Stefan Hochwarter

The Home as the Centre of Care: A Case Study on Moving Healthcare Services into Homes

Doctoral thesis

NTNU
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Abstract

Population ageing and demographic change pose a challenge to the delivery of healthcare services. In light of this development, new care models and the use of digital tools are reshuffling traditional healthcare settings. This is particularly apparent in the trend of moving healthcare activities out of hospitals, and technology plays a central role. The shift of healthcare services into homes opens up a set of sociotechnical challenges worth our attention.

This thesis investigates the shift of healthcare services into the user's home by means of technology. Specifically, the thesis answers two research questions: (i) How are systems that support remote care shaped for their users across different contexts? and (ii) How is care at a distance realised, and what role does technology play in this?

Theoretically, the thesis is situated at the intersection of information systems (IS) and computer-supported cooperative work (CSCW). Moreover, the thesis' theoretical framework includes theories and concepts from neighbouring fields such as participatory design (PD) and science and technology studies (STS).

Through a four-year embedded multiple-case study, the thesis provides a detailed account of what is entailed in moving healthcare services into homes. The two cases have been selected to provide a complementary picture of the phenomenon. Case 1 focuses on welfare technology (WT), a service where technology supplements healthcare services at home. Case 2 on mental health home treatment (HT) follows how severe mental health crises are treated at home by home treatment teams supported with technology. In addition to moving healthcare services into homes, the two cases have in common a level of maturity. Both cases have moved away from the piloting phase and are on the brink of becoming an established healthcare service. Hence, they provide exceptional insights.

Based on detailed accounts of the two cases, this thesis contributes to a better understanding of what is entailed in moving healthcare services into homes. The

ethnographic description of work in HT and the conceptualisation of proximity and distance contribute to the growing body of literature on home care in CSCW. Furthermore, platforms play a central role in disseminating digital healthcare services. The thesis contributes to the theoretical body of platforms in IS by describing the tailoring and shaping of a platform in a fluid environment. Moreover, this thesis offers a methodological contribution by discussing a strategy to scale user participation as understood in the field of PD. Together, these contributions provide a coherent image and advocate a deeper understanding of a healthcare area in motion.

Preface

This thesis is submitted to the Norwegian University of Science and Technology (NTNU) for partial fulfilment of the requirements for the degree of Philosophiae Doctor. This doctoral work has been performed at the Department of Computer Science, NTNU, Trondheim, under the supervision of Professor Eric Monteiro (main supervisor), Associate Professor Babak A. Farshchian (co-supervisor), and Professor Margunn Aanestad (co-supervisor).

The thesis consists of four papers and an additional introductory paper. The introductory paper provides the research motivation and introduces the research aim. Next, the theoretical approach is presented, followed by the research methods. Then, the case is described and the results are summarised. Finally, the implications of the thesis are presented, and the thesis ends with concluding remarks. The following four papers are included in the appendix:

1. Hochwarter, S., & Farshchian, B. A. (2020). Scaling Participation - What Does the Concept of Managed Communities Offer for Participatory Design? *Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise*, *2*, 50–54.

2. Hochwarter, S. (2021). Sociotechnical Challenges of eHealth Technology for Patient Self-management: A Systematic Review: *Proceedings of the 14th International Joint Conference on Biomedical Engineering Systems and Technologies - (Volume 5)*, 394–400.

3. Hochwarter, S., Schwarz, J., Muehlensiepen, F., & Monteiro, E. (in press). Becoming a Guest: On Proximity and Distance in Mental Health Home Treatment. *Computer Supported Cooperative Work (CSCW)*.

4. Hochwarter, S., & Kempton, A. M. (2022). *Platforms in Fluid Space* [Unpublished manuscript], Department of Computer Science, Norwegian University of Science and Technology, To be submitted to an international IS journal.

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Furthermore, I want to thank my colleagues at NTNU, with whom I have discussed large parts of my work. Special thanks to Elena Parmiggiani for countless coffees and many inspirational discussions. I also want to thank my colleagues in Germany, especially Felix Mühlensiepen, Julian Schwarz and Martin Heinze. I hope for many more joint projects to come.

I want to express my deepest gratitude to my informants in Norway and Germany for making my fieldwork an experience I look back on with pleasure.

I am also thankful to my family and my friends. My parents have supported my choices throughout my life, and I am very grateful for that. A special thanks to my aunt Lilli for an excellent job proofreading the thesis. My friends, too many to name here, have always been of great support and I am extremely lucky to have them in my life.

Finally, but most importantly, I would like to thank my wife, Babsi. Without her support over the entire time, this thesis would not have been possible. Thanks for being part of this journey!

Contents

Abbreviations

AI artificial intelligence

ANT actor-network theory

API application programming interface

BoA biography of artefact

CIS common information space

COPD chronic obstructive pulmonary disease

CSCW computer-supported cooperative work

DHC Digital Health Company

EHR electronic health record

GT grounded theory

HI health informatics

HSW HealthSoftWare

HT mental health home treatment

ICT information and communication technologies

IEHT inpatient-equivalent home treatment

IS information systems

PD participatory design

SDK software development kit

SOC standard operation configuration

SOP standard operation procedure

SP safety patrol

STS science and technology studies

TM Trondheim municipality

WHO World Health Organization

WT welfare technology

Glossary

Digital Health Company (pseudonym) A medium-sized company providing a platform for health services, including welfare technology. Part of case 1.

HealthSoftWare (pseudonym) The digital platform developed by DHC and used by Trondheim municipality for remote patient monitoring.

Hospital Lakeside (pseudonym) A hospital on the outskirts of a major city in Germany. It hosts one HT team in the department for psychiatry, psychotherapy and psychosomatics. The HT team serves a large area with a low population density. Part of case 2.

Hospital Metropolis (pseudonym) A hospital in a major city in Germany. It hosts two HT teams in the department for psychiatry, psychotherapy and psychosomatics. The district is the smallest district of the city, having at the same time the highest population density. Part of case 2.

Mental health home treatment is a service where multi-professional home treatment teams visit the service user during a crisis for usually four to six weeks.

Welfare technology is an umbrella term used by Scandinavian countries. It is commonly translated as telecare. WT can be defined as technical assistance to increase safety and security, support inclusion and social well-being, support social participation and support treatment and care for people with physical, psychological or social impairments.

Chapter 1

Introduction

1.1 Background and motivation

Digitalisation and the internet have impacted almost all aspects of society in recent decades. The health sector is no exception, and the digitalisation of healthcare services holds the promise to solve many challenges. Population ageing is one such challenge that economies face globally (United Nations, 2020). The rise in life expectancy comes with an increase of years lived with disabilities such as chronic diseases. Simultaneously, the health sector faces reduced access to healthcare personnel and increasing costs. This represents a high demand for the health sector, both economically and socially. Meaningful use of information and communication technologies (ICT) is widely seen as a crucial part of addressing the challenges connected to demographic change (International Telecommunications Union, 2021).

The use of welfare technology (WT) is one example of recent initiatives to address this demographic shift, and expectations are high. Welfare technology is an umbrella term used by Scandinavian countries that is often translated into English as telecare. WT can be defined as technical assistance to increase safety and security, support inclusion and social well-being, support social participation and support treatment and care for people with physical, psychological or social impairments (Helsedirektoratet, 2018). The landscape of WT consists of a wide range of technologies; most prominent in Norway are automatic warning aids, digital observations, alarm calls and localisation technologies, and electronic medication support (see Figure 1.1). WT operates in a highly heterogeneous and dynamic context. In Norway, municipalities are supported by national authorities

to evaluate and introduce WT services. The 356 municipalities vary strongly in geographic, demographic and socioeconomic factors, placing different demands on these services. Furthermore, the users of WT services not only differ in age and their clinical picture, but they also set additional requirements for the system as individuals.
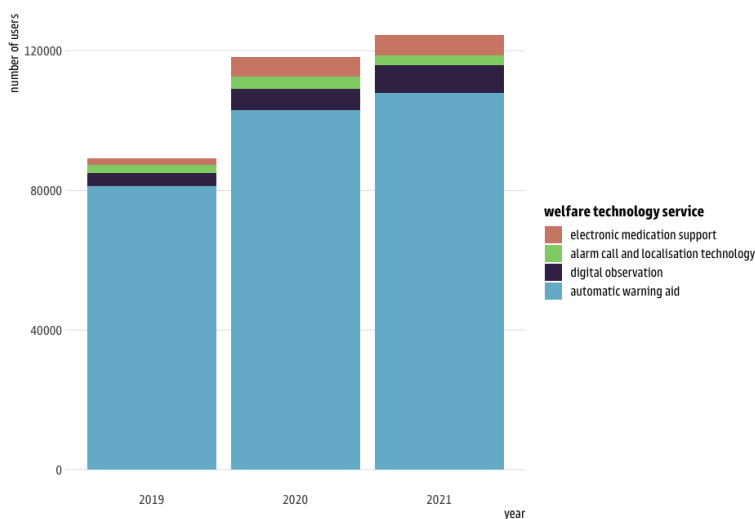
Figure 1.1: Prominent examples of welfare technology services in use in Norway 2019–2021. Data from Statistics Norway, SSB.

While WT shifts healthcare services into homes by providing technical assistance to patients, digitalisation also affects other services at home (Fitzpatrick & Ellingsen, 2013). The coordination of distributed healthcare teams sets further demands for the coordination of work, and digitalisation provides new ways to work together in a dynamic environment (Aanestad et al., 2019; Abou Amsha & Lewkowicz, 2016). An area where close interaction between healthcare professionals and patients is especially pronounced is mental healthcare. Digitalisation allows for both the coordination and connection of distributed, mobile healthcare workers, which can be observed specifically in cases of mental health home treatment (HT). HT is a service where a multi-professional home treatment team visits the patient during a crisis for four to six weeks. This service was introduced by German hospitals in 2018 and has been growing ever since (see Figure 1.2). While

the HT teams physically visit the patients, and are supported by digital tools, their hosting clinics often remain stiff and fail to adapt to a service that blurs existing boundaries.
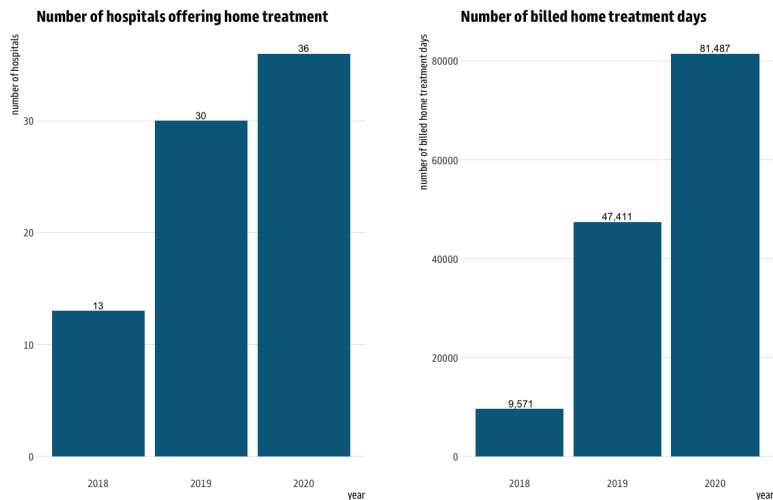
Figure 1.2: Mental health home treatment in Germany, introduced in 2018, is a growing service offered by hospitals (GKV-Spitzenverband, 2021).

Moving healthcare services into the home expands the traditional boundaries of the health sector and adds to a diverse and complex context. Challenges such as access to information (Koch, 2006), integration of information systems (Ellingsen & Monteiro, 2008), and coordination and collaboration of actors (Christensen & Grönvall, 2011) come once again to the fore. In their early implementation stage, welfare technology services and mental health home treatment illustrate this shift vividly. Innovative technologies such as WT promise to overcome these challenges and contribute to solving socio-economic problems. Yet, they often fall short and fail to navigate the dynamic health sector (Berg, 2001; Heeks, 2006).

1.2 Aim and research questions

In light of this background, the thesis' overall aim is *to investigate the shift of healthcare services into the user's home by means of technology*. This aim is investigated

with the help of the following research questions.

RQ1 How are systems that support remote care shaped for their users across different contexts?

RQ2 How is care at a distance realised, and what role does technology play in this?

The first research question focuses on the design and implementation of welfare technology. Platforms play an important role in delivering WT services and providing customised solutions to users. The goal here is to describe the particular context for which WT is designed and to investigate approaches to shape these systems accordingly. This research question will be mainly answered by following a company developing a WT solution, and by an account of how a municipality establishes WT services for its citizens.

The second research question shifts perspective and describes how users experience care at a distance, and what distance entails for them and the healthcare workers. Here, the focus is on cooperative work and the relational activities of users and systems (i.e. fitting) that support the delivery of mental health home treatment. This research question will be mainly addressed with a detailed ethnographic account of home treatment in mental health and a conceptualisation of proximity and distance.

1.3   Theoretical approach

The thesis investigates the shift of healthcare services into the user's home by means of technology as a sociotechnical phenomenon. Theories and concepts are mainly drawn from social studies in information systems (IS) and computer-supported cooperative work (CSCW). Neighbouring fields are not excluded, and research is often overlapping. Hence, the thesis also builds to some extent on work from the fields of science and technology studies (STS), participatory design (PD) and health informatics (HI).

A guiding lens for the thesis was the actor-network theory (ANT) (Latour, 2007). As outlined in the introduction, technologies are often portrayed as a promise to solve healthcare challenges. Yet this falls short and neglects that its actual use emerges in the interrelation of technology and its users (Berg, 1999; Pols & Willems, 2011). ANT provides a way to study technology in use and its practices without putting too much weight on either side. However, the analysis of an ob-

ject in network space has its limits. In network space, boundaries are described as a network of relations with distinct boundaries. In the dynamic research setting of this thesis, studying an object in fluid space provides insights which would otherwise remain unnoticed (de Laet & Mol, 2000; Law, 2002).

Operating in a large, heterogeneous environment as the healthcare setting sets high demands on implementing and introducing technologies. In this thesis, we follow two cases which entail different actors. Hence, the two cases draw from different concepts and themes, but there are also intersections. Digital platforms play a central role in case 1 (Tiwana, 2014). Specifically, the role of the boundary resources and the shaping of a digital platform are central concepts for investigating the formation of a digital platform (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013). Also, generification work and managed communities provide a way to distinguish between common and particular requirements, hence contributing to a system shaped for a large and heterogeneous user group (Pollock et al., 2007). Case 2 leans on the concept of fitting to describe the ambiguity of proximity and distance (Pols, 2012). Pols mobilises the widespread assumption that *warm care* can not be provided by *cold technology* as a point of departure for establishing this concept. Fitting describes the relational activities continuously required by users and technologies, which can eventually result in good care.

Chapter 2 outlines the theoretical background and related concepts.

1.4   Research setting and approach

The research presented in this thesis is guided by an embedded multiple-case study (Yin, 2018). This case study lasted four years (2018–2022) and adopted an interpretive stance (Walsham, 1995). The case is defined as the *move of healthcare services into homes by means of technology*. Two cases have been selected in the course of this study. The first case revolves around WT in Trondheim municipality (TM), Norway. It includes the company Digital Health Company (DHC) as a vendor for WT, the municipality driving the introduction of WT services, and the municipality's safety patrol (SP) overseeing WT services. Case 2 investigates mental health home treatment in Germany. The two hospitals Metropolis (pseudonym; located in a large city) and Lakeside (pseudonym, located in a rural area) have recently introduced HT. While the two cases differ in how they deliver healthcare at home, they have in common that the services move from an evaluation phase

to an established part of their services. Both their differences and overlaps foster an interesting analysis of the overall case.

Data collection included observations, interviews and documents. For case 2, observations in the form of go-alongs (Kusenbach, 2003) were the primary source for data, and an ethnographic approach was followed (Myers, 1999). Case 1 also included observations, but these were balanced with interviews in parallel. Documents were collected in both cases and were included either in the data analysis, or contributed to a better understanding of the case. The data analysis had both inductive and deductive elements. The organisation of data analysis throughout the four years was inspired by the constructivist grounded theory (Charmaz, 2014), which included iterative coding and revisiting the field.

The research setting and approach are described in detail in Chapter 3 and Chapter 4.

1.5   Contributions

This thesis contributes mainly to the field of IS and CSCW in the following ways:

- First, the thesis contributes a rich empirical insight into how healthcare services move into a user's home, and what role technology plays in this process. It includes the trajectory of a digital platform for WT services: from the early stage, up until becoming an established platform; and how this platform operates in practice. Further, the thesis provides a detailed description of the work of mental health home treatment which, to our best knowledge, has not yet been addressed by scholars in IS or CSCW.
- Second, the thesis introduces concepts to analyse questions of proximity and distance as they relate to care at a distance. Moreover, the thesis outlines how to study platforms in fluid space and what the concept of fluidity can contribute to the IS platform literature.
- Third, the thesis contributes methodologically by proposing generification work, and specifically the strategy of managed communities (Pollock et al., 2007) as a technique for large-scale PD.
- Fourth, the thesis outlines implications for practice based on the contributions outlined above.

The two research questions are answered as follows:

1. *How are systems that support remote care shaped for their users across different contexts?*
   I answer this research question by describing how digital platforms are used for remote patient monitoring based on data from case 1. I also provide an analysis of how generification work unfolds in case 1 and how it can be adapted for PD and for a democratic design process. Moreover, I discuss the trajectory of the platform and its surrounding in fluid space to account for aspects not covered in network space.

2. *How is care at a distance realised, and what role does technology play in this?*
   I answer this question based on a detailed ethnographic account of mental health home treatment and its use of technology. The discussion of these findings includes a conceptualisation of proximity and distance. Finally, I reflect on the role of technology based on my analysis of platforms in fluid space.

The comprehensive answers to the research questions can be found in the following papers.

Paper 1. Hochwarter, S., & Farshchian, B. A. (2020). Scaling Participation - What Does the Concept of Managed Communities Offer for Participatory Design? *Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise, 2,* 50–54.

Paper 2. Hochwarter, S. (2021). Sociotechnical Challenges of eHealth Technology for Patient Self-management: A Systematic Review: *Proceedings of the 14th International Joint Conference on Biomedical Engineering Systems and Technologies - (Volume 5)*, 394–400.

Paper 3. Hochwarter, S., Schwarz, J., Muehlensiepen, F., & Monteiro, E. (in press). Becoming a Guest: On Proximity and Distance in Mental Health Home Treatment. *Computer Supported Cooperative Work (CSCW)*.

Paper 4. Hochwarter, S., & Kempton, A. M. (2022). *Platforms in Fluid Space* [Unpublished manuscript], Department of Computer Science, Norwegian University of Science and Technology, To be submitted to an international IS journal.

Table 1.1 gives an overview of the papers, research questions and cases, and their connections.

Chapter 5 provides a summary of each paper and highlights its contributions.

Table 1.1: Overview of papers and contributions.

Paper	Year	Case	Field	RQ1	RQ2
Paper 1	2020	Case I	PD / IS	•	
Paper 2	2021	Case I and II	CSCW / HI	•	•
Paper 3	2022	Case II	CSCW		•
Paper 4	2022	Case I	IS	•	•

In Chapter 6, I describe the implications of the study and answer the research questions based on the empirical findings and the included papers.

1.6 Structure of the thesis

The remainder of this thesis is structured as follows: Chapter 2 outlines the theoretical approach of the thesis and connects theories and concepts with the research. Chapter 3 presents the research methods, including the study design, data collection and analysis. Chapter 4 describes the two cases and their research settings. Chapter 5 summarises the results based on the four included papers. Chapter 6 outlines the study's implications and answers the research questions. Chapter 7 concludes the thesis, and future research is proposed. The Appendix includes the four papers and the co-authorship statements.

Chapter 2

Theoretical approach

The theoretical approach of my PhD thesis can be described as broad and inter-disciplinary. Theories and concepts from the fields of information systems (IS), computer-supported cooperative work (CSCW) and participatory design (PD) form the ground for the theoretical investigation of the empirical case. Connect-ing to the aim and research questions introduced in the previous section, this chapter presents the theoretical approach and the relevant background of this study. The various research fields I touched on throughout the study overlap and often share concepts, but they emphasise different aspects. This section aims to introduce the literature my work is built on and to show how they connect to this study. Instead of committing to a single perspective to study the phenomenon, I chose to investigate different aspects of what the move of healthcare into homes entails. The thesis follows the shift of healthcare services with varying breadth and depth. The theoretical background can be broadly divided into three perspectives, as described in table 2.1.

2.1 Design and collaboration

As outlined in Chapter 1, one pronounced focus of this thesis is the design of remote care systems across different contexts. Healthcare is, at its very core, a collaborative endeavour. Various actors, including the patient, work together to realise a healthcare service. CSCW has investigated the collaborative nature of work and its importance for informing the design of systems supporting cooperat-ive work: 'CSCW should be conceived as an endeavour to understand the nature and characteristics of cooperative work with the objective of designing adequate

Table 2.1: The theoretical background can be divided into three perspectives.

Theme	Perspective
workplace	I follow the argument that healthcare systems and practices are mutually shaped. Related literature to describe this perspective includes workplace studies, often with ethnographic methods, in the tradition of CSCW. The theoretical background is summarised in section 'Design and collaboration'.
IT artefact and context	While workplace studies provide rich insights into local practices, they fall short in describing organisational aspects. In this thesis, I describe the process of delivering healthcare services by a local company and municipality. The alignment of different needs across contextual differences and how a specific type of artefact may support them are described in the section 'Digital platforms'.
global	The last section describes a theoretical approach that guided my investigations throughout the research project. Furthermore, it provides the background for connecting the previously introduced themes and introduces a methodology by which they can be supplemented. This is presented in the section 'Actor-network theory'.

computer-based technologies' (Bannon and Schmidt, 1989, p. 360). Consequently, CSCW has yielded many ethnographic studies, contributing to a better understanding of the nature and characteristics of cooperative work, with healthcare as a popular empirical domain. The shift of healthcare services into the user's home entails a blurring of existing roles and boundaries, for instance, changing the role of healthcare workers (e.g. Grisot et al., 2018) or informal caregivers (e.g. Tellioğlu, 2021). Hence, this calls for a renewed account of the nature of work in remote care to inform the design of systems supporting care at a distance.

Furthermore, the aim and research questions do not explicitly use the term *design*. Rather, they lean on the notion of *shaping* to emphasise the theoretical position of this thesis, i.e. that the design of systems and their environments are interdependent and mutually shaped:

> Simply establishing that technologies are *socially shaped* leaves open
> many important questions about the character and influence of
> the shaping forces. In seeking to grasp the *complexity* of the socio-

> economic processes involved in technological innovation, SST [the
> social shaping of technology] has been forced to go beyond simplistic
> forms of social determinism, which, like technological determinism,
> see technology as reflecting a single rationality – for example, an
> economic imperative, or the political imperative of a ruling élite.
> (Williams & Edge, 1996, p. 866)

Accordingly, while a grounded understanding of the nature of cooperative work contributes to the design of systems, this alone would fall short and miss processes in designing these systems. Hence, in this section, I first introduce the relevant literature which served as the theoretical background for understanding the nature of work that care at a distance entails. This literature is mainly found in the field of CSCW, but also in science and technology studies (STS). Next, I describe the themes of generification and participation, which together form the background for a methodological contribution to the design of large-scale systems.

2.1.1 Collaboration

Healthcare is a very collaborative effort, as described in the article by Fitzpatrick and Ellingsen:

> Healthcare work is highly institutionalised and complex, involves
> multiple stakeholders, takes place across primary, secondary and ter-
> tiary care sectors, in private or public funding arrangements, and
> depends on a highly collaborative approach. It involves diverse pro-
> fessional groups and services. Some are in direct contact with the
> patient, such as nurses, general doctors, medical specialists, allied
> health professionals, and ancillary services, while others are just as
> critical but more indirectly involved, such as health administrators,
> insurance providers, medical suppliers, epidemiologists, health eco-
> nomists and so on. (Fitzpatrick & Ellingsen, 2013, 612f)

Consequently, systems in healthcare often have a strong focus on supporting the collaboration between various actors in healthcare. The field of CSCW has introduced or further developed concepts that provide a good base for investigating the collaborative aspects of care at a distance.

Therefore, large parts of this thesis are grounded on literature in the field of CSCW. The term itself was coined during a workshop in 1984 (Greif, 2019;

Grudin, 1994). CSCW focuses on supporting group activities, and over time, the field has been established with an interdisciplinary community behind it. Moreover, CSCW can be approached by splitting the acronym into two parts. Starting from the back, CW, as in Cooperative Work, points to the nature of collaborative work. Without a deep account and understanding of work, the second part, CS, as in Computer-Supported, lacks a ground for a meaningful contribution. Hence, it is not surprising that CSCW scholars regularly offer a thick description of work based on ethnographic studies. CSCW is also a design-oriented discipline (Schmidt & Bannon, 2013); hence many articles conclude with implications for the design of systems or present a pilot study.

Selected Concepts from CSCW

The second research question of this thesis investigates how care at a distance is realised. This involves heterogeneous actors and complex work practices across disciplines. Throughout the study I have observed how collaborative work in that context takes place. In the following I will introduce concepts of CSCW that were central in forming an understanding of the phenomenon and in its analysis.

