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Ella Airola

Older people and eHealth service use

An exploration of a complex learning and care ecosystem in the rural areas of Finnish Lapland

LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

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For my grandmothers

ABSTRACT

Ella Airola
Older people and eHealth service use: An exploration of a complex learning and care ecosystem in the rural areas of Finnish Lapland
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The general aim of the current dissertation is to explore digital home-care service use (eHealth) from the perspective of rural older people and their social networks in a complex learning and care ecosystem. The use of eHealth services aims to support and facilitate the health, well-being, and everyday lives of older people and their caregivers by improving the accessibility, quality, and affordability of social and health care services. The use of eHealth services also raises many ethical questions related to human dignity.

In particular, the current research aims to (1) increase the knowledge of digital competence in eHealth learning and use, (2) clarify in what way the learning process is part of eHealth service domestication, (3) construct a theoretical-conceptual model for eHealth learning and use, and (4) set development proposals for eHealth design and implementation. The aims are achieved through three theoretical approaches. The learning and care ecosystem provides the basis for the research, constructing older people's eHealth learning and use through practical, social, cultural, and symbolic contexts. The concepts of digital competence and technology domestication focus on the process of how older people learn to use and use eHealth services in everyday situations. A social constructivism paradigm guides the research design as applicable. The methodological approach of the research is qualitative and includes a literature review and empirical data.

The dissertation is based on three substudies, each of which is reported in a separate article. The systematic literature review (substudy I) included 31 empirical studies of older people's learning and use of different eHealth services in 12 different countries in rural and nonrural settings. It provided background information for the research. The other two substudies took place in rural Finnish Lapland. Learning and use of a robotic medication-dispensing service (substudy II) and a phone and

video conferencing service (substudy III) were investigated through a case study approach. For substudy II, older people (n = 5), practical nurses (n = 4), and other health care professionals (n = 2) participated. Substudy II utilized ethnography: in addition to semistructured interviews, the use of the service was observed, and photographs of a medication-dispensing robot were taken at older people's homes. For substudy III, semistructured interviews with older people (n = 2), volunteer workers (n = 2), and a service coordinator were conducted. The gathered data were analyzed through inductive and deductive thematic approaches. The overarching findings of the dissertation were formed through a metasynthesis of the key findings of the substudies.

Based on the findings, in terms of the practical context of the learning and care ecosystem, the eHealth domestication process is most affected by the usability and functionality of eHealth services and their compatibility of the service with users' culturally situated social practices. According to the findings, in the center of the social context of the learning and care ecosystem, there is a learning community that older people form together with warm experts, professionals, and eHealth technologies. The learning community enables the digital competence required for eHealth learning and use as a distributed social activity and the domestication of eHealth services as a social process. With the domestication of eHealth services, social and health care professionals and volunteer workers have taken on a new role as learning instructors for older eHealth users. Pedagogical support for planning eHealth domestication would be necessary.

The findings related to the cultural context of the learning and care ecosystem demonstrated that the meaning of the older people's cultural backgrounds for eHealth service use in the learning and care ecosystem is twofold. On the one hand, culturally congruent practices can be found in the rural Lappish older people's learning and use of eHealth services. On the other hand, despite older people's cultural backgrounds, each rural eHealth service user is an individual, and together, they form a very heterogenous group of eHealth service users. In addition to eHealth users, the study also identified eHealth nonusers, who should be further investigated in the learning and care ecosystem. Finally, the overarching findings related to the symbolic context of the learning and care ecosystem indicate that eHealth services are new and needed services for rural areas yet also a source of inconvenience and concern for older people. Learning and use of eHealth services generated both positive and negative emotions for older people.

The theoretical findings of the research showed that learning and care ecosystem framework is an applicable approach for the study of the use of eHealth. In addition, the reseach demonstrated that learning to use eHealth services in the learning and care ecosystem is not a one-time experience that only happens when the service is introduced, but continues throughout the entire domestication process, requiring different types of digital competence and social support. Thus, the domestication

process of eHealth services should be recognized simultaneously a distributed social learning process.

Based on the theoretical framework utilized in the present research and the overarching findings, a new theoretical-conceptual model of eHealth learning and use, called *Learning and Care Ecosystem in eHealth Use*, was introduced. The model demonstrates the complex nature of eHealth learning and use and can be utilized when designing and domesticating eHealth services or as an analytical tool for research purposes. Finally, the overarching findings allowed the setting of several practical and political development proposals for eHealth design and implementation for eHealth service developers and providers and for social and health care policy makers.

Keywords: digital competence, domestication, eHealth service, Finnish Lapland, learning, learning and care ecosystem, older people, rural area

TIIVISTELMÄ

Ella Airola
Ikäihmiset eTerveyspalveluiden käyttäjinä: Tutkimusmatka moniulotteiseen oppimisen ja hoivan ekosysteemiin Suomen Lapin harvaan asutuilla alueilla
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Tämä väitöskirja kohdistuu ikäihmisten (yli 60-vuotiaiden) arkeen digitalisoituvien sosiaali- ja terveyspalveluiden näkökulmasta. Tutkimuksen yleisenä tavoitteena on selvittää, kuinka harvaan asutuilla alueilla asuvat ikäihmiset ja heidän sosiaaliset verkostonsa käyttävät kotihoidon tarjoamia eTerveyspalveluita (eHealth services) oppimisen ja hoivan ekosysteemissä. eTerveyspalveluiden käytön tavoitteena on tukea ja helpottaa ikäihmisten sekä heidän hoitajiensa ja läheistensä terveyttä, hyvinvointia ja arkea parantamalla sosiaali- ja terveyspalveluiden saavutettavuutta ja laatua sekä vähentämällä niiden kustannuksia. eTerveyspalveluiden käyttö herättää myös suuren määrään inhimillisiä eettisiä kysymyksiä.

Yksityiskohtaisemmin tutkimuksen tavoitteena on (1) lisätä tietoisuutta digitaalisesta osaamisesta eTerveyspalveluiden käytön oppimisessa ja käytössä, (2) selventää, millä tavalla oppimisprosessi on osa eTerveyspalveluiden kotouttamista, (3) rakentaa teoreettis-käsitteellinen malli eTerveyspalveluiden oppimiseen ja käyttöön, ja (4) antaa kehitysehdotuksia eTerveyspalveluiden suunnittelulle ja toteuttamiselle. Nämä tavoitteet saavutetaan kolmen teoreettisen lähestymistavan kautta. Oppimisen ja hoivan ekosysteemi muodostaa tutkimukselle perustan, hahmottaen ikäihmisten eTerveyspalveluiden oppimista ja käyttöä neljästä eri näkökulmasta: käytännön, sosiaalisen, kulttuurisen ja symbolisen kontekstin kautta. Digitaalisen osaamisen ja teknologian kotouttamisen käsitteet keskittyvät siihen prosessiin, miten ikäihmiset oppivat käyttämään ja käyttävät eTerveyspalveluita arjessaan. Sosiaalisen konstruktivismin paradigmasta ohjaa tutkimuksen suunnittelua soveltuvin osin. Tutkimuksen metodologinen lähestymistapa on laadullinen, sisältäen kirjallisuuskatsauksen ja empiirisiä aineistoja.

Väitöskirja perustuu kolmeen osatutkimukseen, joista jokainen on julkaistu erillisenä artikkelina. Ensimmäinen osatutkimus on systemaattinen kirjallisuuskat-

saus. Se sisältää 31 empiiristä tutkimusta ikäihmisten erilaisten eTerveyspalveluiden käytöstä ja käytön oppimisesta 12 eri maassa harvaan asutuilla alueilla ja niiden ulkopuolella. Toinen ja kolmas osatutkimus sijoittuvat Suomen Lapin harvaan asutuille alueille. Lääkeannostelupalvelun (osatutkimus II) sekä ikäihmisille seuraa tarjoavan puhelin- ja videoneuvottelupalvelun (osatutkimus III) käyttöä ja käytön oppimista tutkin tapaustutkimuksen keinoin. Lääkeannostelupalvelututkimukseen osallistui palvelua käyttäviä ikäihmisiä (n=2), lähihoitajia (n=4) ja muita terveydenhuollon ammattilaisia (n=2). Lääkeannostelupalvelun tutkimisessa hyödynnettiin etnografista tutkimusotetta: semi-strukturoitujen haastatteluiden lisäksi palvelun käyttöä havainnoitiin ja palveluun kuuluvasta lääkeannostelurobotista otettiin kuvia ikäihmisten kotona. Puhelin- ja videoneuvottelupalvelua koskeviin semi-strukturoituihin haastatteluihin osallistui palvelua käyttäviä ikäihmisiä (n=2), vapaaehtoistyöntekijöitä (n=2) sekä palvelun koordinaattori. Osatutkimusten aineistot analysoitiin induktiivisen ja deduktiivisen temaattisen lähestymistavan avulla. Väitöskirjan kokoavat havainnot syntyivät osatutkimusten keskeisten tulosten metasynteesistä.

Metasynteesin tuloksena saatiin selville, että oppimisen ja hoivan ekosysteemin käytännön kontekstiin liittyen eTerveyspalveluiden kotouttamiseen vaikuttaa eniten niiden käytettävyys ja toimivuus sekä palveluiden yhteensopivuus käyttäjien kulttuurisesti rakentuneiden yhteisöllisten käytäntöjen kanssa. Tutkimuksessa havaittiin, että oppimisen ja hoivan ekosysteemin sosiaalisen kontekstin keskiössä on oppimisyhteisö, jonka ikäihmiset muodostavat yhdessä läheisasiantuntijoiden, ammattilaisten ja eTerveysteknologioiden kanssa. Oppimisyhteisö mahdollistaa eTerveyspalveluiden oppimiseen ja käyttöön tarvittavan digitaalisen osaamisen jaettuna, sosiaalisena osaamisena sekä eTerveyspalveluiden kotouttamisen sosiaalisena prosessina. eTerveyspalveluiden kotouttamisen myötä sosiaali- ja terveydenhuollon ammattilaiset ja vapaaehtoistyöntekijät ovat saaneet uuden roolin eTerveyspalveluita käyttävien ikäihmisten oppimisen ohjaajina. Pedagoginen tuki eTerveyspalveluiden kotouttamisen suunnitteluun olisi tarpeen.

Oppimisen ja hoivan ekosysteemin kulttuuriseen kontekstiin liittyvät tulokset osoittivat, että ikäihmisten kulttuuritaustan merkitys eTerveyspalveluiden oppimiselle ja käytölle on kaksijakoinen. Toisaalta tulokset osoittavat kulttuurisesti yhteensopivia käytäntöjä harvaan asutuilla alueilla asuvien lappilaisten eTerveyspalveluiden oppimisesta ja käytöstä. Toisaalta jokainen maaseudulla asuva eTerveyspalvelun käyttäjä on yksilö riippumatta hänen kulttuuritaustastaan, ja täten he yhdessä muodostavat hyvin heterogeenisen ryhmän eTerveyspalveluiden käyttäjiä. eTerveyspalveluiden käyttäjien lisäksi tutkimuksessa havaittiin myös ikäihmisiä, jotka eivät käytä eTerveyspalveluita. Heitä tulisi tutkia tarkemmin oppimisen ja hoivan ekosysteemissä. Havainnot oppimisen ja hoivan ekosysteemin symboliseen kontekstiin liittyen osoittavat, että eTerveyspalvelut ovat uusia ja hyödyllisiä palveluita maaseudulle, mutta saman aikaisesti ne aiheuttavat haittaa ja huolta ikäihmisille.

eTerveyspalveluiden oppiminen ja käyttö tuottaa ikäihmisille sekä positiivisia että negatiivisia tunteita.

Tämän tutkimuksen teoreettiset löydökset osoittavat, että oppimisen ja hoivan ekosysteemi on soveltuva lähetymistapa eTerveyspalvelujen käytön tutkimukseen. Lisäksi löydäkset vahvistavat ajatusta siitä, että eTerveyspalveluiden käyttö oppimisen ja hoivan ekosysteemissä ei ole kertaluonteista, ainoastaan palvelun käyttöönoton yhteydessä tapahtuva asia, vaan se jatkuu läpi koko kotouttamisprosessin vaatien monentyyppistä digitaalista osaamista ja sosiaalista tukea. Tästä syystä eTerveyspalvelujen kotouttamisprosessi tulee tunnistaa samanaikaisesti jaetuksi, sosiaaliseksi oppimisprosessiksi.

