their role at work (for example, IT, UX, and so on). If the new hire has a question during their onboarding, they could press a button where the volunteers would show up as icons the new hire can click to ask them a question. This would encourage them to ask for help.

One communicated an idea where it was videos from the different departments, where they present what they are doing to get a clearer picture of what they are doing at the company.

A site was presented where the new hires can get an overview of where to find information and guidance on finding different knowledge and tools. This could give the new hires the correct licenses faster with the help of a start kit requirement.

Another idea under the workshop was to use a VR headset where the company’s CEO welcomes the new hire and gives them access to a self-portal. Where different levels fall through the portal, an animated figure tells, explains, and prepares the new hire with photos, videos, and text to demonstrate what the company does, how to work as a consultant, and so on.

Lastly, a “laugh of the week” was brought up to laugh together in a digital meeting with the video and microphone on.
Appendix B

Creative session
A creative session was performed to generate new innovative solutions for creating the first low-fidelity prototype. In the end, four ideas were created. The first was to create a visual tree or map of all onboarding information as a symbol and guide for all new hires and managers. The second idea was to create visual movements that follow the sounds in an audio file from the onboarding material, which could create a more humanlike feeling. The third idea was broader and suggested that every part of digital onboarding becomes a fun challenge through gamification. Lastly, instead of an idea, a thought was explored. It was brought up that “onboarding” is a process, like “getting on board” at the company, and how the new hire knows which processes to get on board, how far they have come on board, etcetera. Ideas to try and solve this followed, for instance, having sections of the digital onboarding and unlocking them one by one when progress has been made and visualising this with a progress bar that fills up. Ju et al. (2021, 622-623) emphasised the importance of achieving effective onboarding and investigating ways to do so.

Appendix C

Personas
The purpose of creating personas is to get a fictional character to represent a specific group of people, for instance, users, employees, or customers (this is service design doing s. 127). The advantage of creating personas is empathising with the target group by addressing their motivations and behaviours. This will help create solutions to an identified problem.

We created four personas based on interview data, using a template in Miro, and modified it to fit the project. The personas included demographics (name, age, role, and department), behaviours and habits, pain points and frustrations, and needs and goals.

![Persona #1](image1.png)
![Persona #2](image2.png)
Appendix D

Journey mapping

Journey maps are good for mapping out real-life experiences or envisioned experiences in the future (Stickdorn 2018, 28). The scale of the journey map is determined by the steps and stages of the envisioned event; this can be anything from a detailed description of a user signing up for a service taking a couple of minutes to an overview of a customer’s bank loan reaching over five years.

A user journey was created with a template in Miro detailing the different steps a new hire goes through in their onboarding at the collaborative company from the moment they sign their contract until their follow-up meeting with their closest leader. When using interview data, the envisioned employee’s feelings were manifested using emoticon stickers and their thoughts during the different journey steps. Lastly, measures that needed to be taken in steps to improve the user experience were stated in the bottom row.

Appendix E

Crazy eights

This was carried out in three steps with a warmup exercise called “crazy bird,” where the participants would make random shapes at first and then turn these shapes into birds. The second part was the main exercise, crazy eights, where a piece of paper is folded into eight squares of the same size, and the task is to generate eight ideas or concepts that solves the challenge in question. (Levey, Y. 2016).

The authors’ workshop included crazy bird as a warmup exercise to get a more creative main set. Further, a crazy eight exercise was held to look beyond the first new innovative solution, mainly because the first one usually is the least innovative. Lastly, an open discussion was held to give us more insights into the participants’ opinions of the different creative ideas. The data from the workshop and the user tests were collected through notes and used for ideation sessions further in the process.
Appendix F

Interview layout

Step 1: Thank them for participating.
Step 2: Ask if it's okay to record the interview. If they say no, inform them that notes will still be taken.
Step 3: Briefly remind them about informed consent, saying:
“I just want to remind you that your participation is voluntary and that you can stop your participation at any time without having to give a reason. We will process your data in accordance with the GDPR and everything we collect from you will be anonymized. Your personal data will be deleted by 31 December 2023.”
Step 4: Start the interview. Read out the following questions but change the order or skip questions as the situation requires.
1. In what way are you involved in the onboarding process in your work?
2. Can you describe the main elements of the onboarding process according to you? Why? (Show checklist)
3. Do you feel that the introduction offers the elements that you consider important? In what way? (If no skip next question)
4. In your experience, did you miss any elements of the introduction? Why?
5. Which elements of the introduction package are currently most problematic in your opinion?
6. Do you feel that the introduction offers the elements that the new employees are looking for? If not, have they ever had a chance to provide feedback? If yes, please elaborate why.
7. Do you know which systems are included in the introduction package? Do you know if there is any difference between this and what new managers gets? Are there any additional systems you would like to mention?
8. What do you think of the intranet? How do you find the platform? What do you use the platform for?
9. If you had a magic wand, how would a digital platform for the company be developed, how would you like onboarding to be done based on the whole process?
   - based on the personal meeting
   - based on the digital meeting/system?
10. Which situations within the different systems/platforms would you like to develop? Please tell us more
11. What do you think would be needed to create a better user experience and usability when employees create their employee resume?
12. What do you think could be prioritized in the introduction in digital format? What could it look like to promote the user experience?
13. Are the key components of the systems/platforms in place to ensure that a new hire is best positioned to feel confident, well-informed and settle into the job quickly at the new company? If yes, which ones? If no, which would you have preferred?
Conclude the interview with these follow-up questions:
1. Do you have anything else you would like to add?
2. Did you find it easy or difficult to answer the questions in the interview?
3. Was there any part that seemed more difficult to answer and, if so, why?
4. Did the interview give you any new insights? And if so, what insights?
5. Do you have any questions before we end the interview?
Step 5: Thank them again for taking part and tell them to contact us again if they have any thoughts.
Appendix G