Cooperative work requires coordination and managing of the distributed work, as described in the concept of articulation work. As a recurring theme, articulation work is based on work by the sociologist Anselm Strauss (Strauss, 1985; Strauss et al., 1985). As cooperative work by nature involves a group of people, there is a need for coordination across the group. Or, to use the words of Strauss (1985):

> Since the plurality of tasks making up their totality, as well as the relations of actors to tasks, are not automatically articulated, actors must do that too, and often in complex ways. We call the work of doing this 'articulation work'—a supra-type of work. (p. 2)

Schmidt offers a shorter description of articulation work: 'Articulation work is work to make work work. Or to be exact, articulation work is cooperative work to make cooperative work work' (Schmidt, 2011, p. 184). Articulation work can be observed both locally (e.g. in a control room for monitoring welfare technology (WT) alerts) or globally (e.g. a nurse knowing a patient providing information for a decision to the control room) (Færgemann et al., 2005).

An overarching concept in CSCW are coordination artefacts, which support the coordination of work and help to manage its complexity (Schmidt & Simonee, 1996). A vast amount of things, analogue and digital, have been conceptualised as coordination artefacts: medical records (Heath & Luff, 2000), physician's clinical notes (Bansler et al., 2016), or whiteboards (Bjørn & Hertzum, 2011; Whittaker & Schwarz, 1999), to name just a few examples. These artefacts can provide a good ground for a deeper analysis of work practices. Coordination activities possess different dimensions. They can be synchronous or asynchronous and have single locations or multiple locations. A whiteboard, for instance, coordinates activities synchronously in a single location. Whiteboards (or display boards) have been in the centre of CSCW studies in many forms as artefacts that afford coordination (Bjørn & Hertzum, 2011; Scupelli et al., 2010). In healthcare, they are common in control room settings or during handovers (Wilson et al., 2006), which I also describe in case 2.

Mobility work is an apt concept to investigate the movement of healthcare into homes. It is based on Strauss' articulation work (Strauss, 1985), but emphasises the spatial aspects of tasks, while articulation work is mainly concerned with temporal aspects. Mobility work can be defined as 'the work needed to achieve the *right configuration of people, resources, knowledge and place* in order to carry out tasks' (Bardram and Bossen, 2005, p. 136). Similar to Strauss' standard operation procedures (SOPs), Bardram and Bossen introduce the concept of standard operation configuration (SOC) 'as a spatial setup fostering easy cooperation because of common knowledge and agreement as to use and navigation' (Bardram and Bossen, 2005, p. 138). Mobility work hosts different challenges for coordination and awareness, for example, when healthcare workers are on the move or need to locate resources and knowledge.

The concept of common information space (CIS) can give insight into

> how people in a distributed setting can work cooperatively in a common information space – i.e. by maintaining a central archive of organizational information with some level of 'shared' agreement as to the meaning of this information (locally constructed), despite the marked differences concerning the origins and context of these information items. (Schmidt & Bannon, 1992, p. 22)

Hence, the creation of CIS requires effort. Information might be entered into an artefact at a different time or space and interpreted by actors other than the

originator (Bannon & Schmidt, 1989). Unlike boundary objects (Star & Griesemer, 1989), CIS only exists temporally and is more situated once constructed (Rolland et al., 2006). Further, CIS has also been explored from different perspectives by the CSCW community. By focusing on the interconnectivity between objects and spaces, Robertson and Wagner ask, 'how this active construction of a common information space, by objects with each other and with people, can be supported' (Robertson and Wagner, 2015, p. 291).

2.1.2 Fitting

The use of technology to supplement services, especially in healthcare, tends to polarise the discourse on this topic. For instance, the implementation of surveillance technology as part of WT has initially been met with resistance from all stakeholders (Nilsen et al., 2016). However, resistance to new forms of technologies can also be seen as a resource to further shape systems together with their users and their environments.

An ethnographic account of making technology fit is told by Pols. In the second chapter of the book *Care at a Distance*, the opposition of *warm hands* and *cold technology* is investigated by opposing assumptions about why technology is cold and presenting findings from health technology in use. The general assumption is that technology can not provide good and *warm* care, whereas warm care relates to sensitivity and concern to *being there* for those in need. Technology is getting in between humans. 'Warm and cold care stand for a more broadly defined opposition that separates an *ethical* relation to patients from an *epistemological* relation to patients' (Pols, 2012, p. 26). Point by point, these strong and determinate statements on technology are debunked. Instead of setting technology and humans in opposition, the matter of care 'can be analysed more adequately in terms of continuously shaping a match between needs and interventions' (Pols, 2012, p. 36). Good care requires both warmth and coldness; it needs to fit a particular situation. Here, the notion of *fitting* is coined, reflecting the findings of the analysis: 'Fitting is a relational activity, a way of interacting rather than an effect of machines. Users and devices have to continuously establish what may fit where' (Pols, 2012, p. 39). We built our conceptual work for one paper on this notion (Hochwarter et al., in press).

Scholars across disciplines have brought forward related thoughts on apparent oppositions. Similar to the opposition of cold technology and warm care, think-

ing in false dichotomies results in contradictions or misrepresentations, e.g. the opposition of the *digital* to the *real* world (Boellstorff, 2016). Instead of following dualism and treating things as separate and opposed, duality offers a perspective of interdependency, i.e. contradictory and complementary. For instance, stability can be both the outcome of change *and* the medium of change (Farjoun, 2010). Furthermore, technology is not either an objective force or socially constructed, but it is rather a combination of both over its trajectory (Orlikowski, 1992).

2.1.3 Generification

Understanding the application of technology and the context in which it operates provides a good starting ground for design endeavours. However, this can be an utterly complex task. Large-scale information systems have become more common, pervasive and ubiquitous. This also applies for systems in healthcare, where systems are spread across heterogeneous contexts. Given these challenges, scholars have called for a move away from single-site studies; those which investigate artefacts as isolated or in limited depth. One way forward is to extend the boundaries of studies in terms of both space and time. A deeper theoretical and methodological approach is offered by describing the biography of artefact (BoA) (Pollock & Williams, 2008), which can 'expand the focus of research longitudinally and across different social settings and scales' (Pollock and Williams, 2010, p. 524).

When we shift our focus to companies that provide systems for the healthcare sector, we can observe efforts to develop software that fits not only a single customer but a larger part of the healthcare sector. One strategy to design large-scale systems to work across different contexts is termed *generification work* (Pollock et al., 2007). In fields with socially-oriented computing perspectives, such as STS, there has been a strong emphasis on local specificities; if systems were failures, they often were so because of a lack of contextual considerations. When an implementation was regarded as a success, the lens shifted to the local efforts of the users and organisation to adapt the system. However, the authors claim that there exist generic software packages that can travel across different settings, and do so successfully. This happens not by coincidence or pure luck but by generification work, which entails promoting the generic and inhibiting particular requirements. Starting by portraying the biography of two artefacts, generification work is further specified, and the different strategies for the product's life cycle are presented.

The strategy of generification work describes the efforts required for an artefact to travel across different settings; work which is often invisible. (Rolland & Monteiro, 2002). One central aspect of generification work is the configuration of the user base, a strategy that is called *managed communities*. We have drawn from generification strategies in one of our papers (Hochwarter & Farshchian, 2020).

2.1.4 Participation

We can connect the previously introduced strategy of managed communities with user participation, even though they are fundamentally grounded in different motivations. A democratic approach to design artefacts can be achieved through the participation of their users, which also contributes to a weakening of resistance, e.g. WT (Nilsen et al., 2016). There are different perspectives on and definitions of participation, depending on the domain and historical developments. The level of participation varies, and what *genuine participation* entails is a matter of both academic and political discussion (Arnstein, 1969; Wagner, 2018).

In PD, genuine participation can be described as 'the fundamental transcendence of the users' role *from* being merely informants *to* being legitimate and acknowledged participants in the design process' (Robertson and Simonsen, 2013, p. 5). Or, in short, the shift from *having a voice* to *having a say*. The field of PD can be defined as

> a process of investigating, understanding, reflecting upon, establishing, developing, and supporting mutual learning between multiple participants in collective 'reflection-in-action'. The participants typically undertake the two principal roles of users and designers, where the designers strive to learn the realities of the users' situation while the users strive to articulate their desired aims and learn appropriate technological means to obtain them. (Robertson & Simonsen, 2013, p. 2)

However, in the same chapter of the book *Routledge International Handbook of Participatory Design*, it is stated further that PD 'is not defined by formulas, rules and strict definitions but by a commitment to core principles and participation in design' (Robertson and Simonsen, 2013, p. 3). Consequently, as a research field, PD is driven by its principles and underlying beliefs rather than by a set of rules. These principles are not static and can change over time with the evolution of new

technical and societal challenges. Moreover, they are grounds for discussions in the PD community (Bødker & Kyng, 2018; Bratteteig & Wagner, 2016; Wagner, 2018).

The reasons and benefits of conducting a PD project are manifold. One motivation to include the actual users in the design process is to foster innovations and systems (Trischler et al., 2018). Yet, PD also has a considerable political dimension. The Scandinavian stream of PD has its roots in the workplace democracy movements in the 1970s. Workplaces changed during that time also because of the introduction of computers. Workers witnessed automation of work and de-skilling/up-skilling of work (Kensing & Greenbaum, 2013). Consequently, promoting workplace democracy is an intrinsic political value.

Traditionally, PD was mainly concerned with local systems and local actions. The Florence project (1984–87), for instance, worked together with two hospitals in Oslo to collaboratively develop a system to support the cooperation between nurses and promote mutual learning (Bjerknes & Bratteteig, 1988). Prototyping and piloting were appropriate tools for approaching small-scale and single-site projects. The setting today paints a different picture. PD initiatives compete with off-the-shelf software and generic systems (e.g. Pollock et al., 2007). The issue of scaling participation and addressing large-scale IS projects are continuing challenges that the PD community needs to address.

Large-scale projects still can hardly be found in PD. One exception is the health information system program (HISP) and their district health information system version 2 (DHIS2) (Braa & Sahay, 2013). HISP adjusted their PD approach together with the evolution of their system. They started with so-called singular PD and gradually transitioned to a community PD approach (Roland et al., 2017).

Furthermore, to remain relevant, scholars of the PD community argue for a more pragmatic view on participations (Kyng, 2010), while others call for engagement in large-scale developments (Shapiro, 2005). Wagner (2018) provides a good overview of the different voices and suggestions of the community. She ends her reflection on participation in design by underlining that PD '*is* a political program that engages users in the design of IT-based solutions for practical problems, with the intent of increasing users' "power to"' (Wagner, 2018, p. 273).

2.2   Digital platforms

CSCW and related fields have historically focused on single-site workplace stud-
ies. While they provide an important contribution to the design of socially em-
bedded systems, they lack a broader perspective that reflects technological and
societal changes. As Monteiro et al. (2013) state, these can not be grasped by
(then) predominant studies with *localised* explanation of technologies, where im-
portant actors and factors fall through the nets of their restricted attention:

> We argue therefore for a gentle weaning of CSCW-in-use from its ini-
> tial and founding preoccupations (the rather restricted, confined and
> specialised forms of cooperative work witnessed over two last dec-
> ades) towards a second wave of analyses that reflect the more open-
> ended agenda initially set out by Schmidt and Bannon (1992) but also
> now being reflected in the studies that are beginning to appear in JC-
> SCW and other socially oriented computing outlets. (Monteiro et al.,
> 2013, p. 601)

To supplement the theoretical background, I seek advice from the field of IS.
Specifically, digital platforms play a central role in disseminating WT services,
as portrayed in case 1. In this section, I describe relevant literature on digital
platforms that contributed to answering the research questions.

2.2.1   Defining a digital platform

Before laying out the relevant platform literature for this thesis, we need to define
the term platform and its surrounding elements. Table 2.2 shows the definitions
used throughout the research project.

The term platform is widely used in many contexts (Gillespie, 2010). Hence,
it is important to be precise when referring to this term. The focus of this research
project is on digital platforms. There are mainly two types of digital platforms: (i)
transaction platforms, and (ii) innovation platforms (Baldwin & Woodard, 2009).
Transaction platforms describe services and products that facilitate exchange and
interaction between users and groups. An example of a transaction platform in
the Norwegian healthcare sector is the digital physician service *Eyr* (Eyr Med-
ical AS, n.d.), see Figure 2.1a. The platform Eyr connects patients at home with
physicians and provides online consultations for selected conditions and health

Table 2.2: Core elements of a platform ecosystem. These definitions are taken from Tiwana, 2014, p. 7. In the following, I use the terms according to these definitions.

Element	Definition
Platform	The extensible codebase of a software-based system that provides core functionality shared by apps that interoperate with it, and the interfaces through which they interoperate
App	An add-on software subsystem or service that connects to the platform to add functionality to it. Also referred to as a module, extension, plug-in, or add-on
Ecosystem	The collection of the platform and the apps specific to it
Interfaces	Specifications that describe how the platform and apps interact and exchange information
Architecture	A conceptual blueprint that describes how the ecosystem is partitioned into a relatively stable platform and a complementary set of apps that are encouraged to vary, and the design rules binding on both

issues. This also includes prescribing medicine. Consultations have a fixed price, and as a private actor in the healthcare sector, the patients pay this out of pocket. Innovation platforms offer a way for third parties to contribute to the platform by providing resources to complement services and hence facilitating innovation. Staying within the healthcare domain, an example of an innovation platform is Epic Orchard. Epic is a large vendor of electronic health record (EHR) systems, also active in Scandinavia. Their marketplace Epic Orchard, see Figure 2.1b, invites third parties to complement and add features to their system. The developers follow established interoperability standards, and Epic provides a sandbox to support the development of apps (Mandl et al., 2019). The two types of platforms are not mutually exclusive; systems can be both transaction and innovation platforms.

2.2.2 Boundary resources

While there exist many definitions of platforms (Gillespie, 2010), we can narrow down some shared characteristics of digital platforms. The platform architecture is commonly divided into a core and its periphery (Baldwin & Woodard, 2009). Together they form a platform ecosystem. The platform core provides the main functionalities and interfaces to extend the platform's functionality. These exten-

The digital doctor challenges GP

More and more people are using fast, digital medical services online. - A quiet undermining of the GP scheme, the specialist believes.
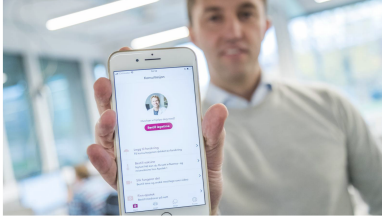
Eyr is one of the largest fully digital doctor's offices in Norway.

(a) Eyr is an example of a transactional platform in healthcare, connecting GPs and patients[a]

(b) Epic Orchard is an innovation platform, allowing external parties to extend the EHR system [a]

[a]NRK. May 16, 2022. Translated.

[a]https://apporchard.epic.com

Figure 2.1: Two examples of platforms in the healthcare sector.

sions and added functionalities from outside, often in the form of apps, form the periphery. Over time, the requirements of the periphery for the platform may increase, demanding more functionality to be accessible from outside the core. As a result, new application programming interfaces (APIs) might be added, and functionalities are relocated from the core to its periphery, see Figure 2.2. External innovations are strengthened while the platform's core shrinks (Tiwana, 2014).
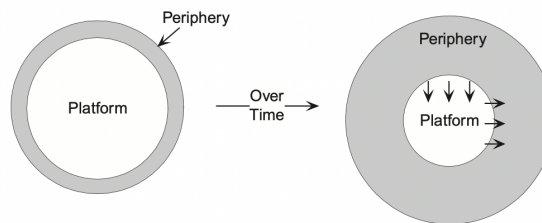
Figure 2.2: Adding interfaces to a platform and pushing functionalities to its periphery leads to a shrunk core. Illustration from Tiwana, 2014, p. 225

The collection of tools and regulations that allow external developers or parties to access the core's functionality is called boundary resources (Ghazawneh & Henfridsson, 2013). These typically include software development kits (SDKs) and APIs. Governance is in the hands of the platform owner, who controls

the platform core and its boundary resources. The design of boundary resources is an act of balance between resourcing and securing, where '[r]esourcing is the process by which the scope and diversity of a platform is enhanced. Securing is the process by which the control of the platform is increased' (Ghazawneh and Henfridsson, 2013, p. 185).

The central role of boundary resources and the balancing of resourcing and securing can be witnessed by following the case of Apple's iOS. Ghazawneh and Henfridsson (2013) explored the evolution of Apple's iPhone platform in three episodes. In the first episode, Apple introduced an SDK for third-party developers to attract external developers. At the same time, they also introduced a review process to secure control. In the second episode, Apple responded to criticism of third-party developers and added more features to diversify the scope. Analogously, the review process was adjusted accordingly. In the last episode, Apple reacted to competing platform ecosystems and restricted other platforms from operating in their ecosystem. Another perspective on this case is offered by Eaton et al. (2015). Their conceptional framing moves away from the dialectic view of boundary resources, i.e. the opposition of platform owners and third-party developers. The notion of *tuning*, as defined in Barrett et al. (2012), helps to describe the conflicting, heterogeneous actors involved in the building and evolution of boundary resources. These actors are 'involved in the tuning of boundary resources is both distributed and dialectic in form. Distributed tuning emerges from on-going tensions among dispersed heterogeneous actors who deal with a set of technology artefacts in a network of dialectic interrelating' (Eaton et al., 2015, p. 235).

2.2.3   Digital platforms in IS

The field of IS and neighbouring fields such as CSCW have been at the forefront of forming the understanding of digital platforms. Various aspects have been investigated, and many scholars chose a sociotechnical perspective. In the past, IS scholars have focused, for instance, on architecture (Baldwin & Woodard, 2009; Roland et al., 2017), governance (Farshchian & Thomassen, 2019), infrastructure and platforms (Constantinides et al., 2018; Madon & Schoemaker, 2021; Monteiro et al., 2013), use of platforms for development (Bonina et al., 2021; Masiero & Arvidsson, 2021), or healthcare application (Aanestad et al., 2019; Vassilakopoulou et al., 2017).

Looking ahead, de Reuver et al. (2018) propose a research agenda for IS and

raise six questions. This study contributes to two of them: (i) 'How should digital platforms be designed?' (de Reuver et al., 2018, p. 130), and (ii) 'How should researchers develop theory for digital platforms?' (de Reuver et al., 2018, p. 131)

2.3   Actor-network theory

The two previous sections have provided a theoretical background on how to approach the case study of moving healthcare services into homes from different and distinct perspectives. On the one hand, we have a rather localised view of workplace studies and the shaping of systems. On the other hand, the literature on digital platforms helps to analyse how digital services are implemented and spread out. However, what is missing is a way to move in between; to fill out the gaps and obtain a mode to grasp the nuances that unfold. One approach is offered by the actor-network theory (ANT), which allows one to zoom in on details and zoom out to see more than just the immediate surroundings. ANT was introduced in the 1980s by Bruno Latour, Michel Callon, John Law, Madeleine Akrich and other scholars in STS. This section fouses on aspects that formed my research and not on the description of ANT itself, nevertheless starting with a brief outline.

   ANT links human and non-human actors together without a priori distinctions, forming an actor network. The different actors of this network pursue interests which are inscribed in social or technical formations. Hence, ANT provides a way forward to investigate technology in practice without being seduced by either technological determinism or social reductionism. It can, instead, contribute to describing the interrelation of technology and society, for instance, between telecare systems and healthcare workers, and allows for accounts beyond technology that supports or hinders healthcare services (Monteiro & Hanseth, 1996).

   In one of Latour's earlier books, he explains why a *sociology of associations* is an approach worth pursuing. Latour (1993b) demonstrates that the proclaimed division of the natural and social worlds has never really happened. In the age of modernity, researchers, politicians and the like stress the importance of separating the two worlds. Yet, in practice, we do not fulfil this promise and only theoretically have a clear distinction between the object (the natural) and the subject (the social). This incomplete shift has created hybrids, which hold both the natural and the social. This, for example, can be witnessed when reading newspaper articles on global warming, where the natural and social worlds are tirelessly mixed. So,

as the title of Latour's book asserts, although we claim to be modern, in actuality we have never been modern. One way to overcome this, as Latour suggests, is to rethink modernity and recognise the mixture of nature and the social instead of forcing a division that is practically not taking place.

Consequently, ANT rejects a strict differentiation between objects and subjects. They are treated equally as actors or actants; humans and non-humans together form a sociotechnical network (Latour, 2007). This duality between humans and non-humans is called *generalised symmetry*, where the same agency is given to both. But to be precise, this symmetry does not state that human and non-human actors have the same transformative power:

> ANT is not, I repeat is not, the establishment of some absurd 'symmetry between humans and non-humans'. To be symmetric, for us, simply means *not* to impose a priori some spurious *asymmetry* among human intentional action and a material world of causal relations. (Latour, 2007, p. 76)

ANT offers a lens to create an account of technology without falling into technological determinism or distinguishing beforehand between elements included in the actor network. For example, standards, a technological part often characterised as neutral, can be dissected with the help of ANT (Monteiro, 2000; Monteiro & Hanseth, 1996). Hence, this results in a detailed description with different granularity, emphasising the work required to build the network. The term *network* might need some explanation, as its meaning has changed over time. As Latour noted, 'there are four things that do not work with actor-network theory; the word actor, the word network, the word theory and the hyphen!' (Latour, 1999, p. 15) With the spread of the World Wide Web, the term network became part of the common vocabulary, but with a meaning contrary to ANT's origins. Transformations are at the core of an actor network, while the popular understanding now is that a network transports data or information *without* deformation. For ANT, the work of the network is in the foreground. Without work, the network collapses, and there is nothing to be seen or followed.

These sociotechnical networks composed of actants allow us to study the two research questions on different levels. We can investigate a company implementing telecare systems, the technology they provide and how their customers domesticate these systems. Or, we can dive into the actor network of a specific technology at a patient's home and lay out the network that unfolds here. Similarly,

ANT allows us to zoom in and out on different levels of the phenomena without a priori defining these as, e.g. micro or macro actors (Callon & Latour, 1981). For instance, we can map out and describe specifics of a platform evolution, including details on how the digital platform has been formed, or we can portray the way a company is positioning its platform ecosystem in a wider context.

2.3.1   Inscriptions and translations

Traces of an actor network can be found in artefacts, or to stay with ANT vocabulary, the interests of actors are translated and inscribed in objects (material or non-material) (Akrich & Latour, 1992; Callon, 1990). For instance, welfare technology with a single button may hold the *prescribed use* in material form affording only one interaction, resulting from a company's pursuit to position themselves as a supplier for 'non-technical savvy' and older users (cf. case 1). Yet, as part of an aligned actor network, the company depends on previous translations, including those from their users. Consequently, the aligned actor network is inscribed in this device; inscriptions hold the interest of actors in material form.

An illustrative example of how objects interact with humans, how they are intertwined, and the inscription of instructions in material form is provided in the essay 'The Berlin Key or How to Do Words with Things' (Latour, 1991). A key used in West Berlin by residents of larger apartment buildings takes centre stage (Figure 2.3). The corresponding lock is set on the outer doors of the apartment buildings. In a very accessible and entertaining analysis, the reader discovers what the key with two bits entails and how the key and the keyhole *make* a social relation as regarding discipline: 'From being a simple tool, the steel key assumes all the dignity of a mediator, a social actor, an agent, an active being' (Latour, 1991, p. 19). The key does not act as an intermediate, transporting a message without transformation (e.g. 'lock the door behind you during nights'), but acts as a mediator and constructs the social relation: 'If I take my key with two bits that authorises me to re-enter my house and obliges me to bolt the door at night and forbids me to bolt it during the day, am I not dealing with social relations, with morality, with laws? Of course, but made of steel' (Latour, 1991, p. 19). The instructions of locking the door at night, but never during days, are inscribed in the Berlin key.

Figure 2.3: Der Berliner Schlüssel (The Berlin key)[1]

2.3.2 Fluidity

ANT describes objects in network space. One concept that Latour introduced is named *immutable mobiles* (Latour, 1987) which describes 'displacement *through* transformations' (Latour, 2007, p. 223). Another way to characterise an immutable mobile is by its spatialities, which is proposed together with a widened view of spaces by Law in his article 'Objects and Spaces'. The network space affords stable objects as long as their relational network remains intact. The immutable mobile is mobile in Euclidian space (i.e. moving spatially), while it remains immutable in network space (i.e. remaining in its relational network). The strong focus on networks of relations is a limitation of the *original* ANT perspective, contrasted by the multiplicity of objects: 'ANT is arguably involved in an intellectual and political refusal to try to squint beyond the possible. It refuses to find and to make [...] the places of Otherness, that lie beyond the limits of the current conditions of possibility' (Law, 2002, p. 92). Hence, he suggests thinking about alterity with three main arguments. First, 'there are *multiple forms of spatiality*' (Law, 2002, p. 92). Second, not only are the objects in space enacted, but the spatialities are also enacted and multiple. Third, while they are multiple, they are 'Other to one another' (Law, 2002, p. 92).

What follows is that the network in the *classic* version of ANT can not grasp in sufficient detail certain nuances of relationships and phenomena (Hanseth et al., 2004). A study on alcoholic liver disease, its diagnostic and treatment processes and the patient's trajectory shows the limitations of classic ANT and can be better described by post-ANT approaches (Law & Singleton, 2005). The idea of a typical trajectory (cf. Pollock & Williams, 2008) of the alcoholic liver disease, i.e. the phenomenon, proved elusive. Law and Singleton demonstrate how messiness arises,

[1]Photo (modified) by Clemens Franz, licensed under CC BY-SA 3.0.

a way of explaining it and how it can be approached. They do so by choosing
a radical ontological response, by describing the phenomenon as a single object
(not as *multiple* objects, cf. Mol, 2002) in spaces other than the network space.