Tässä väitöskirjassa käytetyn teoreettisen viitekehyksen ja kokoavien tulosten pohjalta esitellään uusi teoreettis-käsitteellinen eTerveyspalveluiden oppimisen ja käytön malli. Malli havainnollistaa eTerveyspalveluiden oppimisen ja käytön moniulotteisuutta, ja sitä voidaan hyödyntää eTerveyspalveluiden suunnittelussa ja kotouttamisessa sekä analyyttisenä työkaluna tutkimustarkoituksiin. Väitöskirjan kokoavien tulosten pohjalta on asetettu myös käytännöllisiä ja poliittisia kehitysehdotuksia eTerveyspalveluiden sunnitteluun ja toteuttamiseen palveluiden kehittäjille ja tarjoajille sekä sosiaali- ja terveysalan päättäjille.

Avainsanat: digitaalinen osaaminen, eTerveyspalvelu, ikäihmiset, kotouttaminen, maaseutu, oppiminen, oppimisen ja hoivan ekosysteemi, Suomen Lappi

ACKNOWLWDGEMENTS

I graduated from the University of Helsinki as a Master of Education in 2017. I have also studied nursing and worked as a practical nurse prior to pursuing my studies at the university. I am glad that in this dissertation I have been able to combine my two educational interests: education and health. Personal experience in both fields has brought depth to the research work and during the process my knowledge has increased even further. However, the academic world was more foreign to me. I had no idea what I was getting myself into when I applied for the position of Junior Researcher at the University of Lapland and started my PhD studies in 2019. After my first day at work, I was sure they had hired the wrong person.

I would not have survived this journey without the continuous support of my supervisor, Professor Päivi Rasi-Heikkinen. On this journey, she has been humane but also challenging in the right way. She always remembers to ask "How are you?" before the real business. She has been encouraging and put in a great deal of effort to grow this novice into a researcher. Besides talking academia, we have also had a lot of fun over a cup of coffee or a drink. She is a true professional, and I am forever grateful that Päivi supervised my dissertation.

In addition, I would like to express my appreciation to my second supervisor, Professor Heli Valokivi, for her guidance. Her feedback has been accurate and constructive. She has given me space to do my job but has always been there when needed. I also extend my sincere thanks to my pre-examiners, Professor Bernhard Schmidt-Hertha and Docent Lina Van Aerschot, who provided important advice and comments during the last stage of the work. I am also grateful to post-doctoral researcher Shahnaj Begum for providing valuable comments on the first version of the dissertation manuscript.

For the most part, I had the opportunity to do my dissertation as part of the HARVEST project. I would like to thank the University of Lapland for hiring me for the project and the Academy of Finland for funding the project and my research. The HARVEST research community has played a significant role in my academic journey. It was great to get to know my Swedish and Italian colleagues: Simon Lindgren, Elin Kvist, Fausto Colombo, and Simone Carlo. I would like to express my special thanks to HARVEST members Jens Lindberg and Marjo Outila, with whom I had the honor of publishing together and learning from their way of doing research. The whole team had a great time in Rovaniemi and Milan.

Alongside the HARVEST project, I got to work on a project called HARKKA, which focused on developing training and guidance in health care education. This project was a great counterbalance to writing the dissertation. Thank you to the project team for the instructive project months and fun memories from meeting all over Finland and online. I would like to express my special thanks to Lappish HARKKA members Heidi Jaakola, Sari Melamies, and Hanna Vuojärvi. Hanna has not only been my colleague but also my unofficial third supervisor. Her door has always been open for me, and she has answered numerous questions of mine on topics ranging from the academic world to the best hairdresser in Rovaniemi.

I offer additional thanks to the University of Lapland for the Esko Riepula grant, which played a key role in finalizing this dissertation. Many thanks as well to the Faculty of Education and particularly to members of Media Education Hub (MEH). In addition to the above mentioned MEH members, I would like to express my special thanks to Liping Sun and Janne Väätäjä. I will always be grateful for how you welcomed me to the new city, offered me your friendship, and kept me company in the second-floor corridor. Liping, thank you also reviewing the first version of the dissertation manuscript.

We had a great PhD candidate seminar group which, every month, gave me the power to continue my work. Your peer support and feedback has been invaluable. I want to express my deepest gratitude to my peers and friends Timo Cornér and Susanna Rivinen. We have gone through this journey together, shared the challenges and feelings it brought, and encouraged each other to continue on the path that feels best for each one of us. You always know how to choose the right words and how to laugh at setbacks.

Outside of academia, I want to thank my home economics teacher colleague, a mentor and a friend, Taina Mäntylä, who has given me career and life advice since the day I started as her trainee in the Finnish Competition and Consumer Authority. Thank you also to my present colleagues in the National Audiovisual Institute. The media education team has shown their interest in academic research and thus has supported the completion of my dissertation.

A special acknowledgment goes to all my relatives and friends, who have shown interest and support during this journey. I can't thank my dear family enough. To my parents—you have always walked by my side no matter what. You have given me space when I've asked for it and have listened when I've needed it. You have shown your endless curiosity about my academic journey, supported my move to Rovaniemi, and always made sure I am all right. Olli, my little brother, you are always carefree and positive about life. For you I am anything but my work and research, and that's the best thing about our relationship. Alexander, my soulmate, fate had decided that you would appear in the middle of finishing my dissertation. Thank you for your patience, encouragement, and for calming me down.

The journey was more important than the destination. It made me realize what is meaningful in life. It's health, happiness, and time with your loved ones. And that is what I want to cherish from now on.

Kivikärki, September 2022

Ella Airola

LIST OF ORIGINAL PUBLICATIONS

The dissertation is based on the following three original article publications, which will be referred to in the text as substudies by their Roman numerals I–III. The original articles are attached at the end of this dissertation.

Substudy I: Airola, E. (2021). Learning and use of eHealth among older adults living at home in rural and non-rural settings: Systematic review. *Journal of Medical Internet Research, 23*(12), e23804.

Substudy II: Airola, E., & Rasi, P. (2020). Domestication of a robotic medication-dispensing service among older people in Finnish Lapland. *Human Technology, 16*(2), 117–138.

Substudy III: Airola, E., Rasi, P., & Outila, M. (2020). Older people as users and non-users of a video conferencing service for promoting social connectedness and well-being - A case study from Finnish Lapland. *Educational Gerontology, 46*(5), 258–269.

LIST OF ABBREVIATIONS

DigComp	European Commission's Digital Competence Framework for Citizens
ICT	Information and Communication Technology
N	The total number of research participants
n	The number of participants in a specific group
NGO	Nongovernmental organization
M	Median age
OECD	Organization for Economic Cooperation and Development
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analysis
QoL	Quality of Life
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

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1 INTRODUCTION

The current dissertation explores eHealth use from the perspective of rural older people (over 60 years of age) and their social networks in a complex learning and care ecosystem. It addresses experiences in receiving and providing eHealth services in older people's everyday lives in rural areas. eHealth services are information and communication technologies (ICTs) that support and challenge the social and health care fields (Eysenbach, 2001; Oh et al., 2005; Scheibner et al., 2021; World Health Organization [WHO], 2005). The key target group of the present research is older people living at home in one municipality of rural Finnish Lapland (Figure 1). Through previous empirical studies, the research also brings a perspective to the eHealth learning and use of older people in other welfare states and in nonrural settings. The present dissertation was undertaken as part of an international research project called HARVEST,[1] which aimed to understand the changing dynamics of social and health care by studying the eHealth service use of older people in rural regions of Sweden, Finland, and Italy.

1 HARVEST – eHealth and Ageing in Rural Areas: Transforming Everyday Life, Digital Competences and Technology (2018–2021). The project is supported nationally by the Academy of Finland [318835] as part of the international JPI MYBL call. JPI MYBL is supported by J-Age II. J-Age II is funded by Horizon2020, the European Union Framework Program for Research and Innovation [643850], the Joint Programming Initiative (JPI) More Years, Better Lives – The Potential and Challenges of Demographic Change.

Figure 1

Map of Finland

Note. Reprinted from d-maps.com. Retrieved September 3, 2022, from https://d-maps.com/carte.php?num_car=4224&lang=ens. Copyright 2007-2022 by https://d-maps.com. Reprinted with permission.

The scientific discipline of a dissertation focusing on older people's learning and use of eHealth services can be described as multidisciplinary. By studying older people and their learning, the primary scientific discipline of the present dissertation can be said to be adult education, which I define, after Merriam and Brockett (2007, ch. 1, para. 2), as "any activity for adults designed to bring about learning." The adult education discipline emphasizes learning as a planned educational activity (Merriam & Brockett, 2007; Schneider, 2005); however, in the present research, older people's eHealth learning also occurs informally and in an unplanned manner. When discussing the digital competence of older people, the research interacts with adult media literacy education (Hobbs, 2010; Lantela, 2019; Rasi et al., 2021) as well as educational gerontology (Rivinen, 2020, 2021; Seifert et al., 2018). The concept of technology domestication connects the research with media studies and, through a Nordic domestication approach, with the broader field of social studies of technology and consumption studies (Hartmann, 2020; see also Pantzar, 1996; Sørensen, 2006). In addition, the current dissertation touches on social gerontology, which understands the aging process as individual characteristics and social relationships as part of the broader cultural context in which heterogenous individuals' lives are embedded (Phillips et al., 2010; Suitor et al., 2019). Additionally, to strengthen the educational and social science perspective through eHealth services and the care ecosystem, the present research touches upon the health service research discipline, where qualitative research has become more prominent when research themes have begun to include, for example, "learning from particular human and social experiences" (Lempp & Kingsley, 2007, p. 862; see also Bourgeault et al., 2010).

The present research brings needed information to the research gap identified in previous studies and policy publications. First, it has been identified that previous research on rural aging is mainly focused on a biomedical perspective on aging, neglecting the active participation of rural older people (Burholt & Dobbs, 2012; Finnish Ministry of Finance, 2019). Second, previous studies of home care and home support in a rural context have been dominated by geographical and economic issues in the implementation of care, leaving the need for further research on experiences of providing and receiving care in rural places (Sims-Gould & Martin-Matthews, 2008). Third, the Digi Arkeen [Digital Everyday life] Advisory Board (Finnish Ministry of Finance, 2019) has called for more research on how the use and nonuse of different technologies affect the daily lives of citizens and what is the role of the family and children of older people in their learning and use of ICTs. Finally, in terms of research methodology, previous studies on eHealth have mostly been conducted using imaginary scenarios or small-scale tests built up for research purposes (Van Aerschot & Parviainen, 2020). To assess the effects of digitalization on people's everyday lives, qualitative and ethnographic research on different digital use situations are needed (Finnish Ministry of Finance, 2019). The present research addresses an active role for older eHealth service users and their social

networks (including social and health care professionals and volunteer workers), emphasizing their experiences in receiving and providing eHealth services in older people's everyday lives in rural areas. These active research participants also provide information on warm experts[2] (Bakardjieva, 2005), who include the families and children of older people. When conducting the research, I considered it important that it take place in real home settings; in addition, a qualitative ethnographic research approach is utilized as much as possible.

To clarify the background of the present research, the Finnish and European social and health care policies aim to support citizens' activity and independence in maintaining their own well-being by increasing electronic services (Finnish Ministry of Social Affairs and Health, 2015, 2020a; Kröger & Bagnato, 2017; Rostgaard et al., 2011). Policy makers have a positive outlook for eHealth services: they believe that eHealth solutions should secure equal accessibility to social and health care services in remote areas and for special groups (Finnish Ministry of Social Affairs and Health, 2015). Currently, following the beginning of the COVID-19 pandemic, it can be stated that the Finnish social and health care services are highly digitalized and that the majority of citizens are able to use eHealth services independently (Kyytsönen et al., 2021; Vehko et al., 2019). However, one-fifth of the Finnish population, including older people in particular, might be at risk of digital exclusion and need support when learning to use and using digital technologies (Finnish Ministry of Finance, 2019; Vehko et al., 2019). It would be important to deal with those barriers that prevent people from using eHealth services and to improve their quality in order to meet the individual needs of each person (Ailisto & Leikas, 2017; Kyytsönen et al., 2021; Vehko et al., 2019). In addition, because people learn in different ways, support in using ICTs should be available in a variety of forms and locations, including home environments (Finnish Ministry of Finance, 2019).