Prototype

Down below five pictures from our high-fidelity prototype in Figma are shown. The structure of the buttons, progress bar, contacts, search form, the structure of what is in the “intranet”, “employee portal”, etcetera, was created and utilised from the interviews, workshop, creative session, low-fidelity feedback session & high-fidelity think-aloud session to create a solution that confirms the interviewees’, potential user’s, and close stakeholders wishes and desires on a potential digital onboarding at the company should perform.

Figure G.1: Closest contacts during onboarding
Figure G.2: Employee portal hover-button

Figure G.3: Onboarding task-checklist
Figure G.4: Software video tutorial and PDF

Figure G.5: Tasks completed
Appendix H
Double-Diamond

Figure H: The double-diamond process during this research project showcasing every step through the discover, define, develop and deliver phases. The figure has been purposefully kept blurred to ensure anonymity.
Appendix I
Template - Consent of personal data processing and information to data subjects (GDPR)

In connection with the thesis project “Onboarding through the lens of User Experience: Does it really matter for new employees?”, the following personal information about you will be collected and processed:

Age, gender, when you were onboarded in the company and the sub-department you work at. Your consent is needed for the personal data types mentioned above to be processed prior to the student work. More information can be found below. Umeå University is responsible for the personal data being processed. Contact information is Umeå University, 901 87 Umeå, registrator@umu.se, 090-786 50 00. Umeå University has appointed a data protection officer who can be reached at pulo@umu.se or 090-786 50 00. You can also contact the person responsible for a thesis project via the course coordinator for the magister/master thesis courses in Informatics, spring 2023, Rikard Harr, rikard.harr@umu.se, 090-786 92 82.

With the support of the consent, your personal data will be processed no later than 31 December of the current year or until the time when the student work has been approved.

Your personal information will only be handled by authorized students and staff at Umeå University. You have the right to withdraw your consent at any time by contacting the department via, studentsupport.informatik@umu.se, 090-786 65 23. Please note, however, that a revocation of your consent does not affect the legality of the processing before the consent has been revoked. You also have the right to contact Umeå University to obtain information about what information is processed about you, or to request correction, transfer, deletion, or limitation of your personal information. You can also contact the university's data protection officer by email pulo@umu.se. For more information on how the university processes personal data, see: umu.se/gdpr You also have the right to lodge a complaint with the supervisory authority, the Swedish Privacy Protection Authority, if you think that we process your personal data incorrectly. Do you agree to the use of your personal data in the manner described above?

● Yes  No

Date:
Name:

Consent and information about personal data processing

Umeå universitet 901 87 Umeå Information about Umeå University's processing of personal data in student work If you participate, certain information about you will be processed. The information in question will be age, gender, when you were onboarded in the company and the sub-department you work at. This information will be collected by Rebecka Herrgård and Sarah Lorenzo and will be stored in a private folder on OneDrive. This will solely be accessible to the people mentioned above. Information that can be linked to you is
considered personal data in accordance with the EU Data Protection Regulation 2016/679 (GDPR). The reason why such data needs to be processed is to get an understanding of how viewpoints can differ between different user groups. Umeå University is responsible for personal data for this processing and the legal basis for the processing of personal data is your consent in accordance with the EU Data Protection Regulation, Article 6 (1) (a). The personal data will be stored at the university in such a way that, in addition to the responsible student, only authorized staff at the university will be given access to it. The data will be processed so that unauthorized persons cannot access it. Your personal data will be processed during the entire student work that will take place during the spring semester 2023, but no later than 31 December 2023. Documentation for student work, which includes your personal information, is screened after the student's grades have been reported. According to the EU Data Protection Regulation and national supplementary legislation, you have the right to: · Request access to your personal data (request so-called register extracts) · Get your personal information corrected · Have your personal data deleted · Have the processing of your personal data restricted. In certain circumstances, the Data Protection Regulation and supplementary national legislation allow for exceptions to these rights. The right of access to their data may, for example, be limited by confidentiality requirements, and the right to have data deleted may be limited by rules concerning archiving. If you wish to invoke any of these rights, you must contact the Data Protection Officer at Umeå University (pulo@umu.se) and provide information on current student work. If you are dissatisfied with how your personal data is processed, you have the right to complain to the Privacy Protection Authority. Information about this is available on the authority's website (imy.se).