In this thesis, I draw particularly from the fluid space, which is vividly de-
scribed in the case of the Zimbabwe bush pump (de Laet & Mol, 2000). In the art-
icle, de Laet and Mol explore the characteristics of fluidity by following the bush
pump: where it is designed, where it is used, and through portraying its inventor.
Three main aspects of fluidity are described. First, there are no solid boundaries.
Even when a core part breaks down that was considered stiff and essential, the
bush pump continued working. Certain local adaptions are even surprising for the
inventor of the pump. 'In each of its identities the Bush Pump contains a *variant*
of its environment' (de Laet and Mol, 2000, p. 252).

Second, being successful is not a binary question. A bush pump brings water,
but it also brings health by providing clean water. While standards and detailed
tables with bacteriological data for groundwater exist to define clean water, loc-
ally, this might be experienced differently, depending on the season. The water
might not be clean according to these standards, hence it will not bring good
health, but it still provides water to a community.

And third, it is also a story of an 'actor [. . .] who refuses to act' (de Laet
and Mol, 2000, p. 252). The inventor Morgan deliberately denies ownership
and makes this a project for the community with joint ownership and collective
responsibility. There is also an interesting comparison to Louis Pasteur (Latour,
1993a), who acts on the contrary. The story about the bush pump is a story
of success. Eventually, it became a national standard because, as the inventor
notes, 'in travelling to "unpredictable" places, an object that isn't too rigorously
bounded, that doesn't impose itself but tries to serve, that is adaptable, flexible
and responsive - in short, a fluid object - may well prove to be stronger than one
which is firm' (de Laet and Mol, 2000, p. 226).

Adding to this body of literature, Mol and Law discuss fluidity as a third social
topology to regions and networks (Mol & Law, 1994). Their article is based on
empirical work on anaemia and its comparability. While all three topologies are
described and co-exist, the focus lies on the fluid space and the description of
its characteristics. Objects in fluid space have no clear boundaries. Normality is
a gradient. This point is related to the next characteristic, namely that '[a] fluid
world is a world of *mixtures*' (Mol and Law, 1994, p. 660). Perhaps surprisingly,

this adds to the next point on robustness. Fluid objects are in movement and adapt well, as described in the previous paragraph. And lastly, different spaces co-exist in complex relations, such as network and fluid space or fire space (Law & Mol, 2001; Law & Singleton, 2005).

This last point brings us back to 'Objects and Spaces': 'it also seems important to avoid becoming too committed to the romance of fluidity' (Law, 2002, p. 101). Objects may be multiple in intersections of different spaces, for example, in the fluid and network space. Even parts of the bush pump reside in network space, as fluid as it might appear in the account of de Laet and Mol. On the other hand, accounts of objects in network space often fail to shed light on fluid work. However, 'when fluid objects or subjects do become visible in network space, they tend to look dangerously *elusive, vague and sloppy*' (Law, 2002, 101f).

The intersection of different spaces, specifically between network and fluidity space, provides a fruitful lens for analysing and theorising, especially for socio-technical systems in motion that involve heterogeneous user groups and changing contexts. Here, an account of fluid space complements network space by shedding light on phenomena that would otherwise remain invisible.

2.4   Summary

Before giving an overview of how these theories and concepts relate to the empirical case, a quick word about theory itself. What is a theory? There are many different definitions of what a theory might be. Personally, during the PhD project, I have seen theory as a companion that helped me to understand and systematically explain a phenomenon. Consequently, I often found *theories for understanding* most useful (Gregor, 2006).

Table 2.3 provides a few examples of how the theories and concepts outlined above relate to my empirical case.

Table 2.3: Overview of theories and concepts in relation to empirical findings

Theoretical background	Empirical illustration
Actor-network theory	ANT was used as an overarching lens to approach the empirical work in both cases. At the beginning of the PhD project, I considered various theoretical approaches common in the IS field. When narrowing down the focus of my research, I found ANT provides a framework to investigate the research questions on the design of technology, and technology in practice. Hence, the first paper does not yet explicitly reference ANT. In the second half of the PhD project, the focus on ANT became stronger, as demonstrated in the later papers.
Digital platforms	Digital platforms often play a central role in disseminating and adapting telecare systems or welfare technology. Case 1 illustrates this by describing the trajectory of a platform that is part of delivering welfare technology services. Yet, the platform also provides other services to the platform owner's customers. I demonstrate how, over time, the shaping of the platform introduced new services and broadened the company's target group. Furthermore, case 1 describes the emergence of a marketplace, a store for the company's customers and content providers.
Boundary resources	Boundary resources are being discussed in connection with case 1. The company is in the process of establishing a platform ecosystem to become an attractive partner for other companies. Hence, by adding interfaces and providing integrations, they increase the periphery of the platform. Furthermore, they adjust the core and periphery of the platform to gain a long-desired customer. I describe how the boundaries between the core and the periphery shift, resulting in deviations from established business strategies but also in customer growth.

Generification	Generification work and specifically managed communities are strategies that were observed in case 1. The company organises yearly user conferences, where the users of the system present in what way they adjusted the platform to their specific needs. During these user conferences, the company identifies generic requirements for further implementations. Furthermore, I discuss how generification strategies can potentially support large-scale participatory design projects.
Fitting	Mental health home treatment, as described in case 2, requires constant adjustments to provide good care. We have described this in detail in our third paper. Based on the concept of fitting we show how both proximity and distance are involved in providing good care, and what role technology plays.
Participation	The generification work outlined above is an interesting concept for scaling PD, as discussed in one of our articles. However, to support genuine user participation, we propose a more democratic approach to include the users. Consequently, the strategy of generification work, originally described from a top-down managerial perspective, provides valuable discussions of the scaling of PD.
Collaborative work	Many concepts from CSCW helped to analyse the empirical findings from case 2. The collaborative effort of providing mental health home treatment is carried out by a multi-disciplinary team. They work closely together but are often spatially apart from each other. Hence, the selected concepts described before offered a good approximation to the case. For instance, the concept of common information space helped me understand the teams' conversations while driving to the patients. They formed a temporal picture of the upcoming visit every time they moved out in varying teams. While not all these concepts are included in the paper on mental health home treatment (Hochwarter et al., in press), they played an essential role throughout the data analysis and hence in our conceptual work.

| Fluidity | The empirical findings from case 1 are analysed and discussed by describing the digital platform and the environment it acts on in fluid space. The company offering the platform repeatedly underlined their deliberate decisions throughout the process of designing the platform. Yet, some elements are fluid, which can be better explained in fluid space. While the platform itself is not as fluid as our source of inspiration (de Laet & Mol, 2000), we discuss elements of the platform that operate in fluid space and demonstrate how the concept of fluidity can contribute to the discussion of digital platforms. |

Chapter 3

Research methods

3.1 Research approach

This thesis presents an interpretive case study on a sociotechnical phenomenon. Interpretive research in information systems (IS) is concerned with the socially constructed knowledge of reality (Klein & Myers, 1999). Interpretive researchers are context-sensitive; rather than trying to eliminate, they embrace the social setting and its actors. They are intertwined and involved in forming the scientific knowledge of a phenomenon (Walsham, 1995). Interpretivism can produce deep insights of 'phenomena through the meanings people assign to them' (Klein and Myers, 1999, p. 69), deviating meanings for different people and how perceptions change over time.

Another approximation of interpretive thinking is offered by the two German words *Erklären* (explaining) and *Verstehen* (understanding), based on an historical delimitation of positivism and the naturalistic interpretations of social sciences. While natural sciences aim to find a scientific explanation, social sciences focus on understanding a social phenomenon:

> They held that the mental sciences (*Geisteswissenschaften*) or cultural sciences (*Kulturwissenschaften*) were different in kind than the natural sciences (*Naturwissenschaften*): The goal of the latter is scientific explanation (*Erklären*), whereas the goal of the former is the grasping or understanding (*Verstehen*) of the 'meaning' of social phenomena. (Schwandt, 1994, p. 223)

Indeed, this needs to be understood from an historical perspective, and in view

of the German tradition of hermeneutics in sociology. Explaining is also very much a concern of interpretive studies (Gregor, 2006).

One consequence of conducting an interpretive study concerns the role of the researcher. While positivism aims for generalisation and universalities that are independent from the researcher, in interpretivism the researcher is not neutral. It is acknowledged that the researcher's beliefs and actions shape the research process and thus the outcome. As an interpretive researcher, one should be self-reflective and not deny or hide one's own assumptions (Oates, 2012).

3.1.1 Study design

The research was guided by an embedded multiple-case study design (Yin, 2018), where the case is defined as the *move of healthcare services into homes by means of technology*. The study follows an interpretive mode of inquiry (Walsham, 1995). A case study can be defined as 'an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident' (Yin, 2018, p. 15). No particular research paradigm is privileged by conducting a case study. There are, for instance, positivist, interpretive and critical case studies. Further, case studies differ in the intention of describing phenomena. They can be descriptive (e.g. Whyte, 1993), exploratory (e.g. Yin, 1981) or explanatory (e.g. Vaughan, 1996).
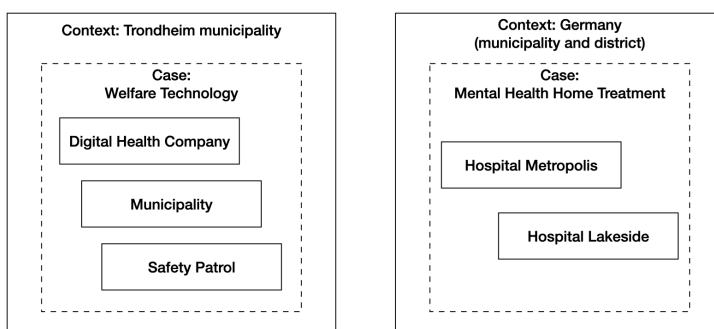
Figure 3.1: The study design of the research project. It follows an embedded multiple-case study design with two cases in Norway and Germany respectively.

The boundaries of the case study, the two cases and their research settings are

described in Chapter 4. Figure 3.1 provides an overview of the study design. Both cases share that they are in the process of moving healthcare services into homes with the help of technology. Hence, they provide a fruitful ground to investigate the case study's questions. While both cases share the broad overall characteristics of moving healthcare into the user's home, when looking closer, they also have other aspects in common. Remote patient monitoring—one focus of the national welfare technology (WT) programme in Norway—has been evaluated in Trondheim since 2008. After pilot projects, remote patient monitoring moved from an evaluation phase to becoming an established service for the citizen of the municipality. Similarly, mental health home treatment (HT) in Germany has been piloted and evaluated before being officially offered by hospitals with psychiatric departments. The first piloting and evaluation of HT in Germany took place in 2001, and further pilot projects followed in the coming years. Since 2018, HT can be offered by all psychiatric clinics in Germany, meaning HT is gradually also becoming an established healthcare service. In both cases, we can observe the structures necessary to become an established service. This can include infrastructure (e.g. monitoring of alarms by the safety patrol), alignment of work practices and tools (e.g. platforms to communicate with patients), and the establishment of legal boundaries (e.g. legislation to reimburse HT by clinics). This was also a rationale to study the three sub-units of case 1, allowing to follow the alignment of the Digital Health Company (DHC) (supplier of WT), Trondheim municipality (responsible for WT implementation), and the safety patrol (coordination of WT).

What distinguishes the two cases becomes apparent when zooming in on how technology mediates care at a distance. Case 1 focuses on welfare technology, where technology supplements healthcare activities at home. Case 2 on mental health home treatment follows how severe mental health crises are treated at home by home treatment teams, and how their work is supported by the use of technology. This is a significant difference, and not following a replication design allowed me to uncover different aspects of the study's aim.

3.2 Data collection

Interpretive case studies often draw from various data collection methods (Klein & Myers, 1999). While interpretive research is frequently associated with qualitative data collection methods, quantitative data should not be excluded, as it

Table 3.1: Data sources for case 1

Source	Description
Observations	• Vendor WT user conference (two days)
	• Municipality planning meetings with institutions (2 meetings)
	• Response centre (1 day)
	• Ambulatory unit (1 day)
Interviews	• Vendor WT (4 interviews)
	• Municipality (4 interviews)
	• Response centre (1 interview)
Documents	• Whitepapers
	• Presentations and dissemination material
	• Government reports and guidelines
	• Internet-based public information

can enrich the study's account and contribute to higher research quality (Oates, 2012). Qualitative data were my main source of data. Yet I stayed open to collecting quantitative data, and did so when meaningful opportunities arose. For instance, I recorded and collected the treatment and driving durations of the HT visits. To summarise my data collection in a very simplified way, I 'watch, listen, ask, record, and examine' (Schwandt, 1994, p. 222). In the following, I describe how I collected data in detail.

Data collection started in November 2018, and the last data were collected in December 2021. Three methods for data collection were employed: interviews (mainly semi-structured), observations, and documents. Table 3.1 and table 3.2 summarise the data collection for each case.

Observations were the primary source of data generation for case 2. I followed an ethnographic approach (Myers, 1999) during the three one-week-long visits to the study sites. The first visit took place in the context of a summer school, and data were collected through participant observation. The findings from this phase were broad and open, exploring different mental health services the hospital offered (Hochwarter et al., 2019). When I identified mental health home treatment as a phenomenon worth pursuing, the focus shifted to the HT teams of two hospitals. For the latter two field visits, I conducted go-alongs for a duration

Table 3.2: Data sources for case 2

Source	Description
Observations	• Field visit at hospital Lakeside (1 week)
	• Go-alongs at hospital Metropolis (1 week)
	• Go-alongs at hospital Lakeside (1 week)
Interviews	• Chief physician at hospital Metropolis (1 interview)
	• Chief physician at hospital Lakeside (1 interview)
Documents	• Collected documents during observations
	• Whitepapers
	• Internal documents shared with me
	• Presentations and dissemination material
	• Internet-based public information

of one-week each (Kusenbach, 2003). Go-alongs combine participant observation and interviews while following a person or a group. They are often named after the type of observation, for instance, drive-along or even party-along (Tjora, 2016). This allowed me to see the HT teams' work in much detail, including patient visits. Further, I used the time in the office or car to supplement my observations with informal interviews.

The data collection for case 1 also involved participant observations, but to a less intense degree than in case 2. Here, I aimed to balance interviews and observations from the different study sites. I spent two days at DHC's user conference, which provided essential findings on how DHC shapes their product, and to what degree users are involved. Further, I joined two planning meetings for the introduction of a WT service between the municipality and a local health institute. Finally, I spent two days observing the work of the safety patrol; once at the response centre, and once I joined the ambulatory unit.

Interviews were a natural choice from the beginning for data collection, specifically for case 1. The first interview took place one month after the start of the PhD research project. I explored different directions for the research project to take, and using open-ended interviews enabled me early on to be more receptive to different aspects of the case. Later, semi-structured interviews were used. While in the beginning, interviews allowed me to collect data quickly on the case, later on, I could come back to my informants and get a deeper understanding of
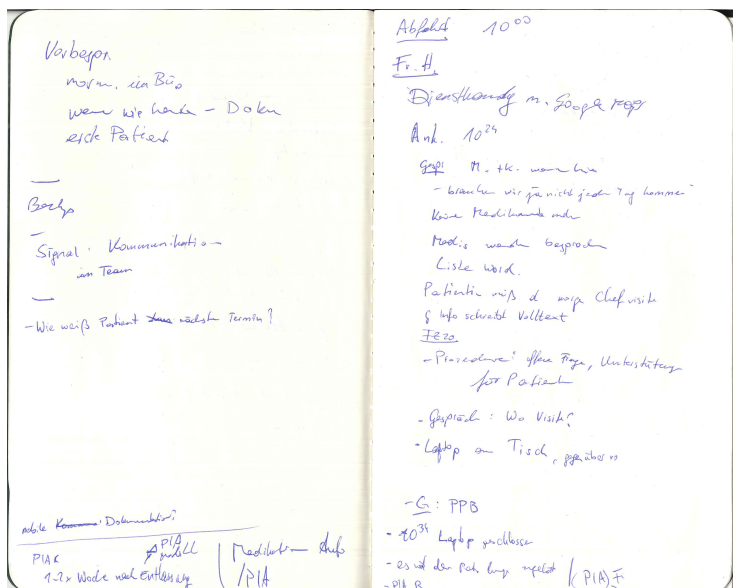
Figure 3.2: Fieldnotes from a go-along. I commonly use the right page to jot down my notes and the left page for questions or memos.

a phenomenon. For case 2, the interviews with the chief physicians from the two hospitals supplemented my findings after returning from the field visits. All interviews were conducted in English, Norwegian or German. They were recorded, manually transcribed and translated to English, if necessary.

As a third data source, documents were collected throughout the process. During the go-alongs, I collected relevant material used in carrying out HT such as treatment plan templates or week schedules of the teams. These were important elements for analysing the case. Further, for case 1, I collected various presentations. After the vendor's user conference, I got access to the presentations from the participants. Sometimes my informants prepared presentations for the interviews, which I collected as well. Finally, for both cases, I continuously collected publicly available documents from different sources, such as the Norwegian Directorate for e-Health or the municipality itself.

All participants were informed about the study's purpose and received a copy of the research agreement. The research project was registered at the Norwegian Centre for Research Data, and collected data were encrypted and pseudonymised.

3.3 Data analysis

A central part of a research project is data analysis. Throughout this research project, I collected field notes, interview transcripts and various documents. I followed an iterative data analysis approach; hence, data analysis can not be seen in isolation from the rest of the research project. It was rather an integrated part of the overall project that had a decisive say in what data to collect next and how to proceed methodologically.

Qualitative data analysis can be understood as meaning-making of the collected material (Flick, 2014). Further, the role of theory in qualitative research is connected to this process. It can serve as an *sensitising device* and provide a lens for the researcher to the collected data and phenomena (Klein & Myers, 1999). For instance, in the second half of my research project, the actor-network theory (ANT) and its components became more relevant for this study. I followed the actors in case 2 and explored the network and fluid space with findings from case 1.

Both the interview recordings and the field notes were usually transcribed shortly after being generated. I collected data in three languages (Norwegian, English and German), and the transcripts were first written in the original language and then translated into English, if necessary. I consider the transcription itself as part of the data analysis, hence no external services were used for transcribing recordings. As I am not a native speaker of Norwegian, some of the transcriptions took some effort and persistence, especially interviews with informants speaking a Norwegian dialect. Transcribing my field notes or interviews allowed me to re-experience the scene. I found it fruitful to especially transcribe field notes from observations as soon as possible. Memories are still fresh, and details, which jottings during observations can not account for, can be added in more depth (Emerson et al., 2011).

The data analysis can be characterised as both inductive and deductive, and I moved between different units of my analysis as described by the hermeneutic circle (Klein & Myers, 1999). In the early research process, I approached the field and data with an open mind. The aim was to be perceptive to emerging phenomena and explore interesting research directions. Relying on ethnographic work to a great extent, an in-depth description of the findings was a crucial part of my analysis.

In the second half of the study, deductive elements, such as a theoretically-

driven analysis, play a more important role. As described in the background, specific themes were prominent throughout the study and deductively became a central part of the data analysis and collection. At the beginning of the research project, I identified the theme of digital platforms as relevant for the case on WT. Hence, both papers that discuss the findings of case 1 evolve around aspects of digital platforms. Another theoretical theme influenced by deduction was the description of fluidity and fluid space in paper 4.

In the early phase of this research project, I explored different methods and styles of qualitative data analysis. I considered, for instance, following Tjora (2019) and his approach of stepwise-deductive induction. Eventually, the one-level coding and the stepwise framework did not fulfil my needs, and I decided to look for a more flexible methodology. Finally, my data analysis was inspired by the methodology of grounded theory (GT) (Glaser & Strauss, 2000). Specifically, I followed in large parts the steps outlined by Charmaz (2014) in her constructivist GT for a number of reasons. Charmaz' approach allows for a more pragmatic application of GT by leaving leeway to the researcher and the research process. The fundamental assumption here is that theory is not discovered but constructed by the research process (including the researcher and the data analysis). I also agree with her and Strauss (1987) that entering the field and data analysis as a completely naive researcher without any presuppositions is neither possible nor sensible. Rather, a reflective inclusion of personal knowledge and experience is a more fruitful approach. The constructivist GT offers 'systematic, yet flexible guidelines for collecting and analyzing qualitative data to construct theories from the data themselves. The guidelines offer a set of general principles and heuristic devices rather than formulaic rules' (Charmaz, 2014, p. 1).

I was carrying out data collection and analysis side by side and as an iterative process. After collecting new data, I stored them systematically in a computer-assisted qualitative data analysis software (MAXQDA, see Figure 3.3) and started with an initial round of open coding. I followed Charmaz (2014) recommendation of using gerunds (noun forms of verbs) for initial codes, which helped me to focus on processes and actions. When appropriate, I also used in-vivo codes. I further wrote memos during data collection and analysis. These included questions for further investigations, early working categories, and concepts/theories. When I collected new data as well as after another round of open coding, I compared the generated codes and their linked data to revise my code tree and eventually
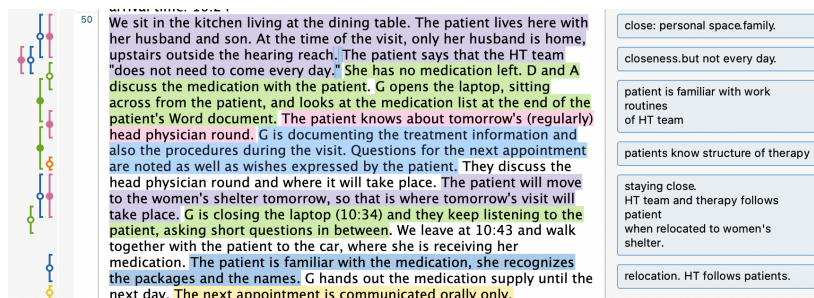
Figure 3.3: A screenshot of a coded field note from a go-along. The codes, both initial and focused codes, are shown on the left. Memos and notes can be seen on the right. This is the result from my fieldnotes seen in Figure 3.2.

modify existing codes.

After I had completed a larger block of data collection, the next step usually began with the process of focused coding. I started with the most significant or frequent codes to identify categories. During this process, I was continuously comparing the codes and their data to find a category that best correlated with their meaning. Sometimes, when overwhelmed with codes and data, I shifted to fanfold paper, sticky notes and pencils. The identified categories were further described with individual memos.

Finally, I analysed the categories and their codes in theoretical coding to find relationships. Following the coding family of Glaser (1978) would have been a possibility. However, I preferred to seek guidance from theories and concepts used in IS and neighbouring fields. Again, this was an iterative process which included going back to the data or even to the field. These different phases of the data analysis were often overlapping, and early reflections were sometimes dismissed or later picked up again but incorporated from a different angle.

Data analysis was not carried out in isolation. While I pointed out above the iterative process between data collection and analysis, the preliminary analysis was also discussed on various occasions. I consulted my supervisors for feedback and theoretical guidance, specifically during the process of theoretical coding. All my work was profoundly discussed with my main supervisor, who also contributed his theoretical knowledge. Furthermore, I *tested* my findings at conferences, seminars and meetings where I could present research in progress. I also had a good network of colleagues at my university, who frequently discussed our research.

3.4   Reflections

3.4.1   Gaining and maintaining access

A crucial part of a case study is to gain and maintain access. However, this is not a straightforward process. I opted for multiple study sites, hence I had to negotiate access more than once. This is a time-consuming task and poses a risk to the research project. On the other side, having multiple study sites can mitigate the risk of having no or limited access to one study site.

Access to case 1 was negotiated early after I had started as a PhD student. My supervisor connected me to the person responsible for implementing WT in Trondheim municipality, and the first meeting took place in November 2018. We mapped out current WT projects, and I further identified the company DHC as an interesting starting point because they had just started working on a project with the municipality. My co-supervisor, Babak A. Farshchian, supported me in gaining access to the company in the spring of 2019.

Maintaining access to case 1 was unfortunately not as easy as gaining access. Although I had follow-up meetings with the company DHC and data collection in the form of interviews had started, they were occupied with expanding their services and moving to a larger office. This could be regarded as a sign of their success, yet, it pushed my goal to be allowed to have a desk at their office further away. I remained persistent and continued working on improving access, but I was promised a desk only after they had moved to the new office. At the same time, I had to be careful not to become an unwanted distraction for the company. In a research outline shared with them, I further offered ways forward and to contribute with insights from my research based on their interest. To be clear, the company was always welcoming, provided me with many insights, and supported my attendance at one of their conferences. Still, I assume that their current circumstances led to putting a visiting researcher on low priority.

Eventually, I had made good progress by the end of 2019, when another complication arose (see Section 3.4.3). At this time, I decided to turn my attention to the other side of WT services, namely the municipality. I already had access there and could supplement my data collection with the perspective of actors implementing and coordinating WT services. I managed to collect data through interviews and observations before a large-scale health project drew all the attention of my informants away. Given that the last year of my PhD research position had

started, I focused on complementing the existing data in a final round of data collection and analysis.

Gaining and maintaining access to case 2 was more straightforward, even though the research site was located in another country. I gained access through participating in an international summer school in 2019. One of the participating partners was the hospital Lakeside. The chief physician of the department for psychiatry, psychotherapy and psychosomatics was highly welcoming and interested in continuous collaboration with me and my research department. Further, I was offered a position as a research associate, which I accepted, intending to use this to maintain good access. Fieldwork at both hospitals was characterised by an open and constructive atmosphere, and I was able to record a detailed account of their work. Moreover, I am a native speaker of German, there was no language barrier to overcome. Again a major complication that had come up was another setback to field access as described in Section 3.4.3.