Age and place of residence have been identified as significant differences in the risk of exclusion from new technologies (Olsson et al., 2019; Talsi, 2014; see also Hyppönen et al., 2018; Kyytsönen et al., 2021; Vehko et al., 2019). On average, the resources available for ICT use decline with age: income decreases, and social networks become smaller (Olsson et al., 2019). When aging, the decline in our cognitive abilities, vision, hearing, and motor skills makes the use of ICTs more complicated (Finnish Ministry of Finance, 2019; Olsson et al., 2019). Furthermore, older people (65+) most commonly include those who are unfamiliar with ICTs in their working lives (Finnish Ministry of Finance, 2019). According to a survey of the use of ICTs in Finland (Statistics Finland, 2020), 41% of people over 75 years old have never used the internet. However, it must be kept in mind that in every special

2 Nonprofessional experts who help less experienced people, usually their relatives or friends, to use ICTs by providing personal support (Bakardjieva, 2005, see also Hänninen et al., 2022; Rasi & Taipale, 2020). In the current research, warm experts provide support related to eHealth service learning and use.

group, there are also people who have excellent digital skills (Finnish Ministry of Finance, 2019; Nimrod, 2017). There are also differences regarding the use of eHealth and other ICTs based on the area in which the individual lives. Finnish people living in rural areas own a computer 8% less often and use the internet 5% less than people living in large cities (Statistics Finland, 2020). According to the Finnish Institute for Health and Welfare (2018), older people living in Finnish Lapland are less likely to use eHealth services than those living in Southern Finland. Based on these statistics, half of the Lappish older people have never used eHealth services and do not feel capable of doing so independently.

Next, I define the key concepts of the current study: older people and eHealth services. After this, I describe the specific characteristics of the contexts of the present research—that is, rural Finnish Lapland and the digitalized Finnish social and health care system, particularly home care services.

1.1 Older people, their health, and their well-being

Older people (60+) are the target group of the present research. Within the research, they are given two main roles: the role of the service user and that of the care-receiver. In the present research, I do not adhere to any particular theory of aging but rather study the activities of older people—that is, eHealth learning and use—in relation to the different contexts in the learning and care ecosystem (Bytheway, 2005; Giustini et al., 2009; Keskitalo-Foley & Naskali, 2016; Talsi, 2014). The chronological age of older people varies in every substudy of the present research: the youngest participants occur in the systematic review (substudy I), with a mean age of 60, and the oldest participant, at 89 years old, occurs in the case study of the phone and video conferencing service (substudy III).

Defining older people per se is challenging because individuals are so different from each other and can feel different ages regardless of their chronological age (Giustini et al., 2009; WHO, 2015). There is no universally accepted definition for older people. The United Nations (2020) and WHO (2015) use a chronological age of 60 or 65 years and over when referring to older people. However, Rotkirch (2021) has presented that age thinking should be changed so that people aged 65 to 75 years are not treated as old but as people in their late middle-age. This proposal is based on the fact that according to the predictive life expectancy in Finland, people under 75 years of age can still be counted as working age (Rotkirch, 2021).

Chronological age is based on the number of years the person has already lived (Bytheway, 2005; Giustini et al., 2009). Although aging is a natural biological process that culminates in death for everyone (see Outila et al., 2019), we can study the differences in biological age for individuals of the same chronological age to see how environmental factors, such as changes in health, affect biological aging

(Giustini et al., 2009; Laslett, 1989; Marioni et al., 2016). "Subjective age" refers to how old a person feels, which correlates to his/her physical and psychological age (Barrett & Montepare, 2015; Kotter-Grühn et al., 2016). It should be noted that people's chronological age rarely matches their subjective age (Kotter-Grühn et al., 2016). While chronological age looks to the past and subjective age the present, prospective age focuses on how many years of life the person still has ahead (Sanderson & Scherbov, 2019).

Age categories are often associated with stereotypes and prejudice about older people, causing ageism—that is, discrimination against people based on their age (Bytheway, 2005; Fletcher, 2020; Gullette, 2015; Harbison, 2019; Lagacé et al., 2015; Nelson, 2002). Ageism has been found, for example, to have negative impacts on the digital competence of older people (Lagacé et al., 2015; see also Damodaran et al., 2014). Previous studies have been criticized for defining older participants too broadly, categorizing them with only one characteristic they all share: a certain age they have all passed (Bytheway 2005; Higgs & Gilleard, 2016). The use of smaller age groups (e.g., youngest-old, middle-old, oldest-old) within the larger category of older people has become more popular, bringing up slight differences between older people (e.g., Hsiao-Wei et al., 2019; Koo et al., 2017; Lee et al., 2018).

Aging research experts Peter Laslett (1989) and Gilleard and Higgs (2005, 2010, 2014, 2015a; Higgs & Gilleard, 2016) divide aging into "third age" and "fourth age," which are based on a social or cultural imaginary: "Third age can be understood as the cultural expression of successful aging, the fourth age represents old age as failure" (Higgs & Gilleard, 2016, p. 2). The purpose of the definitions is to circumvent the way of defining older people according to the biological or psychological indicators and instead focus on the "distinction between able-bodiedness and infirmity, between the fit and the frail" (Higgs & Gilleard, 2016, p. 2).

Regardless of the age categorization used, older people should always be understood as a diverse group (e.g., Bytheway, 2005; Harbison, 2019; Lowsky et al., 2013). In the context of the present research, neither older people living in rural areas (Begum, 2019a; Keating & Phillips, 2008; Keskitalo-Foley & Naskali, 2016) nor their care and service needs (Aaltonen & Van Aerschot, 2019; Ko et al., 2019) or digital competence (Hänninen et al., 2020, 2021; Loeb, 2012; Taipale & Hänninen, 2018) should be homogenized. On the other hand, Ferreira et al. (2019) indicates that the ICT use of older people is not as heterogenous as has been argued.

Despite the criticism of age categorization, age is a socially and culturally significant categorization tool in society and everyday life (Gilleard & Higgs, 2005; Talsi, 2014). Old age is produced in social interaction activities, in which one's own or others' high social age or belonging to a category of older people is identified (Vakimo, 2001). In European society, older people are often seen as the group of people who deserve the most and first welfare state services, above the sick, unemployed, immigrants, and people with a disability (Laihiala & Ohisalo, 2007). This has been

demonstrated lately, for example, in the voluntary COVID-19 vaccination order in Finland, which, based on Decree 1105/2020 issued by the Finnish Government (2020), places older people and their caregivers as the first group to be vaccinated. On the other hand, it can also be argued that the government is taking from those who already have the least, which refers to cuts to public services that affect older people (Naskali et al., 2019). In our society and everyday life, people's life cycles are structured by different age-related, sometimes religiously toned, transition rites, of which, for example, retirement, grandparenthood, and funerals are strongly linked to aging and older people (Schmidt-Hertha, 2014; Schmidt-Hertha & Rees, 2017; Talsi, 2014).

The state of health and well-being among older people is a key part of the discussion on aging and a central concept of the present research because it focuses on eHealth service learning and use to support the health and well-being of older people (Giustini et al., 2009; Shaw et al., 2017; WHO, 2015, 2016, 2018). Schmidt-Hertha et al. (2019) emphasize the effect on education and learning in later life on active aging, social inclusion, and well-being. For example, higher health literacy can help older people maintain a higher level of active aging (Eronen et al., 2021). *Active aging* is a social policy concept that the WHO (2002) and European Commission (2021) have adopted to express "the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age" (WHO, 2002, p. 12). *Active* does not include only economic participation by older people, but also continuing participation in social, cultural, spiritual, and civic affairs (WHO, 2002). *Health* refers to "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948, p. 100). Thus, activities that promote the mental health and social connectedness of older people are as important as those that support physical activity.

Quality of life (QoL) has been used in numerous studies as one indicator of the well-being of older people living in rural areas (e.g., Ćwirlej-Sozańska et al., 2018; Hongthong et al., 2015; Rathnayake & Siop, 2015). QoL is a measurable value; however, the present research does not focus on measuring the QoL score of older eHealth service users but instead describes the meanings of eHealth service use for older people's health and well-being. QoL is based on individuals' perceptions of their physical, psychological, social, and environmental facets in the context of the culture and cultural values and in relation to their expectations (WHO, 1998, 2006; see also Bowling & Stenner, 2011). QoL means, for older people living at home, things such as a feeling of being healthy, independent, and active, not feeling lonely and isolated, having meaningful relationships in life, and living in one's own home for as long as possible (Van Leeuwen et al., 2019). Poor QoL of older people, both in rural and nonrural contexts, is connected to social exclusion, loneliness, poor income, presence of diseases, and poor self-rated health (Dahlberg & McKee, 2018; Rathnayake & Siop, 2015; Scharf & Bartlam, 2008; Zhu et al., 2018).

Despite the intentions of active aging policy (European Commission, 2021; WHO, 2002), older people tend to live alone and be less socially engaged, with social isolation and loneliness affecting their physical and mental well-being (Alpert, 2017; Berg-Weger & Morley, 2020). In Finland, almost one in two people over the age of 75 lives alone (Statistics Finland, 2019a). It is often reported that ICTs and ICT-based care hold promise for improving the QoL for older people, for example, by supporting their social connectedness and promoting their independence and autonomy (Chen & Schulz, 2016; Czaja, 2005; Damant et al., 2017; Hasan & Linger, 2016; Poscia et al., 2018; Schlomann et al., 2020). There is also evidence of a positive impact of ICTs on the QoL of rural Lappish older people (Kilpeläinen & Seppänen, 2014). However, there are also some inconsistencies in the impact of older people's use of ICTs on their QoL; hence, the nonuse of ICTs and its effects on QoL should be investigated further (Damant et al., 2017; see also Kilpeläinen & Seppänen, 2014; Rasi, 2018).

1.2 eHealth services in home care

The present research refers to different social and health care services and technologies used from home that utilize ICTs as *eHealth services*. eHealth is a broad, multidimensional term that encounters several overlapping—although not identical—terms in the research field, such as mHealth, telecare, telehealth (Boogerd et al., 2015; WHO, 2016), and gerontechnology—that is, technological devices for older people promoting *aging in place*[3] (e.g., Chen & Chan, 2013; Merkel & Kucharski, 2019). The term *eHealth* was first used for marketing purposes at the millennium changeover period and later adapted to the academic world, but it still lacks a clear and uniform definition (Boogerd et al., 2015; Eysenbach, 2001; Oh et al., 2005; Shaw et al., 2017). Several previous definitions of eHealth should be critically addressed because they reflect a fully optimistic view of eHealth use, lacking its "adverse, negative, harmful or disadvantageous effects" (Oh et al., 2005; Discussion section, para. 4). That criticism can also be applied to the eHealth definition of the WHO, which stresses that "eHealth is the cost-effective and secure use of information and communication technologies in support of health and health-related fields, including health care services, health surveillance, health literature, and health education, knowledge and research" (2005, p. 109).

The present research focuses on a variety of eHealth services used at home, including, for example, mobile applications, online platforms, monitoring systems,

3 *Aging in place* refers to the political aims of supporting older people to remain in a familiar noninstitutional environment, usually at home, as independently as possible and for as long as possible (Chen & Powell, 2019; Kröger & Bagnato, 2017).

and assistive technologies and care robots, which may have any number and range of capabilities and degree of autonomy (Niemelä et al., 2021a; Van Wynsberghe, 2013). The research focuses on eHealth services that are used as part of public services, as well as eHealth services in general that are developed and sold as part of services produced and sold by organizations or in the private sector.