3.4.2   Case selection

According to my research plan at the beginning of the PhD project, the aim of the study was to 'describe the barriers and challenges of the design, implementation and use of welfare technology with emphasis on the current trends of introducing platform ecosystems'. Clearly, the research project's focus has shifted over the last four years. However, the original aim is still a fundamental part of the research design. When the research plan was outlined, only one case was selected (case 1). I deliberately chose to follow an adaptive research design (Yin, 2018) to be able to react to changes and to be open to new information.

A modification of the case study's design became necessary with the emergence of case 2. While initially I had planned to study at least two cases to investigate WT from different perspectives, case 2 introduced a new topic not directly linked to WT. However, they share the common feature of moving healthcare services into homes, but with different means. Case 2 offered an opportunity to shed light on physically moving healthcare into homes at an early stage of implementation (HT in Germany officially started in 2018). Further, it was also a strategic decision, as it was clear from the beginning that I would have full access to this case. Hence, the aim of the case study was modified to fit both cases.

3.4.3   External factors

Conducting a research project designed to rely on physical access for data collection during a pandemic certainly had a strong effect on the complete study. More than half of the period of the data collection phase was impaired by the COVID-19 pandemic. For instance, I arrived in Germany on March 9, 2021, to follow the two HT teams (case 2) for the rest of the month. Only two days later, on March 11, the World Health Organization (WHO) declared a worldwide pandemic. I had to adapt my plans and was able to take one of the last flights from Berlin to Trondheim on March 20. Two days later, the first national lockdown in Germany went into effect. It was only five months later that I could take up my fieldwork again when the situation had eased over the summer.

I also faced substantial delays in data collection in case 1 due to the pandemic. Conducting observations in a healthcare setting became even more challenging. I had to reschedule and adapt the data collection. At the same time, the introduction of a large-scale healthcare system took away resources from my informants.

Delays in data collection are only one of many challenges I have encountered due to the pandemic. In 2020 and 2021, physically attending international conferences was either impossible or, in my opinion, a thoughtless endeavour. Although conferences do not seem to be directly related to methodology or data collection, I personally receive a motivational boost through discussions and interactions with colleagues at these venues. Afterwards, I usually return with renewed vigour to take up my often solitary research work.

Chapter 4

Case

This is a case study of *moving healthcare services into homes by means of technology*. I followed an embedded multiple-case study design (see Figure 3.1), which I have methodologically discussed in the previous chapter (Yin, 2018). The purpose of this chapter is to define the cases and their elements, describe their boundaries and the research settings.

Before describing the two case studies, the overarching theme of moving healthcare services into homes needs more attention. As Yin (2018) states, bounding the case is an important step to support purposeful data collection and connecting the case closer to the research questions. I have defined the following boundaries for this case study. The focus of the case is on healthcare services provided either by a healthcare professional or institution (i.e. primary or secondary care provider). Hence, personal devices such as fitness trackers for self-tracking are deliberately excluded, as they do not include the full network of actors I wish to cover with this study. Further, a *home* can have multiple meanings. For this case, I consider a home to be every spatiality a service user resides in, which may be permanent or temporary. This includes (but is not limited to) private homes, nursing homes or women's shelters. Next, the *move* of healthcare services must be in the process or in an early phase of implementation. The reason behind this is to support a clear account of the phenomena; or as Latour (2007) notices, '[h]ere, they appear fully mixed with other more traditional social agencies. [...] This is why the study of innovations and controversies has been one of the first privileged places where objects can be maintained longer as visible, distributed, accounted mediators before becoming invisible, asocial intermediaries' (Latour, 2007, p. 80). Finally, the role of technology must play a prominent role and be

accounted for (Orlikowski & Iacono, 2001).

4.1   Welfare Technology

Case 1 focuses on healthcare services at home mediated through technology, and specifically on welfare technology (WT). The term WT originated in Denmark and was established in Norway in 2011. WT is defined as technical assistance to increase safety and security, support inclusion and social well-being, support social participation, and support treatment and care for people with physical, psychological or social impairment (Helsedirektoratet, 2012).

According to the definition by the Norwegian Directorate of Health, there is a wide variety of systems that would be classified as WT. It is not always simple to draw boundaries, and the definition of WT can be seen as ambiguous. Another way to approach this subject is to look at the context. Thygesen (2019) defines three characteristics of WT: (i) WT takes place in the context of health, care or welfare; (ii) WT allows providers to carry out services from distance; and (iii) the target group is primarily the service recipient, i.e. patients and relatives.

The term WT is mainly used and broadly accepted in Scandinavia, while in English-language literature it is rarely used. Similar terms in English would be ambient assisted living, assistive technologies, e-health, telecare, connected care, and health and care technology. Examples of WT include fall detectors, automatic medicine dispensers and remote patient monitoring for chronic diseases such as chronic obstructive pulmonary disease.

In Norway, the national Welfare Technology Programme is driving the implementation of WT in the municipalities. The programme is the product of a cooperation between KS (Norwegian Association of Local and Regional Authorities), the Directorate for e-Health and the Directorate for Health.

4.1.1   Research setting

The research setting of case 1 involves by and large three actors around the WT services offered by the local municipality: the Trondheim municipality (TM) as the implementing and organising entity; the safety patrol (SP) as a central institution where the services are coordinated and unfold; and the software vendor Digital Health Company (DHC) that implements one of the current key projects, i.e. remote patient monitoring. Certainly, WT in Trondheim also includes other actors

such as the service users (patients), general physicians or the local hospital. However, given the study's focus, time and resources, I have decided to focus on three units that are actively playing a role in moving WT towards an established service.

Trondheim municipality

Welfare technology in Trondheim municipality (TM) is organised by the Department for Service and Internal Control under the Directorate for Health and Welfare. TM has been actively working on evaluating and establishing WT services since the beginning of national WT initiatives. One example is the remote patient monitoring of chronic conditions. From 2008, TM participated in pilot projects to evaluate remote patient monitoring, first on a small scale and in cooperation with the local hospital. Soon after, they focused on chronic obstructive pulmonary disease (COPD) as the first distinct area for remote patient monitoring. While the projects had positive effects, there was a lack of digital reporting. Based on this experience, they started a project on remote patient monitoring with the name of 'HelsaMi'. This project included digitised self-reporting for patients with COPD, monitored by the response centre of TM. The municipality continued this project and participated in a national evaluation of remote patient monitoring with a follow-up project named 'HelsaMi+' (Trondheim Kommune, 2018). In 2014, TM established their own WT programme plan to steer further implementations (Trondheim Kommune, 2015), and in 2018, the programme was integrated into daily operations of the municipality's health services. Since then, the municipality has followed the goal of the WT programme to establish WT as a natural part of their services by the year 2020. A guiding vision throughout the programme was to promote the vision 'Trygg der du er!', which translates to 'Safe, secure and confident where you are!'

Trondheim municipality has continued their initiative to implement and adopt welfare technology (Trondheim Kommune, 2015). This work includes the design and implementation of services, procurement and deployment. Further, TM has established a skills development programme for its employees so that they value WT as an integrated part of the service catalogue. The municipality is also active as a partner in both regional and national networks. In 2018, a network connecting the county's municipalities was established. The aim of the network is to share knowledge and expertise of past and future WT projects and have a base for joint procurements of WT.

| Recruitment	Planning	Start	Daily reporting	Evaluation and termination
The patient is referred by an institution (e.g., hospital) and a case is created. Planning of the service is arranged and a visit at the general physician is scheduled.	The general physician establishes together with the patient a self-treatment plan. This also includes individual thresholds for sensors. Questionnaires depend on the diagnosis.	Configuration of the app, tablet and sensors. Training of the patient and testing of equipment. This is done by the safety patrol.	The daily reporting is in accordance with the self-treatment plan. Follow-up when indicated by the safety patrol.. Minor adjustments to the service possible.	After a time, an evaluation takes place together with the patient and general physician. It will be assessed if self-reporting is the right service for the patient, and the service will eventually be terminated.

Figure 4.1: A patient path and the different phases for the WT service of remote patient monitoring.

The municipality of Trondheim offers many different WT services with varying options to their citizen to meet diverse needs (see Figure 4.2). WT solutions include personal safety alarms, location service (GPS), remote patient monitoring, digital monitoring/surveillance, automatic pill dispensers and door alarm services. This list is not complete, as TM continuously tests new systems and adapts existing ones. The main focus of case 1 was placed on remote patient monitoring. Figure 4.1 shows the different stages of remote patient monitoring from the patient's perspective.

The safety patrol

The safety patrol (SP) is responsible for the 24/7 operation of most of the WT services at home residents. WT plays a central role in their workdays, or as the unit manager puts it: 'This is our everyday life, our whole workday is based on welfare technology. Without it, we would not work' (Interview with safety patrol).

The SP of the municipality (Norwegian: trygghetspatruljen) is overseeing the continuous monitoring of WT services and their implementation at the service user. They are composed of healthcare workers, technicians and administrative staff. Their response centre (see Figure 4.3a) handles alarms and events from the WT services, where personal safety alarms are the largest by number. Until recently, they were a combined response centre with the urgent care centre. Now they are two separate units but share the same building and collaboration is still required in the absence of information. SP is also responsible for monitoring the values of remote patient monitoring. For instance, when a service user's meas-
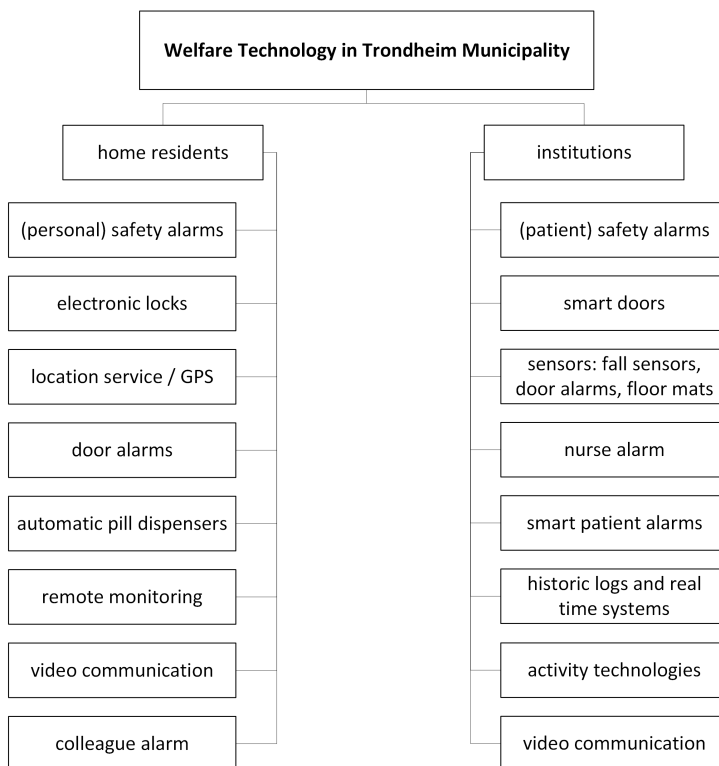
Figure 4.2: An overview of welfare technology at Trondheim municipality. These are either implemented or in the process of implementation. The categorisation is based on a document provided by TM.

ured value exceeds a personalised threshold or a questionnaire indicates a critical change of condition, they need to follow up on the event. Their technicians set up the remote patient monitoring systems at the service user's home and provide an introduction to the system. They are also solving technical issues to ensure a smooth operation.

If a service user's condition can not be clarified on the phone or with the help of other means, one of their ambulatory units moves out and follows up. During the day, they drive on their own and between two and three cars are operative. During nights, they drive in pairs and have one or two cars available. When the ambulatory units move out, they receive the address and a summary of the incid-

(a) A workplace at the response centre.

**(b)** A tablet in an ambulatory car.

Figure 4.3: The safety patrol is divided into a response centre and ambulatory units.

ent on their car tablets and provide status codes through the tablets (see Figure 4.3b). On their work phones, they have full access to the patient record. In the neighbouring municipalities outside the ambulatory unit's catchment area, the local home care service moves out to the service users instead.

Digital Health Company

The Digital Health Company (DHC) is a Norwegian medium-sized company founded in 2007. The company was established based on a product idea by clinicians in a private hospital. Initially, DHC aimed to improve the time-intensive task of questionnaires in clinics by providing an efficient system for self-administered questionnaires. A year later, professional development of the product HealthSoftWare (HSW) started, and a CEO and CTO were hired to drive the development process.

Over time, DHC diversified their software package both in breadth and width. Their initial focus on questionnaires was further developed, and new features were introduced. For instance, clinical users can build their own questionnaires and workflows in addition to standardised questionnaires. Questionnaires and other content can be shared with users through the HSW platform. But they also explored new markets, for example, by providing a solution for assisted self-management in mental health. HSW aims to become a leading provider of digital healthcare services, and they have been actively building a platform ecosystem around their product (see Figure 4.5). Finally, remote patient monitoring broadened their platform further by integrating sensors and adding a dedicated
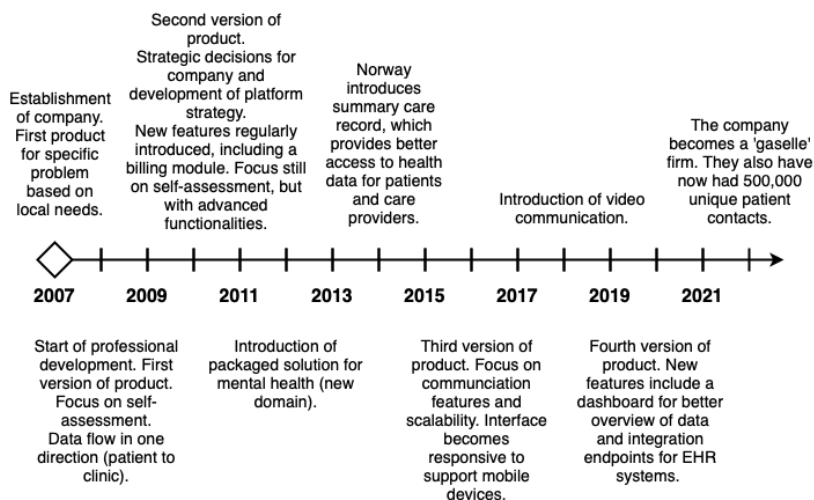
Figure 4.4: A timeline of the evolution of the Digital Health Company and its platform HealthSoftWare.

mobile application for patients. Figure 4.4 provides an overview of the company and the product over time.

Remote patient monitoring has already been piloted and evaluated before DHC signed a contract with TM (as described in Section 4.1.1). TM used their experience gained from the previous projects to spread their remote patient monitoring services from COPD to two additional areas. They tendered a new procurement for remote patient monitoring with three areas, and DHC won this tender. DHC started cooperating with TM in 2018, and the two areas COPD and chronic heart failure were implemented. The third area was not yet decided on, but by 2021 they started to implement remote patient monitoring for mental health as the third area. Together with SP as an experienced partner, they specified the requirements. These include integration of remote patient monitoring into the municipality's electronic health record (EHR) system, three sensors (blood pressure, scale, and puls-oximetry) and a mobile application for patients.
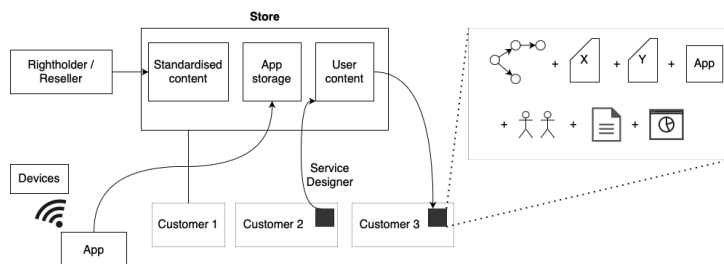
Figure 4.5: HealthSoftWare as a platform for user-generated content

4.2   Mental health home treatment

Mental health home treatment (HT) is a form of treatment for severe mental health crises by a team-based approach within the service user's home or social surroundings. HT (or crisis resolution teams, as they are commonly called in the English-speaking world) is an inherent part of mental health care in many countries (Weinmann, Bechdolf & Greve, 2021). Historically, HT can be traced back to an early movement of deinstitutionalisation of mental health care. In Amsterdam, the psychiatrist Arie Querido established a system for home visits by psychiatrists and social workers in the 1930s. Similar projects took place in the UK in the 1950s. The first services that resemble today's HT were introduced in the 1970s, in Madison, Wisconsin and Sidney, Australia respectively (Johnson, 2013).

HT can have many advantages over traditional inpatient psychiatric treatment. Service users can stay at home and in their social environment, which can be a supportive component for them. At home, relatives are often included in the therapy. Power relations, too, shift and are more evenly distributed than in a hospital setting. Further, HT contributes to the destigmatisation of psychiatric illnesses. Another point is that service users with specific conditions might not be reached with inpatient psychiatric treatment, and hospital admissions can also have harmful effects. Finally, there are also economic reasons for HT (Längle et al., 2019; Weinmann, Bechdolf & Greve, 2021; Winness et al., 2010).

4.2.1   Research setting

Case 2 follows HT teams from two German hospitals. In 2018, HT in Germany was introduced as an intensive form of HT. The German model has the somehow cumbersome name inpatient-equivalent home treatment (IEHT) (German: sta-

tionsäquivalente Behandlung). In the following, I will continue using the generic term of HT, as it is internationally known. Before the official introduction of HT in Germany, model projects to evaluate and pilot HT had been conducted since 2001. Currently, around 10 % of German hospitals with psychiatric departments have introduced HT (Baumgardt et al., 2021).

HT in Germany is subject to a legal framework for its realisation and application. The fundamental requirement for a patient to be submitted to HT, is an inpatient treatment demand as HT replaces inpatient treatment. Hence, HT is designed to resemble inpatient care in both intensity and flexibility but delivered at the patient's home. This is achieved by daily visits of a multi-professional team which consists of a psychiatrist, a nurse and at least one more health professional (e.g. psychologist, social worker or occupational therapist). They follow the same standards as in an inpatient setting, including the weekly medical rounds and multi-professional team meetings. Further, the HT team ensures 24/7 accessibility by phone. There are a number of exclusion criteria for HT. For instance, the home environment must be suitable for this form of treatment and severe endangerment for the patient or other persons must be ruled out. The distance between the place of residence and the HT team's facility is taken into account as well (Weinmann, Bechdolf & Greve, 2021).

While there exists a legal framework for HT in Germany, the implementing institutes have different approaches to organise their HT teams and workflows (Schwarz, Bechdolf et al., 2021). Staffing of HT teams can be organised centrally as an independent unit or decentralised with the help of other departments (Längle et al., 2019). Also, the local context sets different demands on the HT teams and their patients. The following two sections outline some specifics of the two hospitals and their HT teams.

Hospital Metropolis

Located in a metropolitan and vibrant district of a major German city, the hospital Metropolis (pseudonym) hosts two HT teams in the department for psychiatry, psychotherapy and psychosomatics. The district is the smallest district of the city, having at the same time the highest population density (see Figure 4.1).

HT is only one of many psychiatric services they offer (see Figure 4.6). These include ambulatory treatment, day clinics and inpatient treatment. They also provide psychiatric treatment specialised for younger adults or people with an
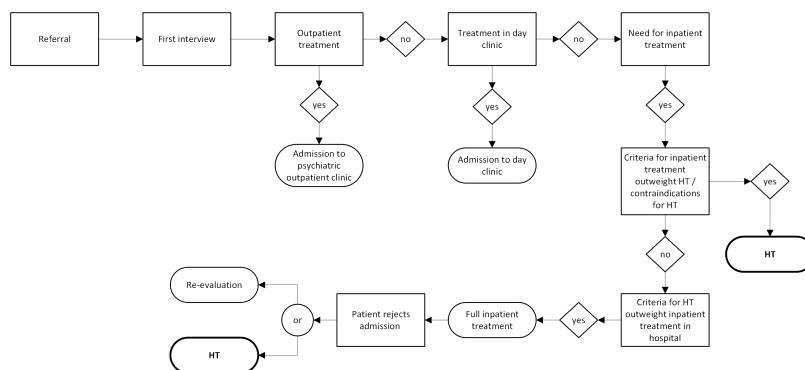
Figure 4.6: A flow diagram showing the different steps to find a treatment option for a patient (Gottlob et al., 2021, p. 201).

immigration background. In 2018, the hospital Metropolis and their sister hospital were the first ones that introduced HT in this city. Before they introduced HT, they already had experience from piloting a model project on outreach treatment. Starting with seven treatment units and one HT team, the two HT teams provide now 21 HT treatment units. Initially, the HT teams were centrally organised, i.e. the HT team workers were not part of other inpatient services of the clinic. In 2020, they shifted to an integrated organisation of the HT teams (Weinmann, Rout et al., 2021).

Table 4.1: Research settings of hospital Metropolis and hospital Lakeside

	Metropolis	Lakeside
population	290,000	240,000
catchment area	20 km^2	1,613 km^2
inhabitants/km^2	14,500	149
average age	38.2 yrs	47.7 yrs
immigration background	35.9 %	3.9 %

Hospital Lakeside

On the outskirts of a major city, the hospital Lakeside (pseudonym) and its department for psychiatry, psychotherapy and psychosomatics is home to one HT team.

They are located in an eastern Germany mixed rural and suburban district, only 35 km from the hospital Metropolis. The private, non-profit hospital of a small municipality serves an area of 1,613 km^2 with a low population density (see Table 4.1).

Figure 4.7: HT team from hospital Lakeside on the way to visit a service user.

The hospital Lakeside was also among the first to introduce HT in 2018. Similar to hospital Metropolis, they have had experience with HT before from piloting and evaluating a model project on outreach treatment. Further, they too offer a variety of psychiatric treatment services to address the different needs of their patients and to support treatment continuity. Due to their large catchment area, they additionally have outpatient day clinics in two towns. The hospital Lakeside hosts one HT team, which usually drives in pairs of two in order to use the relatively long driving time to discuss their visits. In this setup, one of the HT workers does the documentation while the other does the driving. This demonstrates a particularity of their work environment. The HT team spends around half the workday in the cars. However, the poor network coverage does not allow access to their EHR system, so they have established workarounds for documentation whilst on the move (see Figure 4.7). Another particularity of the HT team is the peer-support workers, who regularly join the HT visits. Peer-support workers are people with lived experience of mental distress, often former patients, that support other patients throughout the treatment process (Schwarz, Schilling et al., 2021).

Chapter 5

Results

5.1 Outline

The thesis includes the following four papers:

Paper 1. Hochwarter, S., & Farshchian, B. A. (2020). Scaling Participation - What Does the Concept of Managed Communities Offer for Participatory Design? *Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise*, *2*, 50–54.

Paper 2. Hochwarter, S. (2021). Sociotechnical Challenges of eHealth Technology for Patient Self-management: A Systematic Review: *Proceedings of the 14th International Joint Conference on Biomedical Engineering Systems and Technologies - (Volume 5)*, 394–400.

Paper 3. Hochwarter, S., Schwarz, J., Muehlensiepen, F., & Monteiro, E. (in press). Becoming a Guest: On Proximity and Distance in Mental Health Home Treatment. *Computer Supported Cooperative Work (CSCW)*.

Paper 4. Hochwarter, S., & Kempton, A. M. (2022). *Platforms in Fluid Space* [Unpublished manuscript], Department of Computer Science, Norwegian University of Science and Technology, To be submitted to an international IS journal.

Additionally, two papers related to the case study were published, which are not included in this thesis. They have been written early in this PhD project and describe a broader perspective on the cases. Yet, these papers contributed to the overall thesis by receiving feedback on an early analysis of our findings. For reasons of reference, I do mention them here:

- Hochwarter, S., Tangermann, P., Heinze, M., & Schwarz, J. (2019). Psychiatric Home Treatment for Inpatient Care Cases - Design, Implementation and Participation. *NOKOBIT - Norsk Konferanse for Organisasjoners Bruk Av Informasjonsteknologi*, 11.
- Hochwarter, S., Bechdolf, A., Heinze, M., Von Peter, S., Weinmann, S., & Schwarz, J. (2021). Use of Information Systems in an Intensive Form of Mental Health Home Treatment. *Public Health and Informatics*, 1017–1018.

The included papers in the thesis cover different aspects of the research project while at the same time relating to the overall case study. Together, they contribute to the aim of the research project *to investigate the shift of healthcare services into the user's home by means of technology* by answering the two research questions:

RQ1 How are systems that support remote care shaped for their users across different contexts?

RQ2 How is care at a distance realised, and what role does technology play in this?

Table 5.1: Overview of the papers, research questions, and fields they contribute to.

Paper	Year	Case	Field	RQ1	RQ2
Paper 1	2020	Case I	PD / IS	●	
Paper 2	2021	Case I and II	CSCW / HI	●	●
Paper 3	2022	Case II	CSCW		●
Paper 4	2022	Case I	IS	●	●

Table 5.1 provides an overview of the published papers and the research question they addressed. A description of how the papers contribute to the research question is given at the end of this section for each paper. Paper 1 was written after the first iteration of data collection on case 1, which focused mainly on Digital Health Company (DHC) and how they tailor their system for different customers. Hence, this relates to RQ1. The systematic literature review on remote patient monitoring presented in paper 2 was written at the beginning of the PhD as part of a course on methodology. It has implications for both cases 1 and 2. Paper 3 reports on the ethnographic fieldwork of case 2 and discusses how home treatment requires both proximity and distance and the role of technology. The

final paper focuses on the theme of digital platforms, and the findings are based on data collected throughout the term of this research project. We analyse the findings in relation to fluid space and argue for widening the perspective when investigating digital platforms in use.