The most relevant eHealth services for the present research are the phone and video conferencing service and the medication-dispensing service. They were both provided by the public home care services of one municipality of Finnish Lapland. However, the municipality purchased the phone and video conferencing service from a local nongovernmental organization [NGO] that helps people of many ages in different life situations through volunteer work. The medication-dispensing service is organized by the municipality. The service users did not incur an additional charge for the services.

The robotic medication-dispensing service was targeted at older people living at home, usually with impaired memory and who were using long-term and multiple medications. The service included a medication-dispensing robot at the service users' homes that would remind the service users when the medication should be taken. The robot can be described as a simple robotics technology with service and companion-like features (Pols, 2012; Zafrani & Nimrob, 2018), which included only a small degree of artificial intelligence and was different from complex humanoid robots (Turja, 2020). Practical nurses from public home-care services helped the service users learn to use the robot and facilitated that use. Practical nurses also refilled the robot with preloaded medication bags every two weeks. The robot provided instructions for its use with pre-recorded sentences with a human-sounding voice, short alert voice, light signals, and messages on the touch screen. Pre-recorded messages told the service user, "Medicine coming, wait. Take the medication bag, please. Take the medication out of the bag and take it with water." The public home-care services could monitor the robot remotely, and both the service users and home-care services were able to communicate through the robot by sending messages through a touch screen on the front of the robot. If the service user did not respond to the command to take the medication within a certain period of time (e.g., two hours), the robot stored the medication bag and sent an alarm to a home care security team, which, as part of the robotic medication-dispensing service, took care of the service user. The use of similar but not identical automatic medication dispensing services has previously been investigated, for example, by Kamimura (2019; Kamimura et al., 2012, 2014).

The phone and video conferencing service (see also Outila & Kiuru, 2021) was aimed at promoting the social connectedness and well-being of older people living at home in remote areas of Lapland. The NGO volunteer workers called the service users once a week, and during the call, a volunteer worker and service user exchanged news and memories. The service users were able to choose either a regular call or

video conferencing call. For the video conferencing call, the service users had a touch screen at home, and volunteer workers used a computer and camera placed in the NGO center.

Most recently, Shaw et al. (2017) have developed a conceptual framework for eHealth that suggests a practical guide for individuals and professionals in developing and integrating eHealth into health care and everyday lives. The framework includes the following overlapping domains of eHealth: "(1) health in our hands (using eHealth technologies to monitor, track, and inform health), (2) interacting for health (using digital technologies to enable health communication among practitioners and between health professionals and clients or patients), and (3) data enabling health (collecting, managing, and using health data)" (Shaw et al., 2017, p. 1). The strength of the framework is that although it highlights the benefits of using eHealth, it also provides tools for its critical evaluation, such as an evaluation of the privacy and safety issues of eHealth. The matter of storing digitalized client and patient data, in particular, has recently been under critical discussion (see Saranto et al., 2020; Zechner, 2019).

To summarize the purpose of eHealth services, they aim to support and facilitate health, well-being, and improved quality of the everyday lives of older people and their caregivers by improving the accessibility, quality, and affordability of social and health care services (Shaw et al., 2017; WHO, 2016, 2018). The current capabilities of different eHealth services outside clinical environments are not very different from existing daily devices like smartphones or computers (Kaija-Kortelainen et al., 2018; Leikas, 2017a; Van Aerschot & Parviainen, 2020). Thus, using eHealth services is largely based on internet usage skills (Elo et al., 2022). According to national reports (Hammar et al., 2017; Kaija-Kortelainen et al., 2018), the most commonly used home care technologies in the Finnish context are related to security solutions (e.g., security phones, door alarms), medication (e.g., medication dispensers and reminders), and communication (e.g., remote care or activation via tablet or computer). Some simple care robots, such as medicine-dispensing robots, robotic rollators, robotic spoons, or social robots, are used in the home care of older people by the caregiver or in interaction with the care-receiver or family member (Niemelä et al., 2021a). However, multitasking care robots including integrated robotics, automatism, and modern artificial intelligence are not seen as being very realistic in elder care in the coming years (Melkas et al., 2020; Saranto et al., 2020; Turja, 2020, 2021; Van Aerschot & Parviainen, 2020; Van Aerschot et al., 2020).

The incorporation of digital technology in the care of older people raises many ethical issues. The ultimate value premises for a review of eHealth should be the themes of human dignity and sustainable development, but not only through their threats (Leikas, 2017b; Niemelä et al., 2021a; Turja, 2021). One example of the diversity of eHealth ethics is health monitoring technologies, which raise the issues of privacy and autonomy (particularly among older people with dementia), but also

their possibility to support one's sense of security (Leikas, 2017b; Mittelstadt et al., 2011). Another example is future care robots (see Laitinen, 2020; Niemelä et al., 2021b; Turja, 2020, 2021; Van Aerschot et al., 2020; Vandemeulebroucke et al., 2018). The threats of care robots have been related to, for example, their cost, the reduction of human contact, and privacy and liability issues. In the best-case scenario, care robots will increase the diversity of care, reduce the need to travel, and still support human interaction and the independence of older people.

1.3 Digitalization of rural home care in Finnish Lapland

For the most part, the present research was conducted in rural Finnish Lapland. Finland is one of the most rural countries within the Organisation for Economic Cooperation and Development (OECD; 2008), and Finnish Lapland is the most northern part of Finland, where the population density is especially low and distances between services and residences may be long. Following the European Commission's rural–urban typology (Dijkstra & Poelman, 2018), Finnish Lapland is defined as a sparsely populated "predominantly rural, remote region" with a population density of less than 12.5 inhabitants per square kilometer. This means that the share of the population living in rural areas—that is, areas outside urban clusters—is higher than 50%, and less than half of the residents can drive to the center of a city of at least 50,000 inhabitants within 45 minutes. For comparison, an average population density in Finland is 18 inhabitants per square kilometer (Statistics Finland, 2021). Based on Statistics Finland (2019b), there are 177,500 inhabitants living in Lapland—that is, approximately 3.2% of the Finnish population. Before the year 2040, in Finnish Lapland, the number of older people (aged 65+) is expected to increase by 10.9%, and the working-age population (aged 15 to 64) is expected to decrease by 13.3%, which means that there will be more people to take care of and fewer caregivers in the future (Statistics Finland, 2019b). That kind of demographic change is a global phenomenon in both rural and nonrural regions (Raugze et al., 2017; United Nations, 2020); however, in Finnish Lapland, a comparatively high proportion of the population falls into older age groups (Keskitalo-Foley & Naskali, 2016).

Depopulation of rural areas in Finland has continued for several decades (Heleniak, 2014; Raugze et al., 2017), but hope is seen in the elderly population (Begum, 2019a; Jauhiainen, 2009; Kilpeläinen & Seppänen, 2014). Older people are likely to stay in the rural areas of Finland, and those who moved to larger, industrializing cities when they were of working age are considering moving back, full- or part-time, to their childhood regions after retirement (Jauhiainen, 2009; Kilpeläinen & Seppänen, 2014). Older people are attracted by the clean nature of rural areas and its impact on their well-being, its security, detached houses, lowering

housing costs, and the emotional bond to their home region (Begum, 2019a, 2019b; Jauhiainen, 2008; Kilpeläinen & Seppänen, 2014; Peltola & Sarala, 2014). However, although social communality in rural places is defined as a meaningful factor, family relations in the current living place may prevent older people from moving back to rural areas (Begum, 2019b; Jauhiainen, 2009; Kilpeläinen & Seppänen, 2014). In addition to long distances to relatives, the downsides of the daily life in Finnish Lapland are the availability and accessibility of both public and private services (Dobbs & Strain, 2008; OECD, 2008; Raugze et al., 2017; Sireni et al., 2017).

In rural areas, access to physical services is challenged by reduced service provision, vast geographical distances, limited public transportation, the necessity of private car use, and demanding weather conditions (Begum, 2019a; Dobbs & Strain, 2008; Kilpeläinen & Seppänen, 2014; Rehunen et al., 2012; Sireni et al., 2017). In terms of digitalized services, a lack of broadband connection or its unreliable operation affects internet access and secure use (Pyykönen & Lehtonen, 2016; see also Finnish Ministry of Finance, 2021; Kyytsönen et al., 2021; Sireni et al., 2017). Within Finland, Lapland has the most municipalities with an average travel time to the nearest health center of more than 15 minutes, while the travel time in the most northern part of Finnish Lapland is an average of 35 minutes (Sireni et al., 2017). The latest government plans, which include ideas for concentrating basic public services in major population centers, are feared to further reduce access to physical facilities for social and health care services particularly among low-income, vulnerable households in Finnish Lapland (Tennberg et al., 2020; Zechner, 2019). The reorganization of public health care, social welfare, and rescue services in Finland will come into full force in 2023 (Finnish Government, 2022); the reform aims to improve the customer orientation of social and health services by introducing digital and mobile social and health care services more widely (Finnish Ministry of Social Affairs and Health, 2020c). Begum (2019a) points out that living in northern rural areas should be secured by readily available health services and further improving alternative mechanisms, such as digital health care services.

Population aging shifts the demand of public services toward social and health care services, increasing their expenses and challenging the structure of the social and health care system (Kröger, 2019; OECD, 2008; Valokivi, 2019; Zechner, 2019). Hämäläinen and Reponen (2019) have clearly described the current legal and economic basis of the Finnish public and private health and social care system prior to the health and social services reform in 2023: the Ministry of Social Affairs and Health in Finland is responsible for social and health policy and preparing the legislation. Finnish legislation (e.g., Act on Health Care 1326/2010, Act on Primary Health Care 66/1972, Act on Specialized Medical Care 1062/1989, and Social Welfare Act 1301/2014) sets the overall structure for the social and health care services. The municipalities (n = 309 in Finland; Association of Finnish Municipalities, 2021) are responsible for organizing the public primary health care

services and the social care services for their residents, which are mostly funded by general tax revenues. In addition, the local health center may charge a reasonable customer fee (Finnish Institute for Health and Welfare, 2019). The public health and social care services purchase some services from the private sector (including NGOs). Additionally, private social and health care providers have occupational health care and private citizens as their customers, who are partially reimbursed by the National Social Security Fund. Municipalities form a hospital district (n = 21; Finnish Ministry of Social Affairs and Health, 2021a) responsible for providing public specialized medical care. There are two hospital districts in Lapland, each including one central hospital: Lapland Central Hospital in Rovaniemi and Länsi-Pohja Central Hospital in Kemi (Finnish Ministry of Social Affairs and Health, 2021a). Central hospitals are supported by regional hospitals.

In accordance with the quality recommendations of the Finnish Ministry of Social Affairs and Health (2020a), every municipality must have their own aging strategy. In addition to the recommendations, municipalities are bound by the Finnish elder care policy, along with a long-term care policy aimed at *aging in place*, user involvement, and responsibility, as well as a policy to reduce costs (Finnish Ministry of Social Affairs and Health, 2011; see also Kröger, 2019; Valokivi, 2019). The key themes of the national quality recommendations (Finnish Ministry of Social Affairs and Health, 2020a) include utilizing digitalization and technologies, developing housing and residential environments, and organizing and providing services and guidance for clients.

The legislation sets the guidelines for policy implementation (Valokivi et al., 2021). In terms of Finnish elder care policy, the Act on Supporting the Functional Capacity of the Older Population and on Social and Health Services for Older Persons (980/2012) is essential. Under this act, older people are entitled to receive services regarding their well-being, health, functionality capacity, and inclusion. Social and health services for older people arranged by municipalities include the following: prevention services and rehabilitation, service needs assessment, health services, services for war veterans, housing services, home services and home nursing care, institutional care, informal care, and memory rehabilitation (Finnish Ministry of Social Affairs and Health, 2021b; Hämäläinen & Reponen, 2019). With the present research focusing on the homes of older people, home services and home nursing are key for this research; these services aim to assist an older person when they require help at home and are usually combined into *home care services* (Finnish Ministry of Social Affairs and Health, 2021b, 2021c; Kröger & Leinonen, 2011).