5.2 Summary of included papers

5.2.1 Paper 1 - Scaling Participation: What Does the Concept of Managed Communities Offer for Participatory Design?

Empirically, this paper is based on the fieldwork of case 1 and the municipality's vendor for remote patient monitoring systems. The company DHC (the paper uses a different pseudonym) organises yearly user conferences spread over two days. A central part of these conferences is the presentations and insights provided by their users. The users took the opportunity to present how they implemented and customised the platform for their use and often proposed changes to be picked up by the company. Our observations from the user conference were supplemented by interviews with DHC. The company covers a diverse user base and manages to support its requirements with the platform.

Drawing from our fieldwork and the concept of generification work (Pollock et al., 2007), we reflect on what the strategy of managed communities can offer for participatory design. We have found strong similarities between our case and managed communities as described by Pollock et al. (2007), for instance, when DHC differentiates between the *generic particular* and the *particular*. The former is a feature on the roadmap for implementation, while the latter is either not implemented or left to a single customer to be implemented.

Although managed communities, as presented in our case, follow a top-down approach, we see potential in following this approach in participatory design projects. However, power relations need to be shifted, and a bottom-up approach is required to achieve genuine participation, as understood in participatory design.

Contribution: The idea of following up on *generification work* resulted from a discussion with my supervisor Eric Monteiro. I wrote the paper, and Babak A. Farshchian revised the paper and contributed through discussions and comments on participation. I presented the paper at the Participatory Design Conference 2020.

Table 5.2: A summary of each paper's theoretical grounding and contribution.

Paper	Theoretical grounding	Contribution
Paper 1	- generification work - managed communities - top-down/bottom-up - participation - digital platforms	The paper draws from the concept of generification work and specifically on the strategy of managed communities. We describe how managed communities can be utilised to scale participation in a large-scale software project. Furthermore, we contribute to the theoretical body by proposing managed communities to scale participation in a bottom-up manner and complement the original work of Pollock et al. (2007)
Paper 2	- collaboration - cooperative work - sociotechnical systems	The literature review focuses on patient self-monitoring and self-reporting systems and the related challenges. It contributes to the body of literature by identifying and describing four sociotechnical challenges: (i) social, (ii) legal, (iii) cultural, and (iv) motivational.
Paper 3	- care at a distance - fitting - proximity and distance - ANT	In this paper, we describe the work of mental health home treatment and coin a new concept to describe the interplay and ambiguity of proximity and distance, which we observed during the ethnographic fieldwork. We contribute by describing the concept of Becoming a Guest, where the key is to find the right configuration of proximity and distance, also with the help of technology.
Paper 4	- fluidity - ANT - digital platforms - boundary resources	Our paper presents the case of WT in Trondheim municipality and follows the vendor and its digital platform in this context. The findings present the platform and its surroundings and focus on moments of fluidity. We contribute to the IS literature on digital platforms by demonstrating how new insights can be gained when analysing a platform in fluid space.

5.2.2 Paper 2 - Sociotechnical Challenges of eHealth Technology for Patient Self-Management: A Systematic Review

In this systematic literature review, I identified sociotechnical challenges of eHealth technology for patient self-management, including remote patient monitoring systems. The literature review was designed and carried out as part of a PhD course on research methodology and followed the systematic review recommendation of Cruzes and Dyba (2011).

A review on eHealth technology for patient self-management was selected due to its implications for collaborative work, providing insights for my research project. From initially 443 records, 18 papers were included in this review and analysed. The findings are grouped and discussed in the four themes of social, motivational, legal and cultural challenges. The discussion also includes the collaborative nature of these systems.

Contribution: I wrote the complete paper. As part of the coursework, I incorporated feedback I have received. I presented the paper at the International Conference on Health Informatics 2021.

5.2.3 Paper 3 - Becoming a Guest: On Proximity and Distance in Mental Health Home Treatment

The paper describes mental health home treatment (HT), a service where patients with severe mental illnesses are visited by a multi-professional psychiatric care team at their homes. Empirically, this paper provides an in-depth account of the work of two HT teams in different settings (rural/metropolitan). The fieldwork followed an ethnographic approach by conducting go-along (Kusenbach, 2003).

Theoretically, we found inspiration from Pols (2012) and her work on *warm hands/cold technologies*. She argues that this opposition does not lead to a fruitful analysis and proposes the concept of *fitting* instead. Fitting is the process of finding the right mixture of technology and personal care, leading to what the patients then perceive as good care.

Our findings are discussed with the help of three themes: (i) closeness and familiarity, (ii) bridging the distance, and (iii) tensions of proximity and distance. Together they contribute to the concept of Becoming a Guest, which describes the ambiguity of proximity and distance.

Contribution: The idea of finding inspiration from Pols (2012) came from my

supervisor Eric Monteiro. We discussed the theoretical background and concepts throughout the writing process and worked together on some parts of the paper. I wrote the majority of the paper; Julian Schwarz outlined mental health home treatment in section 3.1 and suggested conducting go-alongs for data collection. Felix Mühlensiepen and I had in-depth discussions when he was a visiting researcher at my university. All authors contributed with comments and discussions throughout the whole process.

5.2.4   Paper 4 - Platforms and Fluidity: An Excursion into Fluid Space

This paper draws on two streams of literature. Empirically, we set the focus on digital platforms (Tiwana, 2014) and boundary resources (Ghazawneh & Henfridsson, 2013). Theoretically, our analysis is guided by the actor-network theory (Latour, 2007). However, we argue that following objects in network space only falls short. In network space, objects are described as a network of relations, and boundaries between them remain discrete (Law & Singleton, 2005). To overcome this limitation, we seek inspiration from the concept of fluidity (de Laet & Mol, 2000) and describe the digital platform in fluid space (Law, 2002).

The findings presented in this paper are based on the complete data collected on case 1, including interviews, observations and documents. Our analysis describes the shaping of the platform and its moments of fluidity. The discussion leads back to our study aim of how fluidity can help us to recognise aspects of platforms that have not yet been discussed in the IS platform literature.

To be submitted to an international IS journal. The paper will be submitted shortly after strengthening the theoretical lens and restructuring the empirical findings accordingly.

Contribution: A discussion with my supervisor Eric Monteiro about my early data analysis led to the initial conceptual idea of fluidity. I wrote the first complete version of the paper, and my co-author Alexander M. Kempton contributed by revising it and together, we completed the paper.

Chapter 6

Implications

The aim of this thesis is *to investigate the shift of healthcare services into the user's home by means of technology*, which can be broken down into two research questions presented in the introduction. In this chapter, I describe the implications for theory, methodology and practice in relation to the theoretical approach described in Chapter 2. Finally, I outline how I answered the two research questions.

The thesis investigates how systems supporting remote care are shaped across different contexts and how care at a distance is realised with the help of technology. At the beginning of the PhD project, I laid the foundation for further exploration of this topic by conducting a systematic literature review (Hochwarter, 2021). Although this was early in the process and before fundamental conceptual work, the review helped me to identify what are considered the challenges of remote care systems. One theme that accompanied me throughout the thesis was the heterogeneous and dynamic environment these systems operate in and the complexity that is entailed when moving healthcare services into homes. I chose a broad and interdisciplinary approach to investigate the phenomenon further and incorporate different perspectives. In the following, I demonstrate how the theoretical, methodological and practical implications together form a coherent picture.

6.1   Theoretical implications

The theoretical implications mainly consist of two themes. First, the study introduces a conceptual model for the growing ambiguity of proximity and distance that the move of healthcare services into homes entails. I approached this theme

with a computer-supported cooperative work (CSCW) perspective on collaborative work practices. Second, the new models of care blur existing boundaries and artefacts need to adjust to this changing environment. Digital platforms providing welfare technology (WT) services are one example, and I explore how fluidity complements existing information systems (IS) concepts of digital platforms.

6.1.1   On proximity and distance

Healthcare work is characterised by a complex and heterogenous environment, including different service sectors and multi-disciplinary teams. Collaborations across disciplines or with service users are essential to providing care to patients (Fitzpatrick & Ellingsen, 2013). The field of CSCW is a particularly good fit to investigate the collaborative nature of work (Schmidt & Bannon, 1992), and healthcare work has been a prominent empirical domain in CSCW. The thesis contributes to this body of knowledge in two ways.

First, we expand the empirical base of healthcare studies in CSCW by introducing an account of the work of mental health home treatment (HT). While scholars in CSCW have published work on mental healthcare, there is an absence of studies that go beyond a specific intervention or design proposition and generally miss the opportunity to describe work practices in-depth. Yet, one of the claims of CSCW is the importance of a good understanding of the nature of collaborative work practices, often formed by in-depth ethnographic accounts (Schmidt & Bannon, 2013). With our ethnographic study of mental health home treatment, we provide an account of cooperative work where we can witness a close interaction between healthcare workers and patients.

Hence, by introducing HT to the field of CSCW, we provide a ground for further investigations of related concepts, such as those introduced in Chapter 2. For instance, mobility work (Bardram & Bossen, 2005) represents a challenge for the coordination and awareness of distributed teams such as the HT teams. Distributed teams, as we have observed, make an extra effort to document and share their knowledge with their coworkers, even if this entails workarounds. Furthermore, a common shared understanding (Bannon & Bødker, 1997) for healthcare workers is a key part when visiting patients in their homes. These activities often do not happen in the familiar surroundings of a hospital but on the move.

Second, based on our in-depth account of mental health home treatment, we conceptualise the move of healthcare work into the home by discussing its implied

proximity and distance. We describe the interplay of actors and the ambiguity of closeness and remoteness in our concept of *becoming a guest*. As inspiration served the description of the false dichotomy of cold technologies and warm hands: 'Good care requires warmth and coldness, knowledge and empathy, but carers need to mix them in quantities that fit the particular and temporary situation of individual patients' (Pols, 2012, p. 37). Pols describes this in more detail by the notion of 'fitting', which was a guiding lens for our analysis. 'Fitting is a relational activity, a way of interacting rather than an effect of machines. Users and devices have to continuously establish what may fit where' (Pols, 2012, p. 39). Furthermore, our conceptual work was inspired by the etymological origin of the word *guest*. It entails the obligation for hospitality but also carries the meaning of stranger. *Becoming a guest* describes the ambiguity about closeness and remoteness in constructing familiarity with strangers, where technology can sustain the configuration of proximity and distance. Our concept describes the relational process of finding the right mixture of proximity and distance.

This case can also be analysed by refuting the dichotomy of proximity and distance. Paper 3 has demonstrated that HT can successfully bridge the distance and provide good care for patients with severe mental health crises. As described in Chapter 4, HT in Germany is implemented as inpatient-equivalent home treatment (IEHT). This entails, as the name suggests, inpatient-equivalent treatment with all procedures, routines and standards connected to a similar treatment in the hospital: 'Inpatient-equivalent home treatment includes psychiatric treatment in the home environment by mobile, physician-led, multi-professional treatment teams. It corresponds in terms of content as well as flexibility and complexity to inpatient treatment' (translated, Bundesministerum der Justiz Deutschland, 2022, § 39/1 SGB V). This description of HT in the German law text resembles immutable mobiles' characteristics. While they move spatially in Euclidian space, immutable mobiles remain stable and keep their relational network. Seen from this perspective, the dichotomy of proximity and distance breaks down. The patient is clearly part of this actor network, and by law, the HT teams keep the relational *closeness* to their patients that psychiatric treatment requires. The routines and standards of inpatient treatment stay the same, including at least daily visits by multi-professional teams. At the same time, there is also spatial *distance*, as the patients stay at home during therapy and the patients generally appreciate this distance. However, we can also see instances when the network is disturbed, and

parts are missing, for instance, when the HT teams fail to access the patient record whilst out for visits. Or, when they use electronic health record (EHR) systems that have inscribed inpatient treatment standards, such as that patients need to be assigned to a hospital bed so that they can be accounted for. In both examples, the HT teams find a workaround and manage to keep the network intact. By refuting the dichotomy of proximity and distance, we can argue that HT works because it includes both proximity and distance and does not treat them as separate and opposed (Farjoun, 2010).

Moreover, the *use* of technology is often seen as a way to reduce complexity and connect spatially dispersed teams. However, it is in the interrelation of users and technologies where we can observe the impact of technology in practice: 'These activities are closely coupled: the coordination of activities is achieved *through* the accumulation of inscriptions, and vice versa' (Berg, 1999, p. 387). In our conceptualisation of proximity and distance in HT, the distance between the visits was also mitigated with technology mimicking proximity. Regarding the role of technology, we agree with Berg (1999) in that technologies do not facilitate action but that they alter it in the interrelation between the user's and artefact's activity: 'A form of embodied expertise emerges *in unison* with the artifacts' activities [...] They [the nurses] become experts in aligning with the often surprising and unplanned features of the tools.' (Berg, 1999, p. 384). In line with this view, our work describes the nuances of the interplay of the different actors.

6.1.2   On digital platforms and fluidity

Digital platforms have been a central theme in IS in the recent years (Constantinides et al., 2018). In a heterogenous context such as the healthcare sector, platforms provide a way to connect various actors and disseminate services (e.g. Aanestad et al., 2019; Farshchian & Thomassen, 2019). Our analysis in paper 4 describes such a platform. We follow the guiding lens of the actor-network theory (ANT) as outlined in chapter 2, but we argue that describing the digital platform and its environment in network space falls short. These descriptions draw on networks of relations, sets of objects and the relations between them (Law, 2002). However, the shaping of the platform of our study requires an account beyond discrete parts and their relations (Law & Singleton, 2005). For this, we turn to fluidity (de Laet & Mol, 2000) and explore the platform in fluid space (Law, 2002). This allows accounting for the blurred boundaries, the entanglement and the messi-

ness of platforms and their ecosystems. We demonstrate how the platform and the surrounding are mutually shaped. Digital Health Company (DHC) eventually implemented a thriving platform because aspects of it are fluid.

We contribute to the IS literature by proposing a mindset beyond the stable core and variable complementary architecture (Baldwin & Woodard, 2009) to discover or explain phenomena that were elusive in network space. Furthermore, we supplement the description of platform architecture by providing a new perspective on the division of a platform into core and periphery (Ghazawneh & Henfridsson, 2013). By establishing the concepts of securing and resourcing, Ghazawneh and Henfridsson focuses on the platform owner. A complementary view is offered by Aanestad et al. (2019) with the periphery viewpoint. In our study, we reject a strict division and attribution of distinct values to core and periphery and investigate the platform in use with mobile boundaries (Law, 2002).

Again, we can approach this discussion by opposing a dichotomy by investigating the evolution of the platform and its use. Stability is commonly attributed to the core of a platform, while flexibility and openness are parts of the periphery. However, we see them rather in a 'contradictory and complementary relationship of stability and change' (Farjoun, 2010, p. 215). As we have demonstrated in paper 4, change in the platform's core contributes to stability, for instance, by adding new functionalities to address the needs emerging during an unforeseen event. Furthermore, boundaries that are introduced by the company to support the stability of the platform are gradient and, in some instances, even promoting change.

While parts of the platform and its environment in this endeavour can sometimes look sloppy, these unclear boundaries allow for adjustments to a fluid environment, i.e. a dynamic context. This is the case for the platform providing WT services, as users change in many aspects over time, or projects with rippling/side effects get introduced in parallel. Hence, we argue that technology as part of supporting care at a distance needs to be fluid *enough* so they don't collapse in this dynamic surrounding (Mol & Law, 1994).

These platforms and platform ecosystems are not acting in isolation. The analysis has focused on one platform ecosystem, including one of its main customers. This description includes many elements, as described above and in paper 4. We can also take a different perspective by closing the *black box* of a digital platform and treating it as a single actor. This allows us to see how platform ecosys-

tems work together or compete. We can do this by following the methodology of
ANT and translations. Similarly to not distinguishing a priori between human and
non-human actors, it allows us not to distinguish beforehand between micro and
macro actors (Callon & Latour, 1981). In our analysis of paper 4, we give a first
glimpse of how this can unfold. In parallel to the introduction of new WT services
in Trondheim municipality (TM), there is a large project of political significance
taking place, introducing a new EHR system integrated across municipalities. This
causes notable delays as resources are drawn away, but more interestingly, it also
leads to uncertainty. This arises because of unclear boundaries of the new EHR sys-
tem, supporting the integration of WT, but also because they manage to spread
their network and promises across almost the entire municipality's health services
and thereby dissociate associations made by DHC. Currently, the new EHR project
faces many challenges on its own, so it is unclear how it will end: 'Who will *win in
the end?* The one who is able to stabilize a particular state of power relations by
associating the largest number of irreversibly linked elements' (Callon and Latour,
1981, p. 293).

6.2   Methodological implications

Paper 1 of the thesis has methodological implications for the field of participatory
design (PD) (Hochwarter & Farshchian, 2020). In this paper, we address the topic
of participation in large-scale PD projects. Within the field of PD, this issue is an
ongoing debate (Robertson & Simonsen, 2013). There are voices arguing for a
more pragmatic approach to stay relevant and not to diminish by loosening the
political stance (e.g. Kyng, 2010). On the other hand, PD also runs the danger
of disappearing when the political dimension is sidelined (Wagner, 2018). In our
paper, we investigate a strategy for scaling participation and propose a way to
democratise this process, i.e. support genuine participation.

For this, we turn our attention to a strategy used in enterprise system devel-
opment. The term *generification work* describes a number of strategies followed
by companies implementing large-scale systems for diverse contexts (Pollock et
al., 2007). These strategies describe how companies design for large and het-
erogeneous groups across different contexts: 'Rather than focus on the effort of
"localisation" and thus highlight the already well-researched "collision" of system
and setting, we seek to examine the much less investigated and poorly under-

stood process through which systems are designed to work across many contexts'
(Pollock et al., 2007, p. 255). We have seen similar efforts in case 1, where DHC
organises yearly user conferences. During these conferences, the company collects
feedback from their customers, presenting how they adapted the platform locally.
This strategy is described as managed communities, where it

> is through establishing and engaging with the users primarily through
> such a forum that suppliers are able to *shape* these communities and
> to extend the process of generification. In other words, through parti-
> cipating in community environments, such as the user-group meetings
> and requirement prototyping sessions, individual organizations were
> often dislodged from attachments to particular needs. (Pollock et al.,
> 2007, 261f)

However, genuine participation is not only about *having a voice* but about
having a say (Robertson & Simonsen, 2013). Consequently, the power relations of
this strategy need to be adjusted to fit within the politics of PD.

We propose the strategy of managed communities as one possible strategy for
PD to address the challenges associated with large-scale projects by following a
bottom-up approach and giving more power to the (local) communities. Our con-
tribution is two-fold. On the one hand, we add to the literature on generification
work and generic enterprise software. We are not the first ones arguing for an
open and collaborative generification process (e.g. Gizaw et al., 2017), but our
focus is specifically on the concept of managed communities. On the other hand,
we take part in the ongoing debate on how to scale up PD and propose concrete
steps on how to democratise the strategy of managed communities.

6.3   Implications for practice

While this study's implications are mainly theoretical and methodological, we can
also derive implications for practice.

A theme that stretches over the entire study is the complex and dynamic en-
vironment in which these systems need to operate. Yet, the users of these systems
should have a say in the design that changes their (work) routines. Hence, a first
contribution to the design is the exploration of participatory design in large-scale
software projects (Hochwarter & Farshchian, 2020). We argue for a democratic

approach to design systems at large and have demonstrated one way forward. For this, we sought advice from a strategy applied by large-scale enterprise systems and adapted it for conducting a PD project. Companies that already use similar strategies can modify them to allow for participation in the design of their systems.

Further, we have described the evolution of a thriving platform in remote care (Hochwarter & Kempton, 2022). It is essential to stay receptive to the environment the system operates in. Strictly sticking to architectural or managerial principles might lead to missed opportunities and the shaping of a system that does not fit the environment. This recommendation is precious in the beginning when the establishment of the core is in the centre. Hence, we advise a design of systems with built-in flexibility and a balanced take on architectural principles and contextual adjustments.

Finally, we can draw on our deep empirical insights and their analysis of mental health home treatment (Hochwarter et al., in press). We have seen that the service user's trajectory strongly informs the therapy. Hence, when moving care into homes, healthcare workers need access to the relevant information at the hospital and when visiting the patients. In our case, that meant supporting spatially and temporally distributed teams, which are excellent multi-taskers from necessity. They drive, navigate, coordinate visits, schedule appointments, are data analysts, prepare medication dispensers, are aware of their surroundings, and are ready to provide the highly intellectual work of psychiatric care within a moment. What is striking, though, is the fissure between the vivid visits to the patient's homes and the plain documentation between the visits. This calls for systems supporting the healthcare worker not only with the data they need but also by providing a presentation of these data that support them contextually for their current tasks.

6.4   Summary

In the conclusion of this chapter, I present how the above-outlined contributions answer the two research questions of the study.

6.4.1   How are systems that support remote care shaped for their users across different contexts?

Research question 1 focuses on how systems supporting remote care are shaped across different contexts. Systems finding application in remote care are part of the

larger group of welfare technologies (Moser, 2019), internationally better known under the term telecare systems. These systems hold many promises and expectations on different levels. The service users are promised that they can live independently in their homes for longer without sacrificing safety. Furthermore, remote patient monitoring has been advertised to improve the treatment of chronic diseases such as heart failure and reduce the rate of rehospitalisation (Hofmann, 2013). Healthcare providers expect the adoption of telecare systems to free up their workforces and increase the efficiency of treatments (Aaen, 2019). Politically, telecare systems are considered a key part of solving the socio-demographic challenges of population ageing and the demographic transition. These promises manifest in government policies and initiatives, as presented in case 1 (International Telecommunications Union, 2021; Trondheim Kommune, 2020).

However seductive the promises of telecare may be, we should not fall into technological determinism when placing technology in complex environments such as the health sector:

> Rather than promises that technologies will, by their sheer installation, 'fix' something, there is a need for more modest accounts of technologies in practices, details about ways in which technologies are working, who is using them and what goals are brought into being. We need articulations of the experimental care practices and their strategies of the early taming and unleashing of innovative technologies. (Pols & Willems, 2011, p. 496)

In both cases of this thesis, we provide an account of technologies in practice at the early stage of domestication. While it is undoubtedly important not to be blinded by the promises of technical innovations, technology is not shaped merely by its social environment. This would neglect the transformative role of technology, and an account of this sort would yet again fall short (Williams & Edge, 1996).

Hence, to describe the shaping of telecare systems and to provide a 'modest account', we need to be receptive to the interrelation of technology and practice. A way forward is to dismiss a priori assumptions about the human and non-human actors and focus on the network of relations (Latour, 2007). Furthermore, this allows capturing the dynamics of a heterogenous environment and its inscription in technology (Monteiro & Hanseth, 1996). This was a guiding and overarching

lens for the contributions presented in this thesis, which is also reflected in the methodology and theoretical framework.

To summarise, I answer the research question of how systems that support remote care are shaped for their users across different contexts by (i) providing an account of a digital platform used for remote patient monitoring and its surrounding, (ii) adapting and conceptualising the top-down approach of user configuration for a democratic design process, and (iii) by showing how digital platforms are shaped in fluid space.

6.4.2   How is care at a distance realised, and what role does technology play in this?

Research question 2 investigates what care at a distance entails and how technology contributes to this. To answer this question, I turn to case 2 and mental health home treatment (Hochwarter et al., in press). We have outlined that the shift of care activities opens up a new set of problems, especially relevant for the field of CSCW. The existing temporal, spatial and personal boundaries are blurred, and established structures are rearranged. Our ethnographic account describes in detail how care at a distance is realised by the example of HT, and we outline rising tensions. The conceptual model we introduce can help to approach similar cases.

Furthermore, technology plays a central part in both cases. We have analysed this specifically in case 1, where technology comes into the foreground in delivering care at a distance. The study of technology in fluid space is, too, a study of mixtures (Mol & Law, 1994). In our paper (Hochwarter & Kempton, 2022), the role of technology when establishing welfare technology services at Trondheim municipality is a central aspect. Yet, when our informants speak about WT, they hardly ever emphasise the technical details or innovativeness of WT. They focus on what these systems (or services) afford: providing the right care to their citizens. Trondheim municipality has a wide range of care services for its citizen, and WT is in the process of becoming an established part. It is not considered an isolated solution that solves challenges just by introducing new technology. Instead, it is improving and complementing the existing service of the municipality: 'It sounds like we're just giving out a lot of technology, and then we sit around and drink coffee. But it's about giving the right help early on' (Interview Trondheim municipality).

In summary, I answer the research question of how care at a distance is realised

and the role of technology by (i) providing an in-depth ethnographic account of mental health home treatment and its artefacts, (ii) coining the concept of *becoming a guest* which describes the ambiguity of proximity and distance as a crucial part for providing good care at a distance, and (iii) a discussion of the role of technology in practice when implementing services that provide care at a distance with means of technology.

Chapter 7

Concluding remarks

This thesis aimed to investigate the shift of healthcare services into the user's home by means of technology. The phenomenon of (professional) care at home has not emerged with digitalisation but has existed for a long time, motivated by different reasons. For instance, the beginnings of mental health home treatment can still today be observed in the Belgian city of Geel, where for more than 700 years, people with mental disorders have been cared for in private homes (Johnson, 2013). However, digitalisation added to the phenomenon by providing new ways of organising and carrying out care at home. The first instance of telecare was simultaneously the first phone call in history when Alexander Graham Bell called for his assistant: 'Mr. Watson, come here, I want you' (Aronson, 1977). Watson, listening in, came to provide medical assistance for Bell, who spilt battery acid over his clothes. Since this first encounter with telecare, care at a distance has evolved in parallel with the invention of new technologies and is motivated by solving health and socio-economic challenges.