Older people with a cognitive impairment—for example, memory disorder—are the largest group using home care services among older people in Finland (Rissanen et al., 2018; see also Kröger et al., 2018). Home care services are seen as particularly important for rural older people because they can often prevent or delay their relocation to urban centers, where social and health care services, especially specialized

medical care, are more readily available (Sims-Gould & Martin-Matthews, 2007). Based on an evaluation by an expert group of the Finnish Ministry of Social Affairs and Health (Rissanen et al., 2018) in Finnish Lapland, the coverage of older people's home care is in line with the national average. However, the national average has not progressed as intended, even though institutionalized elder care has decreased and the number of older people in need of care is increasing (Blomgren & Einiö, 2015; Forma et al., 2018). In Finnish Lapland, there is especially a need to increase the availability of 24/7 home care services and the number of nurses working in home care services, but long distances create challenges for the development of home care services and also increase their cost burden (Rissanen et al., 2018).

The integration of informal care into home care has been characterized as a major change in Finnish care politics in recent decades (Kröger, 2019; Kröger & Leinonen, 2011). Informal care within elder care services comprises informal care support—that is, a paid relative who provides care for an older person at home—and family care, which is non-paid assistance and support for the older members of a family at home (Hämäläinen & Reponen, 2019). Most assistance takes place outside of the paid contractual care (Kehusmaa et al., 2013; see also Ahosola, 2018). The role of informal care and help in enabling older people to *age in place* has come to the fore in recent years in Finland and other Western countries (Jacobs et al., 2018; Hirvonen, 2018; Kröger, 2019; Kröger & Leinonen, 2011; Milligan & Conradson, 2006; Sims-Gould & Martin-Matthews, 2007). The coverage of informal care in Finnish Lapland is above the national target (Rissanen et al., 2018). Here, Dutch research has shown that providing informal care is more common in rural areas than urban areas (Plaisier & de Klerk, 2015, as cited in Jacobs et al., 2018 Steenbekkers & Vermeij, 2013, as cited in Jacobs et al., 2018). On the other hand, in a rural context, intergenerational care may be challenged by the geographical distances and limitation of communication technologies (Aure, 2019). The results of Outila et al. (2019) suggest that the preferences of people living in northern Finland may differ significantly from political intention regarding end-of-life care: there are older people, especially those living alone, who prefer institutional settings, and there are those who prefer to remain at home but wish to be taken care of by formal caregivers.

The Finnish national strategy work for applying information technology to social and health care services has continued for the past 25 years (Hämäläinen & Reponen, 2019; Saranto et al., 2020). It is integrated with the "Information to Support Well-being and Service Renewal, e-health and e-social Strategy 2020" (2014–2020; Finnish Ministry of Social Affairs and Health, 2015) and Strategy 2030 (2019–; Finnish Ministry of Social Affairs and Health, 2021d). The strategic objectives by 2020 included, for example, the following:

> Citizens use online services and produce data for their own use and for that of the professionals; reliable information on well-being and services supporting

its utilization are available; and information on the quality and availability of services is available in all parts of Finland (Finnish Ministry of Social Affairs and Health, 2015, p. 10).

Additionally, the Finnish Ministry of Social Affairs and Health (2016) has prepared digitalization guidelines and conditions that are intended to support the implementation of the above strategies.

According to a national survey conducted in 2017 (Hyppönen et al., 2018; Hyppönen & Aalto, 2019; see also Kyytsönen et al., 2021) concerning citizens' use of electronic services (e-services) in the social welfare and health care sector, the use of e-services has increased in the past few years. The survey shows that two-thirds of citizens had used some of the available e-services, such as viewing personal patient data and requesting renewals of prescriptions. However, in the oldest age group of the survey (75+), two-thirds of the citizens had not used e-services at all, and one-third of them had used e-services, but not all independently. Citizens who responded to the survey experienced the following functions as the main benefits of the e-services: reminders of appointments, support for service selection, and time or money savings.

Although the use of different eHealth services is increasing, the integration of assisting eHealth services into the home care of older people seems to be rather slow (Ahmadinia & Eriksson-Back, 2020; Hyppönen et al., 2018; Van Aerschot & Parviainen, 2020; Vehko et al., 2019). For example, in 2015, practical nurses and nursing assistants in Finnish home care did not include any tasks related to digital health care technology in their daily routine (Kröger et al., 2018). In addition, in 2017, less than 1% of Finnish participants reported using eHealth services that would increase their security in living at home (Hyppönen et al., 2018). It is indicated that the availability and cost of the services and challenges in the attitudes of health care personnel slow the digitalization of home care and long-term care in Finland and Europe (Pihlainen et al., 2016; Rostgaard, 2021; Van Aerschot et al., 2020). However, according to recent research, there has been a positive turn in elder care workers' attitudes toward telecare robots over the past four years (Turja et al., 2021).

As a part of the National Program on Aging 2030 (Finnish Ministry of Social Affairs and Health, 2020b), a program called Technology Supporting Smart Aging and Care at Home (KATI; Finnish Institute for Health and Welfare, 2021) has aimed to reform new home living operating models and services by developing new technologies based on individual needs. As a counterbalance, as part of the Future Challenges in the Nordics research program, a project called Demography and Democracy – Health Aging in a Digital World (Sandberg et al., 2022) provides information to prevent the health inequalities and digital divide caused by digitalization among the aging population in the Nordic countries. The ongoing

projects show that despite the slow progress, the topic of eHealth among older people is now very relevant in the field.

1.4 Research aims and the research question

The general aim of the current dissertation is to explore eHealth use from the perspective of rural older people and their social networks in a complex learning and care ecosystem. The research addresses experiences in receiving and providing eHealth services in older people's everyday lives in Finnish Lapland. The empirical data building this understanding have involved different actors: nine professionals and seven older people acted as informants in the study. A systematic literature review, which consists of several older people and eHealth services, provides background information for the research topic.

In particular, the research aims to do the following:

1) increase the knowledge of digital competence in eHealth learning and use,
2) clarify in what way the learning process is part of eHealth service domestication,
3) construct a theoretical-conceptual model for eHealth learning and use, and
4) set development proposals for eHealth design and implementation.

To achieve the abovementioned aims, the current dissertation was guided by the following main research question: *How are older people's eHealth learning and use constructed in their everyday lives in rural areas?*

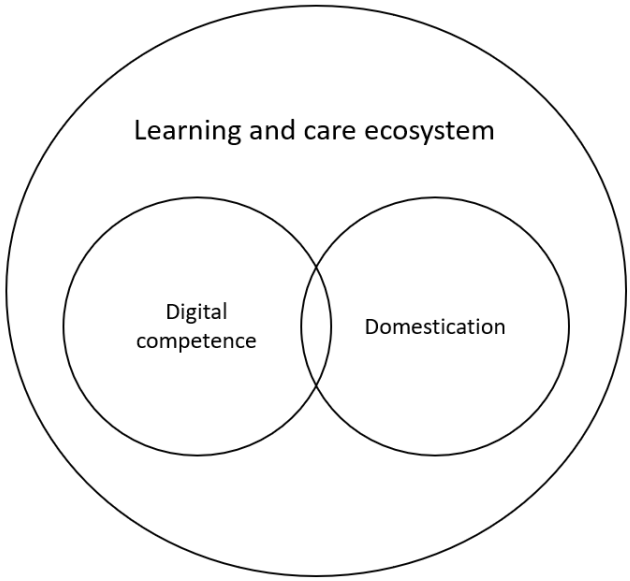
This dissertation consists of the present summary chapter and three substudies (I–III), each of which has contributed to the dissertation. The original article of each substudy has been attached at the end of the dissertation. The summary is composed of four chapters. After having presented the background and aims of the research, Chapter 2 is dedicated to the theoretical framework. Chapter 3 describes the methodological choices, research methods, data, and findings of each substudy. In Chapter 4, the overarching findings, concluding remarks, and new theoretical-conceptual model of eHealth learning and use are presented. Finally, practical and political implications and future directions are discussed, and the dissertation is evaluated.

2 KEY CONCEPTS AND THEORETICAL FRAMEWORK

The current research uses three theoretical approaches (Figure 2). First, I present a learning and care ecosystem that provides the basis for the research theory. It discusses older people's eHealth learning and use in practical, social, cultural, and symbolic contexts. The contexts are utilized as an analytical tool of the present research. Then, the theoretical concepts of digital competence and domestication of eHealth service focus on the process of how older people learn to use and use eHealth services in everyday situations.

Figure 2

Theoretical Framework of the Dissertation



2.1 eHealth use in a learning and care ecosystem

The concept of an ecosystem originally refers to the natural world and the interactions between living and nonliving organisms and their environment, stressing ecological phenomena as a systemic whole (Anker, 2002; Pickett & Cadenasso, 2002). The

ecosystem concept has often been used as a metaphor for quite diverse phenomena in different contexts (Pickett & Cadenasso, 2002; Valkokari et al., 2014), such as for actor networks formatted by stakeholders (e.g., Camarinha-Matos et al., 2015; Kaihovaara et al., 2017). The concept is derived from the natural sciences, where it was first articulated by the British botanist Arthur Tansley in 1935 (Anker, 2002). However, in the twenty-first century, interest in the concept of the ecosystem has become more widespread and more multidisciplinary (Virolainen et al., 2019).

Although each ecosystem is different and built from different starting points, they also have common, generally identifiable ecological principles, which can be summarized as follows (Kaihovaara et al., 2017; see also Kemmis & Heikkinen, 2012; Virolainen et al., 2019): (1) complexity and systemicity, (2) interdependence, and (3) life cycles and adaptability. These principles illustrate that the evolution of the ecosystem is not about linear processes but rather about complex and nested systems that are highly uncertain and unpredictable. Each actor in the ecosystem depends on other diverse actors in the ecosystem network. In other words, an ecosystem is more than just the sum of its parts, and the benefits of ecosystem success should be the common interest of all. Finally, ecosystems are not stable; instead, they are born, grow, develop, and die or regenerate. The ability to adapt to internal and external changes in the operating environment is a vital condition for the functioning of ecosystems.

The concept of the ecosystem is known in the educational as well as health and social care disciplines. However, it is new for research to combine the learning and care ecosystems into one ecosystem and one theoretical concept. There is no previous research literature on the learning and care ecosystem. Therefore, we will first look at the two concepts separately.

In the recent debate, education and learning ecosystems have been approached specifically from the perspective of digital, business, and innovation ecosystems (Virolainen et al., 2019). As a strength of the concept, Virolainen et al. (2019) emphasize how it shows the change in education and the importance and potential of informal learning of adults, while Gütl and Chang (2008) argue that at its best, the learning ecosystem can be seen as integrated activities that take place over the entire life cycle of the individual and is linked to other processes of daily life as well. At the national level, the political concept for learning that takes place through the life cycle is defined as *continuous learning* (Finnish Ministry of Education and Culture, 2018), and at the European level, it is defined as *lifelong learning* (Council of the European Union, 2018). Informal learning is an inseparable part of continuous learning (Park et al., 2021). In the current research, informal learning refers to learning that occurs on a need-based basis outside formal education in a variety of everyday situations, including leisure activities and the home environment, either as self-learning or in collaboration (Bora et al., 2019; Park et al., 2021). In the study by Gütl and Chang (2008), they examine different ecosystem-based theoretical models

for twenty-first-century learning environments and conclude that the following dimensions should be considered in a modern learning ecosystem: (1) the learning content, (2) the learning process, (3) the learning community, (4) the organizational aspects, and (5) the technological aspects.

The care ecosystem enables the integration of social and health care and formal and informal care instead of the traditional division between them (Camarinha-Matos et al., 2015). Indeed, several care ecosystems are based on the integration of different services. Camarinha-Matos et al. (2015) have formulated a care services ecosystem for ambient assisted living that includes senior citizens and a combination of their formal and informal care networks. Merrilees et al. (2020) understand the care ecosystem as a dementia-capable model providing care for people with dementia and their caregivers. Here, the care team includes a multidisciplinary team of different clinicians with dementia expertise. Kaihovaara et al. (2017) have studied health technology ecosystem actors in the Helsinki metropolitan area. The ecosystem encompasses a wide variety of actors, including companies, business services, the city, finance (e.g., investors), pilot platforms (e.g., public services, elder care), universities, research institutes, and other actors. Van Aerschot and Parviainen (2020) explore care robotics in the framework of the care ecosystem. By using the framework, they want to emphasize that care is given and received "as part of complex practical, material, emotional, and social dynamics and interdependencies" (Van Aerschot & Parviainen, 2020, p. 253). In addition, they underline local and global political, economic, and ecological realities when organizing care and producing technological commodities. Several recent innovations of eHealth ecosystems can be found: for example, Gracía-Holgado et al. (2019), Oberschmidt et al. (2022), Schiza et al. (2019), and Zemrane et al. (2020). However, none of these technology-related care ecosystem proposals include a perspective of learning digital competence.