My goal with this thesis was to contribute to the scientific body of knowledge in the area of telecare by following two contemporary cases that could shed light on different aspects of care at home. The thesis was guided by a sociotechnical approach which, in my opinion, fits to describe a phenomenon intertwined in many parts of society and technology. One strength of the thesis lies within its broad theoretical approach, with which I tried to answer the two research questions. Furthermore, the empirical insights and, specifically, the detailed ethnographic account vividly described the shift in healthcare services. Hence, the thesis contributed both empirically and theoretically by answering the two research questions presented in the introduction.

7.1   Limitations and future work

A PhD thesis is limited by time, and I conducted the thesis over four years, which included teaching duties. This is mainly reflected in the data I was able to collect. Data collection in a qualitative case study also requires good access to the field, which was challenging from time to time due to a few reasons. First, gaining access to case 1 was partially time-consuming and delayed the actual data collection. Second, most of the thesis was carried out during the COVID-19 pandemic. Hence access to the field was not possible for large parts of the thesis. Finally, identifying a suitable case and adjusting the study design accordingly is a process that requires constant attention and follow-up.

Accordingly, the data collection is a limitation that many PhD thesis face. Additional empirical insights would have improved the thesis in both depth and breadth. However, I tried to balance these limitations by selecting two cases from different healthcare domains, adding to the breadth of the study. Furthermore, I tried to account for depth in each case by collecting many empirical insights with different methods.

As with many interpretive studies, the empirical insights could be supplemented by exploring other settings. Although this study included two cases, the contributions are empirically based on two study settings, each with a limited scope. Case 1 describes the unfolding of welfare technology (WT) in *one* municipality and provides insight from *one* supplier WT. We have seen that WT includes many different services, and implementation varies in numerous healthcare settings. Case 2 follows two mental health home treatment (HT) teams in Germany. As discussed, HT also exists in other countries with some differences in how these services are designed. Hence, this can be seen as one limitation, and studies in other healthcare settings can supplement our findings. As the Norwegian welfare technology programme has been extended, plenty of opportunities exist to observe the introduction of new WT services. Similarly, mental health home treatment is growing in Germany, and more hospitals are introducing HT as a new service.

Furthermore, the study focuses on two research questions, but there are more nuances to moving healthcare services into homes. I encountered interesting themes during the PhD thesis, but they could not all be included in the study as time was limited. First, to supplement the study's findings, I propose to study similar healthcare settings or widen the scope of the study. For instance, connecting to paper 4, the alignment of competing platform ecosystems in healthcare

would provide an interesting starting point for further investigations. Second, one could investigate the sociotechnical implications of the trend towards quantifying healthcare with, for instance, wearables (Monteiro et al., 2018). Finally, the resurgence of artificial intelligence (AI) is also apparent in telecare, where accountability is specifically pronounced. Future research can connect here to open the *black box* of AI for its users (Terry et al., 2022; Vassilakopoulou et al., 2017). I believe these themes would provide a good ground for future work and contribute to a better understanding of the implications of moving healthcare services into homes.

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Paper I

Hochwarter, S., & Farshchian, B. A. (2020). Scaling Participation - What Does the Concept of Managed Communities Offer for Participatory Design? *Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise, 2,* 50–54.

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Paper II

Hochwarter, S. (2021). Sociotechnical Challenges of eHealth Technology for Patient Self-management: A Systematic Review: *Proceedings of the 14th International Joint Conference on Biomedical Engineering Systems and Technologies - (Volume 5)*, 394–400.

Sociotechnical Challenges of eHealth Technology for Patient Self-Management: A Systematic Review

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Abstract: Ageing of society and increase of time spent with chronic conditions challenge the traditional long-term care model. Assistive technology and eHealth are seen to play an important role when addressing these challenges. One prominent example are patient self-management systems. These systems not only transform the way patients with chronic conditions interact with the healthcare system, but also change work practices of care providers. This literature review addresses sociotechnical challenges of eHealth technologies with a strong collaborative component. As a result, four themes are identified and discussed.

1 INTRODUCTION

Population projections indicate a worldwide population ageing, with high-income countries leading the list [UN, 2017]. This poses a challenge for the delivery of healthcare services, both at a societal and economic dimension. The financial crisis in Europe (European debt crisis) since 2009 and the population ageing forces the countries to rethink their long-term care (LTC) policies [Swartz, 2013]. The rise of life expectancy comes in hand with the increase of disability-adjusted life years (DALYs), whereas non-communicable diseases are leading the list [OECD, 2017]. A shift in primary care for patients with chronic illnesses to address this demographic change is proposed and the use of technology is seen as a powerful mean [Bodenheimer et al., 2002a, Bodenheimer et al., 2002b].

Welfare Technology (WT), or assistive technology as commonly known outside Scandinavia, is one prominent example of such technology in (primary) healthcare[1]. The aim of WT is to increase the life quality and independence of people with physical, psychological or social impairments [Departementenes servicesenter, Informasjonsforvaltning, 2011]. The landscape of WT consists of a wide range of different technologies, such as sensors,

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[1]In this paper we stick to term Welfare Technology to avoid ambiguity.

Internet of Things (IoT) or GPS. Even though WT often introduces and relies on innovative technical solutions, previous research in the field of WT states that challenges are only 20 % of technical and 80 % of organizational nature [Helsedirektoratet, 2012]. Hence, the introduction of WT and in turn the digital transformation of healthcare raises challenges of sociotechnical nature. This has also an effect on the work of care providers and the communication and collaboration with their patients [Meskó et al., 2017].

WT involves numerous types of actors which are highly heterogeneous. Platforms are seen as an intermediate between the use of ICT and societal outcomes. They also support communication across the different users of the platform, each with their own, often very specific, requirements to the system. When designing such a platform, the values and needs of these different actors need to be carefully considered and taken into account [Ann Majchrzak et al., 2016]. The platformization can also lead to a disruption of existing channels for communication between the participating actors of the platform. This can result to uncertainty about where to find information or who is responsible when new information occurs.

The digital transformation also affects the work practices of care providers. In some cases this could also mean the need to perform additional or different work than before the introduction of e.g. WT solutions. New skills are developed by both the care providers and receivers and different forms of communication challenge the traditional form of

care [Grisot et al., 2018].

These challenges are common themes within the field of Computer-Supported Cooperative Work (CSCW). The umbrella term CSCW was coined in 1984 during a workshop by Irene Greif and Paul M. Cashman. The terms used to describe this field were not strictly defined, also to allow broader discussions and invite researchers from various fields to participate. Schmidt and Bannon made an effort to describe those terms in more detail, looking at the meaning of CS ("computer-supported") and CW ("cooperative work"). They argue that one first needs to understand the underlying mechanisms and nature of cooperative work in order to design computer systems that support cooperative work [Schmidt and Bannon, 1992]. Two prominent challenges in the field of CSCW are common themes when implementing welfare technology that changes the "traditional" way of working in healthcare, namely the challenge of *disparity in work and benefit* and *disruption of social processes* [Grudin, 1994].

The aim of this study to investigate sociotechnical challenges of eHealth technology with a focus on its collaborative nature. Welfare technology poses new challenges to the healthcare system and the way work is organized around the patient, similar to the challenges described in CSCW literature, as stated above. This is especially visible for patient self-monitoring and reporting, as it creates new ways of communication and challenges the traditional division of work of care providers and receivers.

2 METHODS

As the eHealth landscape is rapidly changing, and new eHealth solutions and national strategies arise under the umbrella of welfare technology, there is the need for an updated review on the current challenges and opportunities. Even though there have been some systematic literature reviews identified (see for example [Vassli and Farshchian, 2018]), no review was found to understand the collaborative nature of this emerging, and indeed cooperative technology. Hence, concepts were chosen in accordance with the theme, choosing examples of welfare technology that have a high degree of collaboration.

A systematic literature review was conducted in five steps to investigate the study objective to investigate *the sociotechnical challenges of eHealth technology for patient self-management*. The review was designed according to Cruzes and Dyba [Cruzes and Dyba, 2011]. In a first step a first unstructured search to explore the field and get an understanding of com-

mon terms and phrases in this field was conducted. Following, the objective was split up into three concepts, and for each concept similar terms were identifies (see Table 1).

Table 1: Mapping the objective to concepts.

Concept 1	Concept 2	Concept 3
motivation	welfare technology	self-monitoring
pitfalls	ehealth	patient reporting
challenges	mhealth	remote monitoring
	telemedicine	self-management

Based on these concepts, papers for review were identified searching the Scopus database. Scopus was selected as a primary source as it also includes records from the MEDLINE and EMBASE databases. A complete search history including the number of found and accessible papers can be seen in table 3. Accessible papers were selected based on predefined inclusion and exclusion criteria (Table 2). In a next steps, duplicates where removed and an initial screening to assess if the paper is relevant to this objective by reading the title and abstract, and evaluating the journal type and research field. After reading the full-text version of the articles identified in the first screening, the final selection of articles for the literature review were selected (see figure 1).
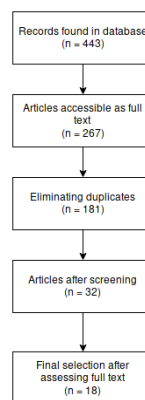
Figure 1: The study selection process.

Finally, the selected articles were analyzed and concepts were identified and mapped using the reference management system Zotero with the extension ZotFile to extract annotations.

Table 2: Inclusion and exclusion criteria.

original articles published in peer-reviewed journal
articles published in 2009 until 2019
written in English, German or a Scandinavian language
no study protocols

Table 3: The search history of the literature review.

Search	Found	Accessible
TITLE-ABS-KEY ("welfare technology" self-monitoring) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY ("welfare technology" patient reporting) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY ("welfare technology" remote monitoring) AND DOCTYPE (ar) AND PUBYEAR > 2008	1	0
TITLE-ABS-KEY ("welfare technology" self-management) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY ("welfare technology" motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	1	1
TITLE-ABS-KEY ("welfare technology" pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY ("welfare technology" challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	6	5
TITLE-ABS-KEY (ehealth AND self-monitoring AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	3	2
TITLE-ABS-KEY (ehealth AND self-monitoring AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (ehealth AND self-monitoring AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	11	8
TITLE-ABS-KEY (ehealth AND patient AND reporting AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	1	1
TITLE-ABS-KEY (ehealth AND patient AND reporting AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (ehealth AND patient AND reporting AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	8	4
TITLE-ABS-KEY (ehealth AND remote AND monitoring AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	2	0
TITLE-ABS-KEY (ehealth AND remote AND monitoring AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (ehealth AND remote AND monitoring AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	17	8
TITLE-ABS-KEY (ehealth AND self-management AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	14	8
TITLE-ABS-KEY (ehealth AND self-management AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (ehealth AND self-management AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	21	12
TITLE-ABS-KEY (mhealth AND self-monitoring AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	27	16
TITLE-ABS-KEY (mhealth AND self-monitoring AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (mhealth AND self-monitoring AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	11	6
TITLE-ABS-KEY (mhealth AND patient AND reporting AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	4	3
TITLE-ABS-KEY (mhealth AND patient AND reporting AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (mhealth AND patient AND reporting AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	13	11
TITLE-ABS-KEY (mhealth AND remote AND monitoring AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	3	1
TITLE-ABS-KEY (mhealth AND remote AND monitoring AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (mhealth AND remote AND monitoring AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	24	15
TITLE-ABS-KEY (mhealth AND self-management AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	19	10
TITLE-ABS-KEY (mhealth AND self-management AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	1	1
TITLE-ABS-KEY (mhealth AND self-management AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	35	22
TITLE-ABS-KEY (telemedicine AND self-monitoring AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	25	14
TITLE-ABS-KEY (telemedicine AND self-monitoring AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	1	1
TITLE-ABS-KEY (telemedicine AND self-monitoring AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	28	18
TITLE-ABS-KEY (telemedicine AND patient AND reporting AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	9	6
TITLE-ABS-KEY (telemedicine AND patient AND reporting AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (telemedicine AND patient AND reporting AND challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	23	13
TITLE-ABS-KEY (telemedicine AND remote AND monitoring AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	15	7
TITLE-ABS-KEY (telemedicine AND remote AND monitoring AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (telemedicine "remote monitoring" challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	31	13
TITLE-ABS-KEY (telemedicine AND self-management AND motivation) AND DOCTYPE (ar) AND PUBYEAR > 2008	49	32
TITLE-ABS-KEY (telemedicine AND self-management AND pitfalls) AND DOCTYPE (ar) AND PUBYEAR > 2008	0	0
TITLE-ABS-KEY (telemedicine "self-management" challenges) AND DOCTYPE (ar) AND PUBYEAR > 2008	40	29

3 RESULTS

Of the initial 443 records found, 18 articles were selected to be included in the literature review. From the 181 accessible articles without duplicates, 159 were excluded mainly because they were not addressing the defined study objective, they were purely focusing on the effect of interventions, or were study protocols for future studies.

Common themes related to the study objective were identified and mapped. The most common theme was related to social pitfalls, followed by motivational and legal challenges. Figure 2 visualizes the distribution of the themes. Table 4 describes the included papers, their subject of study and the themes identified.
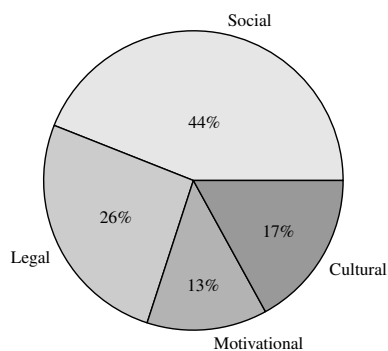

Figure 2: Identified themes related to study objective.

3.1 Social

Social challenges and pitfalls are the most common theme. The lack of social support for the patients when using self-management solutions is seen as a major challenge by many articles. Solutions are received as impersonal and complicated by the end-users [Rollo et al., 2016, Hoaas et al., 2016]. Missing personal contact with the care personnel and hence the absent of physical meetings are reported for long-term care of patients with chronic conditions. Adherence is suffering from this shortcomings [Hoaas et al., 2016, Moyano et al., 2019]. The lack of personal contact and personal support is the most mentioned challenge [Rollo et al., 2016, Hoaas et al., 2016, Rollo et al., 2016, Firet et al., 2019, Wake et al., 2016, Östlund et al., 2015]. Stand-alone interventions without personal support are reported to have low usage and acceptance, especially with the older population or minorities [Wake et al., 2016].

The role of relatives in a healthcare system that is designed around medical conditions rather than the patient's need is another factor for the use of self-management systems, and hence challenges the equitable use and distribution of these systems [Slettebø et al., 2018]. For children, the role of the parent and their education level is crucial for receiving and effectively using self-management solutions [Henkemans et al., 2018].

3.2 Legal

Several articles explicitly mention legal barriers for the use of welfare technology. The use of self-management systems challenges the responsibilities of the involved actors. This is reflected by the question of who is responsible in certain situations and how much trust one can put into reports generated by others through self-reporting systems [Legido-Quigley et al., 2014]. Further, the tension between following the minimum legal requirements and the additional care through digital health services challenges the work of care professionals [Slettebø et al., 2018]. Generally, the lack of a legal framework or the fragmentation of legal frameworks is considered an issue when care providers implement and use welfare technology solutions [Martin et al., 2012, Saner and van der Velde, 2016, Odnoletkova et al., 2016]. Finally, legal issues related to privacy, information security and the right to be forgotten hinder the diffusion of WT. These challenges are also linked to social pitfalls [Bossuyt et al., 2017, Odnoletkova et al., 2016].

3.3 Cultural

Cultural differences influence the usefulness of different features of eHealth solutions. Different requirements to the workflow and user interface are reported, based on different cultural background. Features that are of use in one region might not be of use in another region, or culture so to speak [Dhillon et al., 2016]. The role of cultural practices, language barriers, and the clash of different professional cultures are stated as inhibited factors. Resistance against the role of co-creators arises out of these factors. Further, poor eHealth literacy is mentioned as a common problem linked to the user's background [Rollo et al., 2016, Nilsen et al., 2016, Zibrik et al., 2015].

3.4 Motivational

Finally, pitfalls related to motivational factors were mentioned in three papers. The lack of motivation to use IT rather than poor IT skills is stated as a barrier

Table 4: Details of reviewed literature and identified themes.

Reference	Subject of study	Theme(s)
[Bossuyt et al., 2017]	disease management and monitoring for patients with inflammatory bowel disease	legal; social
[Dhillon et al., 2016]	patient-centered health management system	cultural
[Early et al., 2017]	IT-based self-management of COPD coupled with nurse-coach support	social; motivational
[Firet et al., 2019]	eHealth with pelvic floor muscle training to support self-management of stress urinary incontinence	social
[Henkemans et al., 2018]	pilot implementation of app for self-management	social
[Hoaas et al., 2016]	exercise training at home, telemonitoring and self-management, weekly videoconferencing sessions	social
[Legido-Quigley et al., 2014]	teleradiology across borders in the European Union	legal
[Martin et al., 2012]	adoption, readiness, and implementation of telemedicine in rural hospitals and primary care providers	legal
[Moyano et al., 2019]	perception and acceptability of text messaging intervention for diabetes care	social
[Nilsen et al., 2016]	case study of welfare technology describing resistance of implementation	cultural
[Odnoletkova et al., 2016]	perception of tele-coaching in type 2 diabetes	motivational; legal
[Rollo et al., 2016]	eHealth systems for supporting diabetes self-management	cultural; social
[Ross et al., 2018]	self-management program for people with type 2 diabetes	motivational
[Saner and van der Velde, 2016]	eHealth and telemedicine challenges and opportunities in cardiology services	legal
[Slettebø et al., 2018]	ethical challenges perceived by leaders of community health services for older people	legal; social
[Wake et al., 2016]	evaluation of national electronic personal health record and self-management platform for people with diabetes	social
[Zibrik et al., 2015]	uptake of eHealth for chronic disease self-management among immigrants and seniors	cultural
[Östlund et al., 2015]	design of welfare technology solutions and addressing the needs of its users - STS-inspired design	social

for patients [Early et al., 2017]. One paper mentions that the motivation of patients with chronic diseases is the biggest issue to overcome when implementing self-management systems. [Odnoletkova et al., 2016]. On the other side, lack of motivation is also reported for care providers who are unwilling to support the system by providing resources [Ross et al., 2018].

4 DISCUSSION

The objective of this paper was to investigate the sociotechnical challenges of eHealth technology for patient self-management. Particularly of interest was the collaborative nature of eHealth technology, hence systems for patient self-management were chosen as a good and timely case to investigate this objective.

The major theme found in this literature review, is the one of social pitfalls. When designing and implementing welfare technology that disrupts existing channels, it has strong social effects. Communication and personal contact between the care providers and patients are subject to change. The shift from care activities from a well-defined and known (at least for the healthcare professionals) environment affects the way care is delivered and experienced. The private homes of the patient play a central role and its perception changes. Also, the way cooperative work is done in the healthcare sector receives an additional component to the already manifold system. Finally, the importance of a peer-network (e.g. relatives, neighbors) is illustrated to ensure personal support. Informal caregivers gain more attention and importance in this setting.

The lack of a legal framework is also mentioned repeatedly as an obstacle to implement WT. In order to avoid additional work without compensation, or work where responsibilities are not clearly defined, a legal framework needs to be established. This also includes GDPR (General Data Protection Regulation) and clear reimbursement systems. Leading the way in the European north, Denmark has established a Digital Health Strategy and an eHealth reference architecture.

Further, it is essential to understand the users and actors involved. The actors can generally not be divided in homogenous groups, rather very heterogenous groups that have distinctive characteristics within the group. Elderly patients often have more than one disorder, and the management of comorbidity is in-turn very individual. This has also been underlined in articles reporting cultural challenges, and calls for a holistic approach that takes this diversity into account when designing WT systems.

Finally, another common theme is the one of motivational challenges. For the care-receivers, in the role of co-creators, motivation can stagnate for chronic conditions where they should self-report even in the absent of symptoms, and this in turn reminds the patients that they are living with a chronic disease. For care providers, on the other hand, poor motivation can be traced back to new work routines, new required skills, and lack of clearly established boundaries for their responsibilities (cf. legal challenges).

The importance of addressing challenges of collaboration can be seen throughout all four identified themes and their descriptions, although most common within the identified social challenges. The implications of moving care into the home have been addressed by many scholars in the field of CSCW. The lack of personal contact and personal support, as described in section 3.1, can be a consequence of moving care to a different setting. At home, the (invisible) work of relatives for healthcare plays a major role, while their work might not be recognized, or systems and workflows were not designed with them in mind. At the same time, power relations change when healthcare worker visit the patients physically at their homes. So moving care to a new environment challenges the traditional coordination of it [Fitzpatrick and Ellingsen, 2013].

These challenges have been discussed in detail in the field of CSCW, but it aims to go beyond barely describing the context at hand. It is a constructive research domain, it is design oriented and aims to implement better CSCW systems [Schmidt and Bannon, 1992]. To do so, one must first understand the domain that shall be changed - in our case the cooperative work systems to treat and manage long-term diseases. As Welfare Technology is a rather new umbrella term, which though attracts much attention, the identified challenges are of relevance for the design of new and improved solutions.

5 CONCLUSION

This paper focused on the sociotechnical challenges of eHealth technology, and it aims to support the understanding of the complex systems involved. Hence, it can not cover all the aspects that are relevant. The scope of this paper was on the system as a whole, including all actors involved and using self-monitoring or self-management systems as a proxy for systems with high collaborative nature. This is still a very broad perspective, and this makes it easy to miss important details. Future research is recommended to look at a specific group of actors (e.g. patients, policy-

makers, nurses), at a specific condition (e.g. asthma, dementia) or systems using technologies with unique characteristics (e.g. fall detectors, medicine dispensers). Further, I encourage researchers to become active and uncover what works and what doesn't by using for example action design research or participatory design.

This work has several limitations, mainly due to its scope. First, it uses strict inclusion and exclusion criteria. Only peer-reviewed journal articles are included. To have access to more recent and up-to-date findings, conference papers can further be of interest. Also, only one database was used to retrieve our articles (Scopus). Including other databases which cover a different audience would increase the range of covered topics and perspectives.

Finally, to fully understand this complex and fast-moving field, a different approach, such as a realist review, might bring up more insight into this field.

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Paper III

Hochwarter, S., Schwarz, J., Muehlensiepen, F., & Monteiro, E. (in press). Becoming a Guest: On Proximity and Distance in Mental Health Home Treatment. *Computer Supported Cooperative Work (CSCW)*.

Becoming a Guest: On Proximity and Distance in Mental Health Home Treatment

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Abstract. Mental health home treatment is a service where patients with severe mental illnesses are visited by a multiprofessional psychiatric care team at their homes. In Germany, inpatient-equivalent home treatment as a specialized form of home treatment has been offered by hospitals since 2018. In its early stage, the shift of care activities out of the hospital toward the patient's home opened up a new set of problems and blurred the existing boundaries. This ethnographic study follows two home treatment teams and provides an in-depth description of their work. The findings are presented by three themes from our data analysis: (i) closeness and familiarity; (ii) bridging the distance; and (iii) tensions of proximity and distance. We then discuss the findings with the guiding lens of *Becoming a Guest,* which refers to the ambiguity of proximity and distance. The contribution for computer-supported cooperative work (CSCW) is twofold; on the one hand, we provide a detailed account of mental health home treatment, and on the other hand, we outline a conceptual model that helps to describe and analyze similar cases. We conclude the paper with directions for further research.

1 Introduction

The health care activities of almost all disciplines have started to wander again. In the 18th century, the center of care and related activities, including research, increasingly shifted to the clinic (Foucault 1963). The birth of the clinic entailed not merely the reorganization of health care but, more decisively, a reorganization of medical knowledge and how it was created. After the French Revolution, there was a change of paradigm, away from merely classifying the disease and separating it from the patient; the symptoms were to be experienced with the patient, and the patient became a descriptive part of specifying the disease. 'This new structure is indicated […] by the minute but decisive change, whereby the question: "What is the matter with you?", with which the eighteenth-century dialogue between doctor and patient began […], was replaced by that other question: "Where does it hurt?", in which we recognize the operation of the clinic and the principle of its entire discourse' (Foucault 1963, p. xxi). The illness was freed from the strict nosology, which led to freed knowledge. Currently, we see a tendency in the opposite direction: moving care activities back into the patients' home, but with different means and objectives. At the same time, the structures of the clinic remain stiff and have trouble adapting. Through digitalization, proximity between patients and health care workers is mimicked, thus blurring the temporal, spatial and personal boundaries (Pols and Moser 2009).

Mental health home treatment (HT), a service where a home treatment team visits the patients in person, sheds light on the blurring of these boundaries. Moving mental health care into a different setting can result in rearrangements of established structures and herewith create new challenges, as Strauss et al. described in their study: 'When ideologies entailed more radical departures from conventional hospital organizations, however, alterations in professional roles and identities could be quite profound' (Strauss et al. 1981, p. 157). Our study was guided by the aim of understanding how health care workers carry out these temporal and spatial distributed care activities and what role the various actors/actants play in this endeavor. The general importance in health care of close interaction or proximity between health care workers and patients is especially pronounced in mental care. Mental health is thus a particularly fruitful setting to analyze the technologically mediated proximity, making the relative absence of CSCW attention to mental health unfortunate. Rather than a dichotomous separation of close vs. far, home vs. away and physical vs. digitally mediated, the challenge is rather to 'understand precisely how the digital can be real' (Boellstorff 2016, p. 388). Hence, another objective of this study is to provide an in-depth description of mental health home treatment and its use of digital and physical artifacts.

As the title of this article has already indicated, the overarching theme can be coined by the term *Guest* drawing on its etymological origin, where 'The guest (ghos-ti-)

in Indo-European times was the person with whom one had mutual obligations of hospitality. But he was also the stranger, and the stranger in an uncertain and warring tribal society may well be hostile; the Latin cognate hostis means "enemy"' (Watkins 2011, p. xxix). The theme of the guest, in our analysis, is used as a lens to highlight the ambiguous and conflictual meanings of proximity vs. distance in health worker-patient interactions. Our article's focal points in this two-way relationship are the mental health home treatment teams and how they become guests in the course of their work, i.e., balancing individual needs for proximity and distance in a reiterative mutual process.

2 Background and related work

In the past, CSCW has investigated the domain of health care and its various forms of work from different theoretical and empirical perspectives. While the domain of mental health was touched upon in CSCW, it does not have the same body of literature as home care or primary care settings. We start the literature review with the broader perspective of moving care into the homes, followed by previous work on mental health in CSCW, and finish with a theoretical framing and related concepts.

2.1 Moving care into the home

Moving care into the home changes how work in health care is carried out and poses new challenges to its coordination. Fitzpatrick and Ellingsen (2013) noted this in their review of CSCW studies in health care. Although they report mainly from research where information and communication technologies (ICT) were used to provide care at home (telehealth), we see many similarities when health care activities also move physically, i.e., in person but mediated by digitalization, into the homes of the users. In these studies, the patient and the health care worker become the *key participants* and the home becomes the *key site*. The themes addressed included the use of ICT for managing chronic care and the role of the space in the home. The latter might be negotiated, shared, and cooperation with family members is established. CSCW is a design-oriented discipline, and in contrast to institutional settings, a larger body of literature focuses on designing technologies for the home. Fitzpatrick and Ellingsen conclude their review with four suggestions to broaden the research; the second one calls 'to expand the "work practice" settings in which CSCW research is conducted, to follow the patient trajectory around the multiple settings in which their care is provided and to do this over more extended periods of time' (Fitzpatrick and Ellingsen 2013, p. 652). This recommendation aligns with Bratteteig's and Wagner's article from the same year. Based on their study of elderly people living independently in their homes, they recommend looking 'at homecare settings as a whole: at the web of different types of spaces, artifacts, work tasks, people and collaborative patterns that make up these

settings' (Bratteteig and Wagner 2013, p. 158). We agree with these points, and our study contributes insights into different settings and patient trajectories.

Although the focal point of our study is not primarily the patients' work at their homes, the numerous studies in CSCW and neighboring fields provide a fitting ground to explore our findings. Connecting to articulation work (Strauss 1985), illness work, everyday life work, and biographical work (Corbin and Strauss 1985), Bratteteig and Eide identify other forms of work that play a role when becoming a good homecare practitioner. Relevant for our study is the concept of *information work*. It is described as '[a]ll the work that a homecare worker does to gather, process and select information important for the actual work that day (that shift)' (Bratteteig and Eide 2017, p. 582). In their case, different information sources are consulted for the work, while the journal system itself is not available on the road.

Care activities at home are seen as more complex than those in a hospital setting. The manifestation of this increased complexity can be observed by the required awareness and articulation work to perform the home care work. A binder, situated at the patient's home and used by a health care worker, is a central artifact to support coordination. When different care providers are involved, the binder supports awareness across different actors. It facilitates communication both asynchronously and informally, often with the additional help of sticky notes (Petrakou 2007). The family can play an active part in care and its articulation work. As Christensen and Grönvall (2011) describe, the binder can be designed with the values and attitudes of family members, patients and care workers in mind and by doing so, avoiding possible tensions. Generally, the central role of coordination artifacts in analogous and digital forms was studied from different perspectives within CSCW (Amsha and Lewkowicz 2016; Bossen et al. 2013).

Moving health care activities into homes further challenges the design of systems that are used for coordinating or documenting care. In a participatory design project, Corry and Larsen identify four challenges for EHR systems in such an environment: personal relations, coordination between primary and secondary health sectors, preventive home measurements, and the distribution of information. They call for a flexible architecture that focuses not only on treatment or care but that can also be used for daily tasks around them (Corry et al. 2006). For an extensive overview of challenges when designing for home care, one can consult the book chapter by Grönvall and Lundberg. They conclude by emphasizing the importance of the environment and changing demographics (Grönvall and Lundberg 2014).

2.2   CSCW and mental health

Although mental health HT is not a new concept (see Section 3.1), a broader uptake and implementation started only recently. Hence, it is only natural that studies

investigating mental health outside the traditional setting focus on aspects other than receiving mental health treatment directly at home. In CSCW, we found that most work focused on three broad themes: social media, peer support/communities, and cultures or cultural influences. Many articles describe design opportunities, often for a specific mental illness or user group.

Studies focusing on mental health and social media are frequently carried out using a quantitative approach, finding different usage patterns of the targeted population. Park et al. found that 'depressed users have small [social media] networks' (Park et al. 2015). These findings are in line with a study on user patterns of an online LGBT community, which found that users 'who are less depressed are more deeply integrated into the social fabric of [the investigated social media platform]' (Homan et al. 2014). In addition to the predominant theme of social media and depression, although often very vaguely defined, other themes include eating disorders and self-harm. Chancellor et al. presented an algorithm to predict mental illness severity levels based on the use of social media. They collected data on Instagram, marked with the 'pro-eating disorder tags' (Chancellor et al. 2016). Feuston and Piper describe an alternative method to look at the social media data beyond purely classifying content. They complete data with interviews and digital ethnography and aptly state that '[t]he relationship between mental health and mental illness is thin, porous, and flexible, and not fully observable through behaviors on social media' (Feuston and Piper 2018, p. 17). On a conceptional level, Pater and Mynatt aim to set an agenda by introducing a theoretical framework and defining 'digital self-harm as the online communication and activity that leads to, supports, or exacerbates, non-suicidal yet intentional harm or impairment of an individual's physical wellbeing' (Pater and Mynatt 2017). A good example of a deeper analysis of social media and the role of these platforms for eating disorders can be read in an earlier work of the same authors (Pater et al. 2016). Another perspective on eating disorders and the use of social media is offered by Andalibi et al. They describe how social media and its community can support self-disclosure and 'engage in social exchange and storytelling about difficult experiences' (Andalibi et al. 2017).

Peer support in mental health has often been investigated to provide design opportunities for online communities. In the reviewed articles, peers, although not always explicitly referred to as such, are persons who formerly had or are recovering from mental illnesses who take the formal or informal role of a caregiver or adviser. O'Leary et al. identified in their qualitative study how technology can support care in the absence of traditional caregivers and how it could scale to be available for a larger population (O'Leary et al. 2017). By examining design interventions for trauma-related support, Brown and Choi focus on the role of 'trusted others' and present six categories for designers to support trusted others (Brown and Choi 2017). In their interesting, virtual ethnographic study on the

largest Chinese online forum for users with mental illnesses, Zhang et al. ask 'how online support groups are integrated into users' depression management practices and at the same time create new possibilities for individual empowerment and destigmatization' (Zhang et al. 2018). Their findings report many benefits, such as patient empowerment and reducing self-stigma.

The paper of Zhang et al. brings us to the next theme: the role of culture. Their first research question investigates the impact of Chinese culture on online support groups in mental health. In their findings, they describe the strong impact culture has on how mental health is perceived by patients, care providers, and society. For instance, the relation to the online support group is intimate, often providing a place for communication without threatening the family's 'face' (Zhang et al. 2018). These findings are in line with the case study of Li et al. on a Chinese online community for people with depression. Additionally, they provide social media design opportunities based on their findings (Li et al. 2016). Using social media as a lens, De Choudhury et al. present the differences in shared social media content in relation to gender and cultural norms (De Choudhury et al. 2017). Another study on social media and depression (Homan et al. 2014) focuses on a youth LGBT community. The study highlights how to address a possibly hard-to-reach population with the help of social media.

There are certainly more articles on mental health in CSCW and even more in neighboring fields such as human-computer interaction (HCI) or information systems (IS). A review of mental health in CSCW and HCI can be found in the article by Ertl et al., which by itself is worth reading and addresses the timely and important topic of refugees' mental health (Ertl et al. 2020). What we did not find, however, were articles on mental health home treatment. Additionally, most of the articles we found focused on a specific intervention or design, reporting primarily on the patients' perspective. There was generally a lack of depth on the nature of work in mental health care. Our study aims to fill this gap, at least partially.

2.3   Theoretical framing and related concepts

Coordinating the work of multiprofessional teams, distributed over time and space and addressing the needs of different patients can be an overwhelming and complex task. In describing what role tools play here, Berg decides to conceptualize these 'reading and writing artifacts' as artifacts with the capacities to coordinate and accumulate: 'These activities are closely coupled: the coordination of activities is achieved *through* the accumulation of inscriptions, and vice versa' (Berg 1999, p. 387). In doing so, the boundaries between computer-based and paper-based technologies are blurred, and the interrelation of the artifacts and their users move to the foreground. 'Reading and writing artifacts do not "support" tasks: it is only in the interrelation of staff members' and artifacts' activities that the task emerges

in the first place' (Berg 1999, p. 390f). Nevertheless, focusing on this interrelation does not mean neglecting the intrinsic values built into an artifact. For example, responsibilities and role definitions can be affected depending on the design of an artifact. Artifacts, such as medical records, are not merely a representation of the patient or the case but act as mediators (Latour 2005) and are intertwined with their surroundings. This affects how the patient is perceived and how care is coordinated (Berg 1999; Berg and Bowker 1997; Munkvold et al. 2007).

The guest analogy and the ambiguity of proximity and distance pulled inspiration from a book by Pols (2012). In the second chapter, she analyzes the contrast between warm care and cold technologies. While presenting the case of palliative care that deployed telecare to establish additional contact with the patients, she debunks this opposition bit by bit. It is not the opposing nature of cold technology and warm care that sheds light on why patients have experienced good care with the help of technology. Pols then introduces the notion of fitting and modest aesthetics that helps analyze and explain care at a distance.

3 Case and method

3.1 Mental health home treatment

The idea of treating severe mental health crises at home is not new. The origins of HT can be traced back several centuries (Johnson 2013): For more than 700 years, citizens of the Belgian city of Geel have established a system of family foster care, in which people with mental disorders are taken into their homes and cared for. In the 1930s, psychiatrist Arie Querido in Amsterdam, Netherlands, introduced home visits by a psychiatrist and social worker to prevent admission to a mental asylum. In the 1970s, Leonard Stein and colleagues from Madison, Wisconsin, offered multidisciplinary, team-based, acute psychiatric treatment that approximated today's forms of HT.

The advantages of avoiding inpatient psychiatric treatment are obvious (Winness et al. 2010, p. 201): the ability to continue with everyday life, to stay in touch with family and friends, to recognize and promote the patient's resources and to recover in familiar surroundings. The psychiatric ward, on the other hand, is an artificial place where many people with acute crises are concentrated, rigid processes and various rules prevail, and the atmosphere is often restless (Wood and Alsawy 2016).

Internationally, there is a wide range of outreach treatment concepts that differ in terms of the intensity, complexity, and flexibility of treatment. HT or crisis resolution teams (CRT) are currently the most common concepts. They offer acute psychiatric care at home, usually with at least one contact per day for a period of up to 4 weeks. Sonia Johnson gives an excellent overview of the key organizational

characteristics according to the HT/CRT concept (Johnson 2013). Assertive Community Treatment (ACT) teams, on the other hand, offer longer-term outreach treatment for people with chronic conditions or mental disabilities, with a rather lower contact frequency (Nugter et al. 2016).

Even if evidence shows that HT is feasible, effective, and predominantly preferred by patients and relatives (Murphy et al. 2015), widespread implementation is still pending. In the past two decades, only England and Norway have implemented the CRT model into standard care (Hasselberg et al. 2011; Lloyd-Evans et al. 2018). The Netherlands is now implementing flexible ACT teams at different locations (Nugter et al. 2016).

In Germany, HT was first piloted in Krefeld in 2001 (Bechdolf et al. 2011). Further model projects followed that were based on the ACT concept and specialized in treating psychotic disorders (Lambert et al. 2010). In 2013, new legislation was introduced to promote flexible and integrated treatment (FIT) models, including HT, in at least one hospital in each of the 16 German federal states. After considerable pressure from German psychiatric associations, another second legislation followed in 2018, which allows all 585 psychiatric clinics in Germany to introduce an intensive form of HT. This so-called 'Inpatient-Equivalent Home Treatment' (IEHT; German: Stationsäquivalente Behandlung, StäB) is close to the CRT model and is currently implemented by approximately 10% of German clinics. The effectiveness, costs and processes of IEHT are currently being evaluated (Baumgardt et al. 2021).

3.2   Research setting

The case study took place at two departments of psychiatry, psychotherapy, and psychosomatics in two German clinics. Both psychiatric departments offer a variety of services for their users to serve different needs and conditions. One of these services is to provide inpatient-equivalent home treatment (IEHT), better known outside Germany as home treatment for mental health or crisis intervention teams. Patients are referred mainly from other professional services, such as psychiatric outpatient clinics or advisory services. Before treatment begins, HT ensures that patients fulfill the legal regulations for IEHT (Weinmann et al. 2020). In the following, we will briefly introduce the research setting of each department and their implementation of IEHT.

Department (Dept.) Metropolis (pseudonym) is part of a public hospital in a metropolitan district of a major German city, serving 280,000 inhabitants and an area of 20 km^2. Dept. Metropolis offers a variety of services oriented toward the diverse population they serve. In addition to the ambulance, day clinics (intensive, full-day treatment but without stationary admission), and inpatient services, Dept.

Metropolis further provides specialized treatment programs such as services for young adults or people with an immigration background. Regular home treatment services started in April 2018 with one home treatment team, and demand continued to grow. After a year, they established a second home treatment team. The two home treatment teams consisted of 14 health care workers at the time of the study: two senior physicians, two assistant physicians, two psychologists, six nurses, one social worker and one nursing manager.

Department (Dept.) Lakeside (pseudonym) is part of a nonprofit hospital in a small municipality located only 35 km away from Dept. Metropolis but belonging to a different state, serving a rural area of 1,613 km^2 with 240,000 inhabitants. Similar to Dept. Metropolis, it also offers a wide range of services for their users. Due to the large area covered by the department, they have two additional outpatient day clinics situated in relatively populous towns. The department was among the first to offer home treatment as a regular service, starting in May 2018. Dept. Lakeside currently has one home treatment team comprising eight health care workers (at the time of the study in August 2020): one senior physician, one assistant physician, two nurses, one physiotherapist, one social worker and two peer-support workers (PSW). PSWs are people with lived experience of mental distress, often ex-users of psychiatric services that support patients in coping with their everyday lives, mediating between the various stakeholders, and often sharing their own recovery stories (Repper and Carter 2011).

Table 1: Some characteristics of the two catchment areas

	Department Metropolis	Department Lakeside
Location	metropolitan district of a major city	mixed rural and suburban district in eastern Germany
Population	290,000	240,000
Catchment area	20 km^2	1,613 km^2
Population density (inhabitants/km^2)	14,500	149
Average age (years)	38,2	47,7
Immigration background (%)	35.9	3.9

3.3   Research method

The presented research is part of a larger research project designed as a multiple-embedded case study (Yin 2017) with the aim of investigating health care activities and practices when they move into the homes of patients or service users. While the first case focuses on care at a distance mediated with the help of technologies, the case presented in this paper focuses on the health care practices and work conducted at home by health care workers. We chose an interpretive approach to study this objective. The first author carried out the data collection.

Our study followed an ethnographic approach and data were collected with go-alongs, '[a] hybrid between participant observation and interviewing' (Kusenbach 2003, p. 463). This allows the researcher to focus on the spatial practices and draw from the experiences of the informants, which seemed appropriate for understanding the work involved in home treatment, as the informants are on the move and the spatial practices were of specific interest. Between the visits, there was time for following up on questions that emerged. The first author followed between one and three informants (three nurses, two senior physicians, one assistant physician, and one peer-support worker), depending on their everyday routines. When following more than one person, it was helpful to overhear their conversations. The first author did not give too specific directions on what to talk about, being more interested in their everyday concerns. In the offices, there was contact with all members of the HT teams. The findings presented in this case are based on two weeks of go-alongs (63 hours). Observations took place in March (Dept. Metropolis) and August (Dept. Lakeside) 2020. The research project was registered at the Norwegian Centre for Research Data, and all collected data were encrypted and pseudonymized after transcription. Given the focus on the health care workers, we did not collect any therapeutic details during the patient visits. The patients were informed of the presence of a researcher and could deny access. In some cases, the HT teams decided upfront that a visit was not suitable to be observed.

The first author (FA) approached the field with an open mind and took field notes of various impressions and observations (Emerson et al. 2011). Conversations during go-alongs were not recorded, but jottings were written down. The field notes were transcribed shortly after they were taken, often in the evening of the same day. During transcription, memos were drafted either to follow up on observations or to note early ideas about conceptual perspectives. Over time, the field notes became more focused. In addition, documents and pictures were collected, which were included in the analysis. Initially, the field notes were written in German and subsequently translated into English once they were imported into the computer-assisted qualitative data analysis software MAXQDA.

Data analysis followed a grounded theory approach (Charmaz 2014). As described above, an inductive approach was taken to see new phenomena of interest in the beginning. Although the FA familiarized himself with home treatment by reading textbooks (Längle et al. 2018; Weinmann et al. 2020) and being in contact with one of the home treatment teams before the fieldwork, it was the first time to see the work of the home treatment teams in practice. Hence, in the beginning, the field notes were broad yet detailed. The FA tried to grasp every detail; any nuance of the specificity of their work, and even notes on colors and smells and their impressions were recorded. Some of the descriptions now feel, after the complete data collection, almost obvious or redundant, but they were perceived relevant at the

time. These notes fulfilled a critical purpose: they allowed us to re-experience the field visits and contributed to a vivid data analysis process. This also entailed writing analytic memos throughout the prolonged research. At the second field visit, half a year apart from the first one, the glance was more focused and initial themes and analytic ideas were either confirmed, altered, or dismissed. Early concepts that seemed relevant were written down and further refined over time. Data analysis compromised moving back and forth in a time-intense process between the data (the pictures and documents proved to be very helpful), the field, discussions, and the literature, and refined the themes, which will be presented in the findings section. Early work on this case was also presented at two conferences, and feedback was incorporated (Hochwarter et al. 2019, 2021). To support the data analysis and for easier sharing with the other authors, we have used mainly MAXQDA but also a fanfold paper for visualizing and structuring different themes. Eventually, three main themes were identified: (i) closeness and familiarity, (ii) bridging the distance, and (iii) tensions of proximity and distance. Together, these three themes make up the conceptualization of becoming a guest.

4   Findings

4.1   The daily routine

4.1.1   Department Metropolis

Dept. Metropolis hosts two HT teams. They usually start their workday slightly before 8 am, in the larger of their two available offices (see Figure 1, left). The teams spend the first half of the morning in the office, preparing for the visits and conducting their regular meetings. Their office is configured to support these activities: whiteboards, a table for meetings, the desks groups by teams, and the medication supply stored in a cabinet. During the morning planning meetings, they review each patient, and the visit plan for the next day is decided upon. The team members make notes on paper, in their notebook, calendar or on sticky notes. The information is then written on the team's whiteboard, consisting of a table with all their active patients. They typically leave their offices between 10 and 11 am. To visit their patients, the HT teams have access to five small cars and two bicycles. While most team members drive a car, one uses his private bicycle and sometimes visits a patient before coming into the office. Before leaving, they arrange the medication for their patients. Usually, they drive without a navigation system; they know the neighborhoods, ongoing construction work and challenging parking situations. They visit the patients alone or in teams of two. The weekly senior physician's round is one exception, where they visit more patients on a single day with two or three HT workers. When they come back from their visits, typically in the early afternoon, they complete the documentation. Team A has a debriefing meeting, while team B combines this with their morning planning meetings. A nurse from team B describes the different organization with the words, 'Our team is more

independent, but important matters are also communicated when they arise after visits.'

Figure 1: Offices of the HT teams in Dept. Metropolis (left) and Dept. Lakeside (right). These are the larger of the two available offices in each department.

4.1.2 Department Lakeside

Dept. Lakeside is home to one HT team that also starts the day at approximately 8 am. The office is in a former apartment building on the edge of the hospital area, just behind the helicopter landing spot. Situated on the top floor, it consists of two office rooms with three desks with one PC in each office. Figure 1 (right) shows the larger of the two offices. Team members work in two groups formed based on their patients' locations; unlike Dept. Metropolis, they only consist of one HT team. Serving a large area, the two groups are divided to cover a specific geographic area where their patients are located. When preparing, the team members take notes and sometimes check the electronic patient records. There is also a printout of all the patients currently in care. As a result of the morning meeting, today's visits are documented on a sticky note, including the patients' names and the planned visiting time. The size of the catchment area (47 x 40 km) and the patients' scattered location make planning the route a challenging task. On weekends, they work with fewer workers, and two or three team members visit all their patients. Before the HT team leaves the office, they print out a Word document with a patient list. The patients are divided into four tables, depending on which care model the patients are assigned to: StäB (IEHT, standard HT patients, visits every day up to 4 weeks), FIT model (flexible and integrated treatment; a form of integrated care contract that is only accessible to patients belonging to certain health insurance companies; flexible, needs-adapted steering of the frequency of visits), PIA (Psychiatrische Institutsambulanz, psychiatric outpatient clinic; allows approx. one to three visits per patient and quarter), and a waiting list. The HT team has access to two compact cars without any features that could identify them as health care workers. To keep in contact with the other group, they use phone calls or write in a group chat on Signal, an encrypted messaging service. They do not have a debriefing meeting at

the end of the day; they usually leave the office early and come back late and try to quickly finish their documentation work.

4.2   Proximity, distance, and tensions

4.2.1   Closeness and familiarity

At both departments, the HT teams visit their patients daily for up to eight weeks. They visit the patients mainly at their homes, where they often also meet and include family members. Coming to their homes allows the HT teams to collect impressions they otherwise would not have access to. Furthermore, these frequent visits establish a familiarity between the HT teams and their patients.

> The relationship with the patient can be described as intimate. The home treatment team usually sees a patient every day for usually 6 to 8 weeks. Patients are often chronically ill; HT is indicated when their conditions worsen. They are demographically diverse. The youngest patients are 18 years old. The HT team tells me that they get many different impressions from their visits. The family members are often a good assistance and source of information – both actively and passively. (go-along, 24 August 2020)

This proximity leads to an understanding of the patients' habits. The HT teams know the preferred visiting times, their nuances at their homes, and when to take the shoes off for the visits (I, the first author, made the mistake of bringing shoes with laces). Visiting the patients at home allows for detailed observations.

> On the way to the car, assistant physician G says that he observed that the patient was bending down to pick something up, apparently without pain. He has doubts if she truly needs physiotherapy. (go-along, 26 August 2020)

The family members are mostly helpful, providing additional information for the therapy, and sometimes are even actively involved.

> We sit outside in the garden in a circle. It's a sunny and warm day. Senior physician S has the laptop open on his lap. The patient lives temporarily with the family of her daughter after the death of her husband. They have questions regarding the medication that the granddaughter can answer. The granddaughter currently works from home due to COVID-19. She also provides an oral overview of the patient's history. (go-along, 25 August 2020)

However, sometimes the presence of a family member can also be obstructive. For example, when a family member who is a topic for therapy is eavesdropping.

Similar to the presence of family members, the desired level of proximity is individual. Each patient has a reference therapist, who is the primary contact for the patient and visits the patient regularly. After a new patient is admitted to home treatment, the reference therapist usually initiates regular visits, and together they define an aim for the therapy. During the next week, they get to know their patients well. However, they also try to keep a certain distance in their professional role as therapists.

> We found a parking spot close to the first patient without any problems, so we are early for the first appointment. Nurse L tells me that she usually avoids physical contact with patients, but this patient is an exception because she is blind, and she thinks that a hug helps her to create a better image of the person visiting. (go-along, 10 March 2020)

Once a week, the HT teams have a multiprofessional team meeting. Three professional groups, mostly a nurse, a physician and either a psychologist or social worker, discuss all their patients. Even though they bring their handwritten notes and have the EHR system open during these meetings, they often summarize their patients' progress without consulting any notes:

> When senior physician B reports about his patients, he does not need any notes even though his remarks are very detailed. He also knows the administered medication by heart. (go-along, 11 March 2020)

While medication is documented, they sometimes do not need to consult the records when discussing the medication and its dosage. Further details of their visits are shared with other team members, sometimes between meetings and visits, which are not documented. For instance, this can be the patient's mood, impressions of the visit, or the relationship with their family members. The HT workers also know at what times the patients do not want to be visited.