According to Virolainen et al. (2019), examining learning in an ecosystem highlights and enables the perception of the complexity of the links between actor units, potentially setting aside specific cultural features of actor units. The same phenomenon is also recognizable for care ecosystems: either examining the cultural context is not central for the research, or the research does not clearly define the meaning of culture in the ecosystem. However, the following frameworks show the need to address the cultural context as part of the new learning and care ecosystem. Väljataga et al. (2020) conceptualize a higher education institution as a socio-technical learning ecosystem consisting of mutually interacting (1) tools, services, digital resources, curricula, and policy; (2) coexisting communities of users (e.g., learners and experts); and (3) social, economic, and cultural environments. Sims-Gould and Martin-Matthews (2008) studied rural home care in a human ecological framework by focusing on dimensions of the environment, relationships, and person—both the care provider and receiver perspectives—by

embedding their framework within larger socioeconomic, cultural, and political contexts.

In light of the concepts of domestication and digital competence, the integration of the cultural context in the learning and care ecosystem is required. The framework of Silverstone et al. (1992; Silverstone & Haddon, 1996) takes into consideration the ICT users themselves, as well as the cultural and social processes of eHealth domestication (see also Hartmann, 2020). Several previous studies emphasize the importance of understanding the social and cultural aspects of digital competence (Lipponen, 2007, 2010; Olsson & Viscovi, 2018; Rasi & Kilpeläinen, 2015) and the health literacy (Sentell et al., 2018) of older people and other age groups.

As an educational researcher, I form a new theory that connects these two separate concepts, and for the first time examine care ecosystems from the perspective of learning. By doing so, I want to indicate and emphasize that the investigated eHealth services are services that require learning from both older people (Hyppönen & Aalto, 2019; Kaihlanen et al., 2021) and professionals (Valenta, 2013; Valenta et al., 2013). In the present research, the new concept of the learning and care ecosystem is understood as the care environment where learning occurs and becomes visible through concepts of digital competence and eHealth domestication.

Here, eHealth use in the learning and care ecosystem will be studied within larger practical, social, cultural, and symbolic contexts. The selected key contexts are used as an analytical tool for this research. They are needed to get attached to and to brighten the new concept of the learning and care ecosystem. In addition, the key contexts best serve the dialogue between the learning and care ecosystem and the concepts of digital competence and domestication of eHealth services. Furthermore, they help to construct the findings of the present research as a theoretical-conceptual model for eHealth learning and use. The four key contexts were chosen based on the previous research literature and preliminary analysis of the overarching findings of the present research. The starting point of the design for the key contexts of the learning and care ecosystem has been the study of Van Aerschot and Parviainen (2020) and their observations related to social, emotional, and practical contexts. Instead of an emotional context, the concept of a symbolic context was chosen because it was perceived as a broader concept that better serves this research (Søraa et al., 2021). In addition, as a fourth context of the learning and care ecosystem, a cultural context was added because it was deemed necessary based on the above discussion.

Next, I define how the key analytical contexts are understood in the present research; they are summarized in Table 1. Despite their precise definitions, the contexts are closely related to each other and, to some extent, also overlap. They should be seen as interconnected and complementary perspectives.

Table 1

Summary of the Key Analytical Contexts of the Learning and Care Ecosystem

Practical	Pattern of usage that guides older people's eHealth learning and use, emphasizing physical interaction with the technology.
Social	Interaction of the learning community and social meaning of eHealth services.
Cultural	Older people's eHealth learning and use in their everyday lives as a culturally constructed activity.
Symbolic	Meanings and emotions assigned to eHealth learning and use.

Practical context. In the present research, according to Frennert (2016), the practical context of the learning and care ecosystem refers to "the context of use and the rules and procedures that prohibit or guide the user into a given pattern of usage" (p. 99; see also Søraa et al., 2021). For the current dissertation, this includes the barriers, challenges, and enablers that affect the daily usage of the eHealth services. In the practical context, the practical capabilities of eHealth services, their physical appearance, and users' physical interactions with them are emphasized (Frennert, 2016; Søraa et al., 2021; Van Aerschot & Parviainen, 2020). The practical context has a strong connection with the social context and emotions of the symbolic context (e.g., Korjonen-Kuusipuro & Saari, 2021).

Peek et al. (2014) have shown that multiple factors influence (positively or negatively) the acceptance of technology for *aging in place* at a stage when technology has not yet been used. Some of these factors are persistent, continuing after the user has experienced the technology, while new factors also emerge. A Finnish survey (Hyppönen et al., 2018; Hyppönen & Aalto, 2019) of citizens' experiences of national e-services in the social welfare and health care sector shows that the most significant barriers of uptake and use were the quality, availability, and accessibility of e-services and citizens' trust in and attitudes toward the use. Older people generally have positive attitudes toward technology and a willingness to learn new things, such as new technology (Boulton-Lewis, 2006; Fischer et al., 2014; Yusif et al., 2016). The findings from previous literature reviews on the factors influencing the acceptance and use of eHealth among older people are very diverse and depend on the included technologies and emphasized perspectives. However, the following unifying factors can be identified: expected benefits of the technology, need for technology, self-efficacy, social network support, and concerns related to privacy, usability, and cost (Fang et al., 2018; Kampmeijer et al., 2016; Peek et al., 2014; Spann & Steward, 2018; Yusif et al., 2016). *Self-efficacy is "skills and confidence*

in using new media technologies" (Livingstone et al., 2005, p. 6). Peet et al. (2014) have found a correspondence between an older person's housing type and the technology influencing its acceptance. Spann and Steward (2018) note that older people expressed their preference for inconspicuous health care technology.

Previous studies (Fang et al., 2018; Kempmeijer et al., 2016; Peek et al., 2014; Spann & Steward, 2018) have found that usability as a facilitating factor of older people's eHealth use was often associated with the ease of use of eHealth. In addition, technical problems with the device or internet have been a threat to usability in those studies. Based on the definition from the international standards for the ergonomics of human–system interaction (ISO 9241-11, 2018), *usability* refers to the extent to which a service "can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (Introduction section, para. 2).

Social context. An essential feature of ecosystem thinking is collaboration and networks (Kaihovaara et al., 2017; Saranto et al., 2020; Van Aerschot & Parviainen, 2020), which in the current study are addressed through a social context. The social context of the learning and care ecosystem is understood as older people's participation in culturally constructed social networks (Lipponen, 2007, 2010). These social networks are made up of a combination of three different actors: warm experts (Bakardjieva, 2005), professionals, and eHealth technologies. However, they become different for each service user, and not all actors are always included. The older eHealth service user, together with his/her social networks, constructs a learning community, which refers to the sense of community as a place to connect with each other, learn, train, and receive support related to eHealth services (Gütl & Chang, 2008; Morales et al., 2019; Sarnok et al., 2019). Whereas the use of eHealth requires the learning of different competences (see Rasi et al., 2020; Sentell et al., 2018), it may also require support from broad and multitalented social networks of older people (e.g., Damodaran & Sandhu 2016; Ng, 2007; Sentell et al., 2018). In addition to the independent use of digital services, older people use them through shared use, assisted use, and on-behalf-of use (Hänninen et al., 2020; Hänninen et al., 2022).

Professionals who participate in older people's eHealth learning and use are usually different actors from their formal care network (Hirvonen, 2018; Jacobs et al., 2018; Kröger & Leinonen, 2011; Vehko et al., 2019). In addition to publicly and privately paid professionals, volunteer workers can be included (Jacobs et al., 2018; Kröger & Leinonen, 2011). It is also common for eHealth service providers to provide technical support for eHealth users (e.g., Costa et al., 2017; Evangelista et al., 2015). In the current research, professionals are defined as those individuals who, through their work or volunteer work, are required to support and assist home care clients in the use of eHealth technologies. These individuals include different health care professionals, technical professionals, and volunteer workers. According

to Elo et al. (2022), with the advent of digital technology for care, professionals have a new role as instructors and support for learning. They claim that eHealth services somewhat change professionals' roles and learning needs in the social and health care sectors.

In previous research, nonprofessional experts who help less experienced people use ICTs by providing personal support are called *warm experts*, after Maria Bakardjieva (2005; see also Hänninen et al., 2022; Rasi & Taipale, 2020). In addition to children, spouses, or grandchildren, friends and neighbors have been identified as warm experts (Heart & Kalderon, 2013; Ng, 2007; Olsson & Viscovi, 2018; Rasi & Kilpeläinen, 2015; Taipale, 2019). In the current research, warm experts (Bakardjieva, 2005) are understood as spouses, other family members and relatives, friends, and neighbors who provide support related to eHealth service learning and use. While providing support for eHealth service learning and use, they may also interact with the older person outside the learning community in relation to other parts of everyday life and care, for example, by providing informal care (Hämäläinen & Reponen, 2019).

The special aspect of support provided by warm experts is that in addition to technical skills, they can utilize the information they have from their family member, thus providing support for older people in a more personal way (Bakardjieva, 2005). Olsson and Viscovi (2018) found that warm experts support ICT service users from the moment the need for the ICT use is noticed until the service user has learned to use the technology, and they continue to support the service user by solving technical problems that arise. The complexity of a new digital technology specifically maintains the need for support from warm experts (Hänninen et al., 2020). Warm experts' role is emphasized in the ICT use of older people, for example, because it is easy-to-reach, cost-effective support compared with professional support (Taipale, 2019).

The concept of warm experts (Bakardjieva, 2005) touches on the topic of intergenerational learning—that is, the exchange of knowledge, skills, competence, attitudes, and perspectives across generations (Schmidt-Hertha, 2014; Schmidt-Hertha et al., 2014; see also Martínez & Olsson, 2022). Intergenerational learning is often associated with lifelong learning, and it enables learning in both directions, from younger to older generations and the other way round (Boström & Schmidt-Hertha, 2017). In the present research, the concept of warm experts (Bakardjieva, 2005) does not focus only on intergenerational relationships but rather on all informal relationships around eHealth learning and use. Moreover, it unilaterally emphasizes older people as a party in need of help and care, as opposed to the concept of intergenerational learning.

I recognize the problematic nature of the concept of warm experts. By using the concept, I do not want to underestimate the ability of professionals to provide "warm" care and help for older people, nor do I consider the support provided by warm experts to be unconditionally "warm." Previous research on the role of warm

experts in ICT use merely focuses on everyday technology use, such as cell phones and computers (Bakardjieva, 2005; Hänninen et al., 2020; Taipale, 2019; Olsson & Viscovi, 2018), not for the utilization of new kind of technologies such as health-related ICT use. The present research provides a new perspective on the role of warm experts in eHealth service learning and use among older people.

Support from warm experts has been found to be especially essential for rural older people (Fang et al., 2018; Heart & Kalderon, 2013; Ng, 2007; Peek et al., 2014; Rasi & Kilpeläinen, 2015; Spann & Stewart, 2018; Steenbekkers & Vermeij, 2013, as cited in Jacobs et al., 2018). However, it is not always problematic either. The support of warm experts is challenged by the shrinking size of the social networks of older people (Formosa et al., 2014; Hänninen et al., 2020; Olsson et al., 2019) and geographically distributed families (Formosa et al., 2014; Taipale, 2019). Warm experts may live too far away (Hänninen et al., 2021) or seem too busy to help (Rasi & Kilpeläinen, 2015). Some older people do not want to burden their loved ones with their digital problems (Hänninen et al., 2021) or feel that they are advising them too fast and in a hurry (Colombo et al., 2018). On the other hand, typically, only one or two family members at a time are acting as a warm expert for the older ICT user, so there is no need for an extensive social support network related to digital technology use (Taipale, 2019). It is interesting that, in general, health care professionals have reclaimed older rural residents' trust (Hirvonen, 2018; Sireni et al., 2017), but when it comes to support in ICT learning and use, older people trust more in family and friends than professionals, including service providers and health care professionals (Nguyen et al., 2015). It remains to be studied which support older people will trust and rely on for eHealth service learning and use.