Another indication of how well they know their patient is the individual setup of the pill dispenser. The HT teams do not use automatic medication dispensers because they do not want to 'take away the competence of the patient' (nurse L). They prepare the pill dispenser, stacked with daily medication boxes (morning, noon, evening, bed), which can be withdrawn either from top or bottom:

> We visit the last patient on today's tour. The patient is using HT services for the second time and is currently experiencing a crisis for which she needs HT support. Senior physician W discussed the therapy plan with her. The patient receives the pill dispenser for the week. She withdraws the daily medication box from the dispenser from the bottom, while I have seen most

> patients withdraw the box from the top. The medication dispenser needs to
> be arranged accordingly. (go-along, 12 March 2020)

Most patients build a strong trust in HT teams. For instance, a patient was asked by her general physician to deliver a diagnosis once per quarter. The HT team assured the patient that they would not share the diagnosis if she were against it. A similar incidence was observed with another patient. Furthermore, the patients also ask the HT team to support them with tasks not directly related to therapy, such as shopping or writing a recommendation letter for renting an apartment. The supportive relationship to the patients is verbalized, especially during challenging times for the patients, as noted here: 'You can always call. I'm here to help.' (assistant physician G) or during another visit:

> Nurse K clarifies to the patient that the team is available anytime for him
> and that he should call on the day of the funeral if he needs help. (go-along,
> 25 August 2020)

4.2.2   Bridging the distance

The proximity and familiarity described in the previous section alternate with a distance between the visits when the HT teams are on the move or in their offices. Although they know their patients well, their work is supported by documents that are regularly consulted and updated, depending on their work routines, patients, and environments.

When visiting the patients, the HT teams of Dept. Metropolis do not have access to their EHR system because 'we are not online while visiting'. The primary documentation in the EHR system consists of a free-text description of the therapy, some prestructured medical findings (e.g., structured psychopathological finding, a brief systematic description of a person's mental status at the time of writing), and the performance documentation according to the Operation and Procedure Classification System (OPS). In addition, they also document and prescribe the medication of the patients. On occasion, blood samples, ECG and other clinical tests are taken.

Not all information is recorded in the EHR system. After the HT teams of Dept. Metropolis complete the documentation work, they keep talking about small details experienced with the patients and informally discuss issues at the end of the day.

> From 3 pm, the colleagues from the other office also join the office of the
> nurses, and they informally discuss events from the day and loosely start
> planning the next day. One patient with financial problems is discussed in

detail; they consider supporting him to apply for a special form of early retirement. (go-along, March 10, 2020)

The HT team in Dept. Lakeside decided to do most documentation during their visits or on the way to/from the visits (see Figure 2). Hence, they bring a laptop and maintain a Word document for each patient. This document consists of two tables: one for treatment information and one for medication. Treatment information includes the date, a free-text field and the initials of the person documenting. Each entry represents one visit, and the free-text field usually contains the type of visit, the treatment report, psychopathological findings, procedures, and the journey and visit duration. The medication plan at the end of the document is represented by a table with five columns. When prescribing a new medication, a new row at the end of the table is created. Inactive medications are colored in red, and the date and the HT worker's acronym are noted.

The HT team brings along the laptop to the visits with patients, and during the first part of a visit, the laptop is opened. They often talk to the patient at the dining table or around a coffee table, where they sit across from the patient and rest the laptop on the table. Once they complete the documentation and do not need any further information, they close the laptop but keep talking to the patient. The latter part of the visit is less structured and more open to being led by the patient.
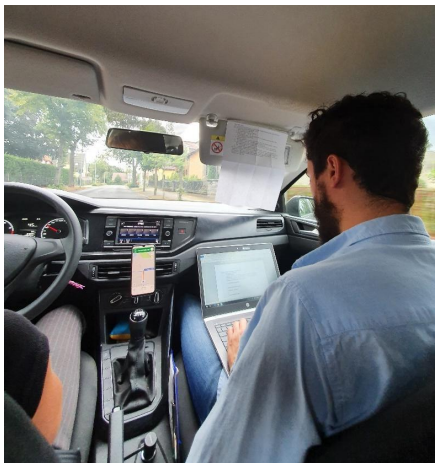

Figure 2: Documentation while driving to a home treatment visit.

The documentation of therapy is not merely used by the HT team to reconstruct the therapy process or for administrative reasons but also plays an active role during the therapy. However, patients sometimes prefer to keep a distance that the HT team acknowledges. The following observation is from a last regular HT visit.

> We arrive at 8:40. The patient welcomes us to the living kitchen in a one-family house. Senior physician S opens the laptop and sits diagonally opposite the patient. S asks the patient if they shall read her therapy transcript together. The patient does not want to, she says: 'By reading it, it will get worse again.' S replies: 'Yes, maybe it is better if you don't read it.' (go-along, August 25, 2020)

Furthermore, the documentation also supports the continuity of services outside the HT team's working hours. Patients, experiencing a crisis, might need to have access to psychiatric services in case of emergencies. While they are treated as inpatient cases, they are situated in their homes, physically remote from the clinical infrastructure. Providing access to the emergency control center can mitigate this distance.

> The admission consultation includes the topics of medication, therapy plan, and methods (e.g., exposure therapy). The patient asks who to contact if his condition worsens. He does not want to visit the clinic. Senior physician S explains to him that there are telephone numbers for all team members on the therapy plan. They can be reached during office hours, from 8 am to 4 pm. Outside these hours, the emergency control center can be contacted, and they have a psychologist responsible for the home treatment cases who has access to the patient's data. (go-along, March 12, 2020)

4.2.3   Tensions of proximity and distance

When the HT teams carry out their work, they also encounter friction when balancing the needs of their patients and the resources they have. They face issues of different natures and need to navigate around them to provide services that fit.

Theoretically, the HT team at Dept. Lakeside would have access to the hospital's EHR system while visiting the patients through connecting to the hospital's virtual private network (VPN). However, given the inadequate network coverage in the rural area where they operate, this does not work in practice. Furthermore, compared to the Dept. Metropolis, they spend more time driving to the patients; they leave earlier and return later to their offices. Writing documentation before or after the visit does not fit into their schedule. Therefore, for the time being, they implemented a workaround:

> Their documentation system is not working on the move because of the region's inadequate network coverage. The system requires a constant internet connection. In the beginning, they tried to work with it, but this worked poorly. Therefore, they decided to use Microsoft Word (2010) documents instead. For each patient, they create a Word document. In the

> office, they store USB pen drives with the documents for their patients. In the morning, before they leave to visit the patients, they copy the documents of the patients they will visit on this day to their laptops. That way, they can read the patients' documentation on the way and document the treatment. At the end of the day or on the next morning, they replace the files on the USB pen drives with their updated versions. Once a week, they transfer the Word documents into the hospital's system as a report. (go-along, 24 August 2020)

They are aware of the downsides of this workaround and would like to replace this with a 'proper' system. Assistant physician G thinks that the documentation is antiquated: 'I can well imagine that this could be done more efficiently.' While the Word documents are imported into the EHR system once a week, they are not updated daily, and their content is not searchable. Furthermore, access to these files is only possible within the hospital. This workaround can lead to missing documentation and, in turn, fragments the information they have available. For instance, when an HT worker needs to go home directly after the visits:

> We have arranged a meeting with nurse K at a grocery store in a small town to pick up K's documentation. K will drive home directly after her last visit. At the grocery store, we buy some food and eat at the parking lot. K calls and says that she still has two patients and is late for the meeting. She will send the documentation via e-mail. (go-along, 24 August 2020)

> Senior physician S goes through the documentation on the laptop. S: 'The Word document for patient four is missing.' Peer-support worker A: 'Yes, it is still on the laptop. I need to copy this later back and forth.' (go-along, 25 August 2020)

In addition to the EHR system they use for documenting the therapy, Dept. Lakeside also uses SAP for the reimbursement of their services. Dept. Lakeside also attends to the FIT model patients, who do not need to be visited every day and are treated as outpatient cases. Unlike regular HT patients, they are allowed to visit health care services offered by external providers. While they do not have to be visited every day, during a crisis they are often seen daily. In regard to documentation and administration, the different patient groups follow different regulations. At their weekly team meeting, the HT team at Dept. Lakeside invited a person from the administration to address this issue. The flexible approach and different services provided by the HT team have been a challenge for the administration of the clinic for quite some time now:

> It is unclear how the different patient groups of HT should be registered in the system. A person from the administration joined the team meeting and

> said that she had already said in the beginning that FIT model patients needed to be entered at every visit into the SAP system for billing. That was not done, however. She did not know that the HT team had their own PIA (psychiatric outpatient clinic) patients. They discuss how the HT team should register the patients in SAP. The team only has restricted access to SAP and would like to have full access. The person from the administration says, 'SAP access is bloody expensive.' In addition, the HT team also needs to generate a new calendar entry for every patient contact. (go-along, 26 August 2020)

The HT teams of Dept. Metropolis also face challenges using the systems in their clinic for patients located outside the premises. They are offline while driving to or visiting the patients, and the hospital's EHR system does not work outside the hospital. Therefore, as described earlier, they take notes on paper. At their offices, they use the EHR system that is used for inpatient cases. Each of their two teams has a dedicated 'virtual room', where they 'place' their patients currently in home treatment.

Furthermore, the handling of a new admission to the service illustrates the interplay of local circumstances and distributed patients. One morning, two suggestions for a new HT admission are proposed. The information about these two patients is printed on paper. The team starts discussing the patients, their medical history, demographic data and where the patients live. One patient lives at the border of the district. The team members complain about the long journey that would entail the admission of this patient. They search the patient's address; one nurse uses Google maps while another nurse stands up from her desk and walks over to the district map. This district map is pinned on a whiteboard, and the patients' locations on both teams are marked with colored magnets. A nurse commented, 'Well, then the patient will be visited at approximately 8 to 9 am during the weekends.'

Home treatment is only one form of treatment offered by the departments. Patients in home treatment might have been inpatient cases before, or after home treatment they might be transferred to the psychiatric outpatient clinic. Hence, when discussing patients in their meetings, they also need access to documentation from different treatment settings provided by the hospital. In these meetings, there is little room for delays.

> For the discussion of one patient, they are searching for an overview of the PIA (psychiatric outpatient clinic) appointments in the EHR system. Assistant physician B gives up after slightly less than one minute: 'No, this is a waste of time. We have to look another time.' (go-along, 11 March 2020)

Access to information represents not only a challenge with multiple sources, but also a fluent transfer of a patient between home treatment and another treatment setting.

> At the end of the meeting, the discharges and admissions are discussed. There is one new admission of a patient; he is currently a stationary patient in the department. This should be a fluent transition from inpatient to HT. They run into some problems about how their EHR system can support this. Assistant physician B proposes to 'sign the patient up with an offset of one minute.' Senior physician W said, 'Then, we cannot invoice it, but ok.' (go-along, 11 March 2020)

4.3   On becoming a guest

The findings have described HT from various angles, highlighting distinctive characteristics of the work's nature. Before moving to the discussion, a recapitulation of the findings under the lens of *becoming a guest* is in order.

The individuality of the visits and the demands for the HT teams as guests are reflected already before the visits take place. The offices of the HT teams look strikingly different. The urban catchment area of Dept. Metropolis allows for more planning and documentation work after the visits; hence, their offices hold fully equipped desks and meeting areas to do so. At first glance, the HT offices at the Dept. Lakeside give an impression of a perhaps less organized team. However, this is not the case; their large, rural catchment area requires them to do most of their work in between the visits. Furthermore, the two-way relationship of *becoming a guest* and its characteristics is mirrored by the different forms of treatment that the two departments offer for their patients. Additionally, the multiprofessional teams provide services to the patients based on their specific needs. For example, occupational therapists or social workers are joining the visits to cover all facets and needs.

Our conceptualization deliberately contains a temporal dimension, as the HT teams are *becoming* guests. Closeness, professional or personal, is developed over time. Additionally, between the HT teams and the patients, a closeness is formed over many visits during a period of usually four to six weeks. As guests, they also encounter family members and observe details they would not grasp when the encounter would take place in the hospital. Some patients expressed a strong trust in their visitors. However, the HT teams are more than merely guests. In their professional role as health care workers, their visits serve a purpose. Their gaze observes details that are relevant for the therapy, such as the patient's living condition and changes from previous visits.

While the visits are time-restricted, the HT teams continue to play the role of guests. The distance in between the visits is often mediated with the help of communication technology and reading and writing artifacts. At Dept. Lakeside, for example, the distributed HT teams coordinate their visits with a messaging service and a shared documentation, which they bring for each visit. The important role of this documentation can be observed when the documentation is not accessible, as described before.

Tensions arise not only when bridging the distance fails but also when there is not the *right* amount of proximity. A (guest) relationship is two-sided, but HT needs to follow certain regulations and rules. Patients expressed their dissatisfaction when the visits did not follow their personal schedule. Although the HT teams try to accommodate this as much as their tight timetable allows, they cannot stay as long as the patient might like. Or on the other hand, the HT regulations do not permit skipping a visit. Hence, while becoming a guest contains both parties in building a relation and power distribution is more equally distributed, the HT teams still have the main responsibility of the visits.

5   Discussion

'A stranger is coming into your apartment with the expectation to hear something new from you. However, from one day to the other, there is not so much change.' This quote from a discussion with an HT worker fits well with the title of our article: Becoming a Guest. The word guest has its etymological roots in the Proto-Germanic language, and its sources can also be traced to the Latin *hostis*, which can be translated into *strangers* (Watkins 2011). The transition from being a stranger to becoming a guest requires effort, time, and work to build this reciprocal relationship. However, can this transition ultimately be complete or completed? The findings illustrated that absolute closeness is not the desired aim of mental health home treatment, neither for service users nor for HT workers. Certainly, there is proximity and familiarity, but not all the time and not in all aspects. There are many instances where distance is more beneficial. Hence, this is not a question of proximity *or* distance but rather how to find the right balance of proximity *and* distance, and with what means. In the following, we will discuss this with the help of the previously presented findings.

5.1   Proximity

The transition for HT workers from being a stranger to becoming a guest evolves over the course of HT. Naturally, it takes time to get to know their patients and establish a supportive relationship for their daily visits. The HT teams of both departments visit the patients daily for several weeks, and some patients have also used HT before. As described in Section 4.2.1, this closeness contributes to the HT

teams becoming familiar with the patients. During the visits, they pick up different impressions and learn their habits. The therapists recognize small details and nuances, which otherwise might be overlooked. For instance, when a patient, who just complained about back pain, bends down to pick something up. As the therapy is usually carried out at home, family members can become part of the therapy. They are often a source of additional information and even become part of the therapy sessions. Sometimes, however, they may also hinder an open dialogue. At first glance, this obstruction might be perceived as problematic, but understanding the local environments of the patients helps the HT teams to shape a complete understanding of the circumstances the patient is surrounded by.

In this two-sided relationship, the closeness of the patients is often expressed by building strong trust in the HT teams. They share personal details during the therapy, which they do not want other doctors, such as their GP, to have access to. Furthermore, they seek support with practical matters and financial concerns. This closeness, too, can be observed when the patients familiarize themselves with the structure of therapy and acquire competencies, which in turn helps to provide smooth home treatment.

We have observed a closeness that goes beyond mere spatial proximity. There are moments where familiarity is expressed, and this familiarity is built from the beginning of the therapy. The theme of the therapy is defined together; they work together toward a goal. Away from the patient, the HT team remembers small details and even the exact prescription of their medications, often without consulting their notes. Before the end of the day, they talk about their patients informally and provide helpful hints for the next visits. This shows that they maintain mental closeness, even when they are remote.

Specifically, during difficult situations for patients, the HT team makes sure that the patients are aware that this closeness is sustained, even when they are not physically present ('You can always call. I'm here to help.'). However, closeness is perceived differently. While we have encountered one patient who seeks, due to her blindness, physical contact to better visualize the persons she is interacting with, many patients stated that the visits daily are too much, and early visits are experienced as disturbing. The HT teams try to keep a professional distance while providing a trusting atmosphere. A functioning care relation in an HT setting requires closeness, but not all the time. There is also the need to give room for distance.

5.2   Distance

The treatment of severe mental health conditions in the homes of the patient comes in hand with distance. This distance can sometimes be welcomed, for example when

the patients can stay in their homes and do not need to relocate to the clinic. Or when the patient decides not to read through the past therapy transcript together with the HT team. However, a spatial distance does not necessarily result in a relational distance. In overcoming this spatial distance, coordination and accumulation artifacts (Berg 1999) play an important role. Although the two departments follow different routines for the documentation of treatment, it takes a prominent space within their daily work.

The HT team of Dept. Lakeside must be arranged with a large catchment area and a scattered location of the patients. In their distributed work setting and alternating composition of groups who visit the patients, their work relies, at least in part, on the treatment documentation. Depending on various factors, such as who (which profession) is visiting, the scope of the day's visit, and the patient's current state, they prepare for the visit while driving to the patient's home. The HT team often had visited the patient for several weeks daily and knows their patients well; this helped them to use the limited time for focused discussions. While their in-depth knowledge of the patient forms this picture, they also consult the patient record and the notes from the previous visits. Their work mainly takes place at a distance from the clinic's digital infrastructure, and hence, they do not have access to the EHR system. Analogous to these reflections in the car, the HT teams in Dept. Metropolis also review their patients before the visits. However, this takes place in the office and not while driving to the patients. With shorter journeys, they can spend more time in their office in the mornings and afternoons, before and after the home visits.

Access to documentation not only mitigates distance for the HT teams, but also allows patients to have contact for emergencies after the service hours of the HT teams. During the daytime, they can reach the HT team and their reference therapist on the phone. One patient expressed concerns about what to do during the night; he needed contact but did not want to come into the clinic due to his condition. Providing access to the documentation for the emergency center helps to provide a continuity of service.

5.3   Finding the right balance

It becomes apparent from the two previous sections that finding the right balance of proximity and distance depends on both the patients and the HT teams, as well as on the environment they act in. Patients have different habits, concerns and needs. The HT teams try to accommodate them as well as they can with the resources at hand. Both departments offer services based on the individual needs of their patients. We have been focusing in this paper on HT, but there are also complementary services that contribute to continuity of care that have other structural and organizational demands. When operating in such an environment, frictions occur.

The importance of having access to the treatment documentation can be observed at Dept. Lakeside, where they implemented a workaround for documentation of the treatment on the move. The two HT groups drove to their patients in parallel and kept in contact using mobile phones. As presented in the findings, they use laptops and a Word file per patient to document the therapy in a somewhat structured format. Additionally, knowledge is spread out over paper notes, sticky notes, patient curves and personnel experiences. The dispersed location of the patients and the changing HT group allocation leads to little space for flexibility throughout the day. Adjusting to changes is difficult, time-consuming and interferes with their work. This causes tensions and issues. In both hospitals, the teams depend on systems and organizational structures designed for work carried out mainly in the hospital and not at a distance. The HT team in Dept. Metropolis handled these issues relatively well, although in their EHR system, they need to assign their patients into 'virtual rooms'. Usually, EHR systems support the spatial distribution of patients and its arising logistics. Rooms are allocated to patients of the same sex. However, HT patients are not situated in a single room but are distributed in their own homes. Nevertheless, they need to be managed in a single room in the EHR system, which leads to problems with mixed-sex room allocations.

From the patient perspective, the patients themselves also expressed the wish for more flexibility. Some of them wanted to use ambulatory health services but were not allowed to due to the strict regulations that come with HT. Other patients told us they preferred a more flexible service and not being visited every day, and some of the visits could be replaced with phone or video calls. At Dept. Lakeside, they have a different form of therapy (FIT model patients) that allows for greater flexibility. Or, as one of the nurses told me, 'Model patients are better off, I believe.' However, providing services that fit the needs of their patients, the HT team at Dept. Lakeside faces increased administrative and organizational workload and conflicts, as we could observe at a meeting with an administrative assistant (Section 4.2.3). Related to this, we can see how Dept. Metropolis struggles with their EHR system when transferring a patient from HT to another service.

5.4   Becoming a Guest

We started with the analogy of the etymology of the word *Guest*, and the transition from *being a stranger* to *becoming a guest*. *Stranger*, in our case, represents remoteness, while *Guest* stands for familiarity and proximity. Now we would like to end the discussion with yet another play on words and briefly discuss the oxymoron *distant proximity*. We believe that good mental health home treatment depends on the right balance between proximity and distance, similar to care at a distance, as described by Pols (2012, p.37): 'Good care requires warmth and coldness, knowledge and empathy, but carers need to mix them in quantities that fit the particular and temporary situation of individual patients.' The concept of *Guest*

that we outlined is the ambiguity about proximity and distance. Good care can be close, while distant at the same time and vice versa.

The right balance of proximity and distance is individual. Patients have different perceptions of closeness and needs. These are not constant; they change over time and vary based on their conditions. For HT teams, finding the right balance of proximity and distance is a recurring task for each patient, and to achieve this, a good understanding of the patients is important. Here, reading and writing artifacts such as patient records play a central role. They can inform the therapy of the patient, providing details from previous visits or allowing reflection on the past together with the patient. Furthermore, they can mitigate the distance when being treated at home by providing the patient's history to an emergency center that might be consulted by the patient. Good mental health care does not need to be close all the time; many patients asked for fewer visits, and daily visits were sometimes experienced as disturbing and unnecessary. However, the patients appreciate the certainty of having the home treatment teams in reach when they need them.

Furthermore, proximity and distance can be discussed within the guest-host relationship. While the HT teams enter the homes of their patients as guests, they do not do so as understood in the traditional sense. Although they leave the clinic and thereby weaken the prevailing power asymmetry—cf. the keychain worn openly in clinics, see (Längle et al. 2018)—the main responsibility for the visit is still carried by the HT teams and not the patients. Hence, it requires the HT teams to be attentive to the patients and understand when they have overstayed. Otherwise, the visit might be perceived as a burden. When the HT teams succeed in finding this balance together with the patients, the visits are generally perceived as positive and welcomed. However, there are limitations to this endeavor. For instance, the tight schedule the HT teams need to operate in. Furthermore, the closeness, although in a certain situation it might look otherwise, is of a professional nature. Patients understand that the purpose of the visit is to receive therapy, and they decide what to share with their guests. The HT teams, while getting close to the patients, need to maintain professional distance during therapy. Communicating openly these and similar limitations and constraints contributes to positively shaping the space for the visit and the guest-host relationship. In our case, this was done during the initial interview with the patient and the first visits.

6   Conclusion

In this article, we have described the work of mental health home treatment based on ethnographic fieldwork at two sites in Germany. We focused on the ambiguity about closeness and remoteness in constructing familiarity with strangers. The (re)configuration of proximity and distance is sustained with the help of technology such as electronic patient records. The frictions we have described—the

workarounds, the mix of digital and paper-based notes, being disconnected from the clinic's infrastructure—are common phenomena within care that moves into the homes (see, for example, Bratteteig and Wagner 2013). We have drawn from Jeannette Pols' analogy of cold technology and warm hands, where she lays out the notion of fitting (Pols 2012). Fitting can also describe a strategy to address the misfits of systems, which is described together with other strategies such as workarounds (Gasser 1986). For HT teams, balancing proximity and distance involves finding ways to comply with their clinic's infrastructure and structure, which deviates from their daily work, hence resulting in workarounds (Garfinkel 1984). In our discussion, we have reflected on how this manifests in proximity and distance.

As we mentioned in the introduction, our aim was to understand how health care workers carry out temporal and spatial distributed care activities in a domain where close interaction between health care workers and patients is in the foreground. The study's findings suggest that finding the right balance between proximity and distance, often with the help of technology, is a key ingredient to providing care that fits (cf. Pols 2012). Our main contribution is the conceptualization of this process, which we named *becoming a guest*. Furthermore, we contributed to the body of health care literature in CSCW by introducing mental health home treatment to the domain. To our knowledge, this is the first work on this topic, and we gave an in-depth account of the work in mental health home treatment.

We have chosen to discuss these findings under the term *Guest* because, during the fieldwork, the feeling of *becoming* a guest was omnipresent, not only during the visits but also when observing the work in the departments. We have discussed the findings in light of this inspiration. When we entered the field and started collecting data, our focal point was the HT workers. Over time, while being part of many visits, our perspective widened, and the theme of this paper emerged. Furthermore, we describe care at a distance that is, although coordinated and supported by technology, carried out in person in the homes of the service users. Distance mediated by technology with the help of telecare systems might result in different configurations, and finding the right ingredients for a balance of proximity and distance could imply different steps and considerations.

6.1   Limitations and suggestions for future research

Our study drew mainly from ethnographic data with the HT teams as the center of attention. Hence, our findings naturally shed more light on the HT teams than on the patients. We acknowledge though that mental health home treatment and similar services entail a two-way relationship. Although we collected impressions during the visits, which included both the patients and HT teams, we see the focus on the HT teams as a limitation of our study.

Future research can start where we fell short, i.e., investigating the patient's perception of mental health home treatment and possibly comparing it with experiences from different forms of mental health care services. Many patients we encountered had previous experiences with inpatient treatment or other forms of therapy offered by the clinics. Moreover, while we encourage more research in mental health care, research on home visits in different domains can also be of interest to further develop our concept.

Acknowledgment

Conflict of Interest

The authors declare that they have no conflicts of interest.

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To the evaluation committee

Co-authorship regarded publication included in Stefan Hochwarter's PhD thesis

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Hochwarter had the main idea for the first version of the paper and wrote the first draft of the paper. Monteiro guided the conceptual work with several discussions and contributed with the idea to discuss the case in the light of proximity and distance in analogy to Jeanette Pol's work on care at a distance. Monteiro revised parts of the introduction, background and discussion. Schwarz proposed the data collection method of go-alongs and supported the local data collection in Germany. Schwarz also wrote the case background (section 3.1) on mental health home treatment. Muehlensiepen provided feedback on the sociological background. All authors took actively part in revising the manuscript and contributed with comments throughout the process.

Statement by the co-author:
I hereby confirm that the doctoral candidate's contribution to this paper is correctly identified above, and I consent to Stefan Hochwarter including it in his PhD dissertation.

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Paper IV

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This paper is submitted for publication and is therefore not included.

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