It is less common that researchers will define an active, even caring role for eHealth technologies. Sparrow and Sparrow (2006) have even been very critical of the capacity of care robots to meet the social and emotional needs of older people. Van Aerschot and Parviainen (2020), however, argue that the potential of care robots in a care ecosystem should be evaluated. From their point of view, with the limits set by the current eHealth development, robots may support the human actors of the care ecosystem by offering help for single instrumental tasks related to basic care needs, such as medication. Pols (2012) launched the concept of *love for the device*, which describes a caring relationship between a human and device. In her research, an older person describes a telecare system at his home as a friend and pet, which has the time for him, unlike busy doctors. The findings of Søraa et al. (2021) support this claim that eHealth technology may have a social meaning in the learning and care ecosystem.

Cultural context. The concept of culture can be characterized as very broad. According to the UNESCO (United Nations Educational, Scientific and Cultural Organization) Universal Declaration on Cultural Diversity (2001, p. 3), "Culture should be regarded as the set of distinctive spiritual, material, intellectual and

emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs." In the present research, the cultural context of the learning and care ecosystem focuses on the cultural identity of Lappish older people, their life cycle, and their cultural values in relation to their eHealth service and other digital technology learning and use. An important perspective of the research is to understand how Lappish older people culturally shape eHealth services. This point of view emphasizes the role of tools in human actions, connecting it to how older people understand eHealth and how they take these services into their everyday lives (Haddon, 2011; Hakkarainen, 2012; Lipponen, 2007, 2010; Olsson & Viscovi, 2018).

The present research is highly culture-specific, focusing on eHealth learning and use in Finnish Lapland. The perspective is especially needed because more country-specific studies on technology domestication are aimed for (Haddon, 2011). However, it must be kept in mind that in terms of digital competence and ICT use (Damodaran et al., 2014; Hänninen et al., 2020, 2021; Ofcom, 2019; Statistics Finland, 2020), as well as living in rural cultures (Keating & Phillips, 2008; Rasi & Kilpeläinen, 2015), older people are a very heterogenous group, and for that reason, Lappish older people cannot be generalized. Rasi (2018; Hakkarainen, 2012; Rasi & Kilpeläinen, 2015) focused several research projects on the digital competence of older Lappish residents. The findings reveal that Lappish older people include both internet and computer users and nonusers—that is, people who do not use digital technology. However, the division into users and nonusers is a bit problematic. First, the term *nonusers* can be characterized as too broad, including the different variations of people who have never used digital technology, to those who have used it but later stopped the use, to those who have made their decision consciously of their own will, to those who have not (Rasi, 2018). Second, the division of older people into digital technology users and nonusers can be described as insufficient because the way of using digital technology is rarely exact, and virtually every person needs intermittent digital support, regardless of their age or activity (Hänninen et al., 2022; Taipale, 2019).

The cultural context of the learning and care ecosystem includes the concept of the life cycle. The life cycle is one of the key ecological principles of the ecosystem (Gütl & Chang, 2008; Kaihovaara et al., 2017; Saranto et al., 2020; Virolainen et al., 2019), and that is why I have chosen to use this concept instead of the concept of the life course according to the discipline of social sciences (e.g., Elder et al., 2003; Mayer, 2009). It is important for the life cycle in the ecosystem to make use of existing resources and build new ones upon them (Kaihovaara et al., 2017). In the present research, the life cycle suggests that the learning and use of eHealth is constructed through older people's previous media-related practices and experiences and their cultural-historical knowledge and skills (Lipponen, 2007, 2010; Schäffer,

2007). In terms of culture, older people approach new technologies by applying what they have learned before and up to the present moment (Boulton-Lewis et al., 2006; Schäffer, 2007; Spann & Stewart, 2018; Suopajärvi, 2015). Age and affiliation are found to be the most significant predictors of whether the person is familiar with the new technology and how s/he uses it (Schäffer, 2007). From another point of view, older people's tools for using new technologies are built on their cultural-historical knowledge and skills (Lipponen, 2007). In terms of eHealth technologies, for example, to make a medication-dispensing robot function in the older person's everyday life, the older user does not have to understand all of the details included in the service or device. Instead, the older user will get to know the device when using it. Sometimes, the logic learned in the past can also lead to misunderstandings with new digital technologies (Schäffer, 2007; Suopajärvi, 2015).

Finally, the meanings of eHealth are constructed through cultural values (Zimmerman Umble, 1999). Political debates on the care of older people (Finnish Ministry of Social Affairs and Health, 2015, 2020a; Kröger & Bagnato, 2017; Rostgaard et al., 2011) and previous research on rural home care (Sims-Gould & Martin-Matthews, 2008) emphasize the independence and autonomy of older people beyond other cultural values. However, independence should not be confused with loneliness—that is, "a subjective state of distress because of self-perceptions of being lonely or not belonging" (Alpert, 2017, p. 250)—and I argue that the values of togetherness, belonging, and participation of rural older people (Damant et al., 2017; Leikas, 2017b; Nyman & Isaksson, 2015; Tennberg et al., 2020) should also be included in the discussion of cultural values, here in terms of eHealth learning and use.

Symbolic context. In the present research, the symbolic context considers different meanings and emotions assigned to eHealth services and their learning and use in the learning and care ecosystem. "Symbolic" was seen as the best common denominator for these factors, according to Søraa et al. (2021). The interpretation of meanings is a central part of the concept of technology domestication (Haddon, 2011; see also Frennert, 2016; Hartmann, 2020; Søraa et al., 2021; Talsi, 2014). In this concept, meanings are understood as what technology means to a person in his/her everyday life (Haddon, 2011), but also more in-depth as the silent part of a culture, reflecting the individuals' values, thoughts, emotions, and ways of seeing the world (Gubrium & Holstein, 2000; Haddon, 2011; Talsi, 2014; Zimmerman Umble, 1999).

The emotional features have a strong sociocultural connection (Rinne et al., 2020; Stets & Turner, 2005; UNESCO, 2001), and from a cultural point of view, emotions are always a context-specific set of meanings (Korjonen-Kuusipuro & Saari, 2021; Povrzanović Frykman, 2020). Based on Talsi (2014), all technological choices, which would include eHealth services, are colored with emotions. Previous research has shown that learning to use and using eHealth may cause a wide range of negative emotions for older people, such as anxiety, fear, shame, and dislike

toward the technologies (Korjonen-Kuusipuro & Saari, 2021; Spann & Steward, 2018; Urban, 2017). The negative emotions of older people are often connected to their uncertainty regarding the use of eHealth technologies and in relation to aging stereotypes (Spann & Stewart, 2018; Urban, 2017), while competent use of eHealth technologies can reduce negative emotions (Spann & Stewart, 2018). Negative emotions can be a barrier to learning and using digital services and, thus, a barrier for their human agency (Korjonen-Kuusipuro & Saari, 2021; Rasi & Kilpeläinen, 2015). From a positive perspective, previous studies have indicated that the use of eHealth technologies promotes the emotional well-being of older people by, for example, mitigating distress, reducing loneliness, and fostering new social relationships (Antunes et al., 2019; Chen & Schulz, 2016; Villani et al., 2018). Van Aerschot and Parviainen (2020) consider emotions related to eHealth services through social care robots. The objective of social care robots is to build an interactive, emotional bond with the care receivers (see also Turja, 2020; Turja et al., 2020; Turkle, 2011).

To conclude the analytical contexts of the learning and care ecosystem, older people's eHealth learning and use do not happen in a "vacuum," "detached from other people and cultural artefacts" (Lipponen, 2010, pp. 52–53). Instead, older people's eHealth learning and use can be characterized as a culturally situated and distributed joint activity with existing professionals, warm experts, and eHealth technologies (Damodaran & Sandhu, 2016; Lipponen, 2007, 2010; Olsson & Viscovi, 2018; Rasi & Kilpeläinen, 2015; Sentell et al., 2018). Practical and symbolic contexts are an essential part of the learning and care ecosystem that bring out important details that help deepen and further the understanding older people's eHealth learning and use in their everyday lives.

2.2 Digital competence of older rural eHealth users

In the present research, the concept of the digital competence of older people refers to their ability to learn to use eHealth technologies in their everyday lives. A few Finnish studies have investigated the connection of digital competence on eHealth service use. According to Hyppönen and Aalto (2019), the most important predictor of the use of digital social and health care services is the user's digital competence. Heponiemi et al. (2022) have found that with digital competence, it is possible to curb the decrease in the use of eHealth services caused by aging until around the age of 80. Insufficient digital competence makes it difficult to use, or can even prevent, the use of remote services and the ability to benefit from them (Kaihlanen et al., 2021). Rasi and Kilpeläinen (2015) argue that Lappish rural older people's digital competence is mutually diverse and very much distributed with family and informal networks. The role of digital competence in Lappish rural older people's everyday

lives is mainly small and based on need-based ICT use (Rasi & Kilpeläinen, 2015). When it comes to eHealth service use, rural older people see them as undeniable solutions for their everyday life and are prepared to learn to use them (Lindberg & Lundgren, 2022).

The DigComp framework (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022) is divided into five different competence areas, in which each citizen has a need for digital competence: (1) information and data literacy, (2) communication and collaboration, (3) digital content creation in different formats, (4) safety, and (5) problem solving. The Council of the European Union (2018) counts digital competence as a Key Competence for Lifelong Learning. In addition to the abovementioned competence areas, they include (6) media literacy, (7) intellectual property-related questions, and (8) critical thinking in digital competence. The competence areas of digital competence demonstrate that digital competence overlaps with several background disciplines and related concepts, such as information, data, and media literacy (Ilomäki et al., 2011; Ilomäki et al., 2016; Lantela, 2019; Rasi & Taipale, 2020). One literature review (Oh et al., 2021) reveals that the digital competence areas among older people have been measured using different instruments, of which the eHealth Literacy Scale (eHEALS) has been the most frequently used. The same literature review shows that *safety* is the least measured digital competence area among older people.

When applying the DigComp framework to eHealth services, the digital competence of older people can be understood as follows (see Rasi-Heikkinen & Airola, 2022):

- search, critically evaluate, and manage health data, information, and digital content, and identify the values, perspectives, and purposes behind the information (information and data literacy [1], media literacy [6], critical thinking [8]);
- interact through digital technologies with health service personnel and peers and share data, information, and digital content related to one's health (communication and collaboration [2]);
- create and edit digital content for one's personal health for distribution to either a limited or unrestricted audience, here in different formats and also considering intellectual property–related questions (digital content creation [3], intellectual property–related questions [7]; see Kivinen, 2019);
- protect one's devices, health data, privacy, and personal health and well-being (safety [4]); and solve technical problems in the use of eHealth, identify needs for eHealth, use eHealth creatively, and identify one's digital competence gaps (problem solving [5]).

However, digital competence alone is not enough for the successful use of eHealth services. Because of the complex nature of eHealth services, in addition to digital competence, the eHealth use of older people requires support to and learning

of competences and literacies that are medical and administrative (Rasi et al., 2020; Sentell et al., 2018). It also requires becoming eHealth literate—that is, "the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem" (Norman & Skinner, 2006, eHealth Literacy Model section, para. 1). It is known that age and education are connected to eHealth literacy (Eronen et al., 2019, 2021; Neter & Brainin, 2012), and that eHealth-literate people tend to be younger and more educated (Neter & Brainin, 2012). Because of the rapidly changing and evolving nature of eHealth services, new competence areas to be included in digital competence will arise. For example, simple care robots already appear in elder care, and many expectations have been placed on their development (Van Aerschot & Parviainen, 2020; Van Aerschot et al., 2020), which is why robot literacy—that is, the abilities and competences to understand and interact with robots—has been proposed as a new concept of media literacy (Suto, 2013; Suto & Sakamoto, 2014).

Despite the multidimensionality of the concept of digital competence, two deficiencies can be recognized from the perspective of older eHealth service users (Rasi-Heikkinen & Airola, 2022). First, the DigComp framework (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022) emphasizes digital competence in the working life and school contexts, which indicates that the framework is intended to apprise the competence of citizens in formal education and among those who are not yet retired. Despite latest update for the framework (Vuorikari et al., 2022), which highlights contemporary themes in the digital world, it lacks an assessment of the digital competence of older people using digital health care services. It would be desirable if the DigComp framework would more prominently adapt the lifelong learning perspective called for in other European Union (Council of the European Union, 2018) and OECD-level (OECD, 2019) policy papers. However, according to Oh et al. (2021), when compared with other similar frameworks (e.g., Fraillon & Ainley, 2013; OECD, 2012), the DigComp framework is the most generalizable across different age groups. Valenta (2013; Valenta et al., 2013) modified the framework for care workers and caregivers in home care (CARER+ Digital Competence Framework) to improve the quality of life of older people. Experts who shared their views on digital competence in the care sector for the CARER+ framework expressed that because of the rapid development of eHealth, digital competence among professionals is needed in the elderly care sector (Valenta et al., 2013). Second, the DigComp framework can be criticized for being individual-centric and decontextualized, not considering the contexts in which people live, such as taking into account the sociocultural point of view for digital competence and ICT use (Rasi & Kilpeläinen, 2015; see also Lipponen, 2010; Olsson & Viscovi, 2018; Sentell et al., 2018).

The concept of digital competence has been characterized as a relatively new, broad, and loose concept, which has initially become familiar as a political concept

at the European and global levels in the twenty-first century (Ilomäki et al., 2016; see Ala-Mutka et al., 2008; OECD, 2019; Punie, 2007). Comparing digital competence with media education, for example, which dates back to the 1920s, helps better outline its novelty (Fedorov, 2008). In educational research, the use of concept of digital competence is constantly increasing, but the definition is not yet well established (Ilomäki et al., 2016). However, the concept has potential as a boundary concept in cooperation between policy makers, practitioners, and researchers (Ilomäki et al., 2016), which is why I use it in the present research. By using the concept, I can better bring to the discussion its areas of development and the potential of the framework for evaluating and improving the digital competence of older eHealth service users. However, I will integrate the concept of digital competence with the framework of the learning and care ecosystem to better understand older people's eHealth learning and use in the complex dynamics of their everyday lives. The concept of digital competence has been used as a theoretical concept in all the substudies of the dissertation.

2.3 Domestication of eHealth services

The concept of domestication takes into consideration of the personal, cultural, and social process of adoption, use, and nonuse of ICTs, but also "what technologies and services mean to people, how they experience ICTs, and the role that these technologies can come to play in their lives" (Haddon, 2011, p. 312; see also Hartmann, 2020). In other words, although the main research interest is ICTs, the domestication framework also focuses on everyday life and routines around and behind technology. The concept was chosen as part of the theoretical framework of the present research because of its multidimensional approach and its inherent way of integrating the sociocultural perspective into a new technology adoption and use. The well-structured label of the domestication process (Hynes & Richardson, 2009) enables a better understanding of eHealth use in the complex structures of the learning and care ecosystem. In addition, the concept's possibility to observe the development of users' skills, competences, and literacies (Silverstone, 2006) supports a dialogue with the concept of digital competence (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022). The concept of domestication has been used as a theoretical concept in all the substudies of the dissertation.

The concept of domestication has its origins in anthropology (e.g., Douglas & Isherwood, 1980) and consumption studies (e.g., McCracken, 1990). The contemporary British version of the concept of domestication was formed at the start of the 1990s based on Silverstone et al. (Silverstone et al., 1992; Silverstone & Haddon, 1996). Hartmann (2020) introduced a Nordic (including Finland) domestication approach, which originated at the same time as the British version

but has its own, extended interpretation of the concept. The present research has features of the Nordic domestication approach while also respecting the original model of domestication. According to Hartmann (2020), the special features of the Nordic domestication approach are the following: (1) The concept can be applied to any kind of technology, not just media technology (Hartmann, 2020). (2) It emphasizes the role of the users and their values in the domestication, in and after the design process of technology (e.g., Routarinne & Redström, 2007). (3) In addition to individual and group levels, it considers the societal level of the domestication process. This is reflected in, for example, the discussion on feminism and technology (Berg & Lie, 1995), the importance of infrastructure for the domestication process (Sørensen, 1994), and energy consumption as part of the domestication discussion (e.g., Jensen et al., 2009; Juntunen, 2012). (4) It brings up the ethical implications of domestication, connecting it to the societal discussion of domestication processes (Hartmann, 2020).

Although the term *domestic* refers to a household environment, the concept can also be applied to other areas of everyday life, focusing on people in different life stages (Hartmann, 2020; Hynes & Rommes, 2006), such as in investigating how university students domesticate their laptops on a university campus (Vuojärvi et al., 2010) or the domestication of digital media in a children's leisure-time center (Martínez & Olsson, 2020). However, in the current research, I focus on the home environment, where older people spend the majority of their time and where they primarily want to grow old (Gitlin, 2003; Liu et al., 2016). Nevertheless, social networks of older people outside the home environment have been considered. This responds to the discussion of the traditional domestication concept that has been criticized for being too home-centric, disregarding wider social networks beyond the home (Haddon, 2011).

To utilize the concept of domestication to study the use of eHealth services by older people is not new, although previous studies lack the learning perspective. Other than that, a similar research design to that of the present research can be found, for example, in the study of Nimrod and Edan (2022), who explored the domestication of voice-assistance among community-dwelling women 75 years and older; the study of Søraa et al. (2021), who emphasize the social dimension of domestication of care robots in the homes of older people in a socio-technical ecosystem; the doctoral dissertation of Frennert (2016), who studied the domestication of robots in the everyday lives of older people in three different case studies; and the study of Aceros et al. (2015), who conducted an ethnographic study on home telecare domestication in later life.

Common to the previous studies mentioned above is that they demonstrate that the process of eHealth domestication in later life is not a homogenous process among older people using different eHealth services. In Nimrod and Edan's (2022) study, this was shown to varying degrees of eHealth domestication: broad, focused, and

restrained. The study of Frennert (2016) demonstrated that older people's individual domestication processes of eHealth services are shaped through negotiations with other people, other technologies, everyday life practice, society, and in relation to and with the eHealth and the user. Søraa et al. (2021) presented that the domestication of the same eHealth service into heterogenous homes is possible through the ontological reorganizations of different modes of operation, for example, different symbolization. Based on Aceros et al. (2015), eHealth domestication tries to shape older people into a certain type of user, but the risk is that instead of older people domesticating the eHealth, eHealth domesticates the users, keeping them *staying at home* instead of actively *aging in place*.

However, the concept of domestication does not have an educational background, and for that reason it has not previously been examined from the perspective of learning digital competence. Rasi-Heikkinen (2022) brought up that the perspective of learning, and thus the actual learning processes, have so far been largely ignored in the research of domestication. Søraa et al. (2021) recognize cognitive domestication, by which they refer to "how users learn from and through technology" (p. 4); however, they do not focus on how users learn *to* use technology. Thus, I agree with Rasi-Heikkinen (2022) that an approach that recognizes the domestication process as simultaneously a learning process seems justified. This research brings new knowledge on how digital competence and learning are part of eHealth domestication.

The domestication process of new technologies has been traditionally built upon four phases or dimensions: appropriation, objectification, incorporation, and conversion (e.g., Hynes & Richardson, 2009; Hynes & Rommes, 2006; Silverstone, 2006). Hynes and Richardson (2009) describe that the dimensions are not discrete, and neither do they occur within linear or closed processes. Additionally, over time, the reassessment of technology can happen, and uses can change or end (Hartmann, 2020). In several previous studies (e.g., Carter et al., 2013; Nimrod & Edan, 2021; Scheerder et al., 2019), as well as in substudies I and II, the dimensions of domestication are used to structure the analyses and findings of technology adoption and use. In the present research, the learning process is not separate from these dimensions, nor is it a synonym for domestication, but it is simultaneously included in them (Rasi-Heikkinen, 2022).

Appropriation is the first phase of the domestication process, where a potential technology user decides to acquire new technology or not and, in this way, becomes a user or nonuser (Hynes & Richardson, 2009; Hynes & Rommes, 2006; Sørensen, 2006). Hynes and Rommes (2006) call attention to the fact that in many cases, it is not actually the user who decides that a technology is appropriate for the household; however, they expect that the decision will be made by some of the family members. When we talk about older eHealth service users, it might be someone outside the household, such as a daughter or nurse, who decides that the technology will be

appropriated. Regardless of who makes the final decision, as the person becomes a user, the technology becomes a private, domestic object (Hynes & Richardson, 2009). As Silverstone (2006, p. 234) puts it, "Machines and services do not come into the household naked," which means that the user always has expectations, both good and bad, about the new technology. During appropriation, the public meanings of the commodity start to transform into more personal meanings (Hynes & Rommes, 2006). In the appropriation and conversion dimensions, the symbolic meanings of technologies are emphasized.

During the *objectification* and *incorporation* dimensions, the material meanings of a technology are central. In objectification, the spatial aspect of the domestication process is essential because the technology is given a physical location in the environment, which, in the present research, is in the home (Hynes & Richardson, 2009; Hynes & Rommes, 2006). In addition to the material space of the technology, the technology is also located in the social and cultural spaces of the home (Silverstone, 2006). In incorporation, the main focus is on the temporal aspects of the domestication process: the technology is given time or no time in the user's daily routines, and the focus is on when and for how long the technology is used in everyday life (Hynes & Richardson, 2009; Hynes & Rommes, 2006). To be successfully incorporated, the technology must be actively used (Silverstone et al., 1992). Both the placing and timing of new technology in the home involve restructuring the household and its dynamics, such as challenging the existing rules of behavior or codes of familial practices (Silverstone, 2006).

The *conversion* dimension is intrinsically linked to appropriation through its association with symbolic meaning generation. During the phase of conversion, the personal meanings that the user earlier attached to the technology start to convert to the public meanings again (Hynes & Rommes, 2006). Conversion is concerned with the household's internal affairs and social and cultural aspects of the outside world (Hynes & Richardson, 2009). After the user has mobilized a new technology into part of his/her identity, the user displays his/her ownership and competence to others in a public culture (Haddon, 2011; Hynes & Rommes, 2006). As shown during the cross-sections of the domestication process, the consumption of new technology is never a private matter; it must be worked into the political level, but it also involves transformation at the point where cultural expectations and social resources meet the challenges of the technology (Silverstone, 2006). In the case of eHealth services, their domestication is always part of a broader care policy plan aimed at *aging in place* (Chen & Powell, 2019; Kröger & Bagnato, 2017). Furthermore, broader ethical reflection on eHealth services (Leikas, 2017b; Niemelä et al., 2021a; Turja, 2021) is linked to the sociocultural discussion.

Although the strength of the domestication approach provides a context for people's technology decisions and a useful framework to investigate these further (Carter et al., 2013; Haddon, 2011), the limitations of the theory are more on a

practical level: a considerable overlap between the abovementioned dimensions (Carter et al., 2013) and the resource-consuming approach of the theory (Haddon, 2011). I agree with Cartier et al. (2013) that the division between the dimensions is not watertight. But as Haddon (2011) describes, a domestication study can take more than one interview and, in total, more than one year; I would call that a reasonable time for a study. However, Haddon (2011) expects that this may limit the number of domestication studies in the field.

3 METHODS AND FINDINGS OF THE SUBSTUDIES

The present research explores eHealth use from the perspective of rural older people and their social networks in a complex learning and care ecosystem. The dissertation consists of three substudies that have been published in international peer-reviewed journals. This chapter discusses the contribution of each of the substudies (I–III) to the main research question: *How are older people's eHealth learning and use constructed in their everyday lives in rural areas?* The chapter provides an overview of the substudies, their philosophical assumption, ethical considerations, methodological issues, research settings, and findings. However, the chapter does not present the theoretical frameworks of the individual studies because they have already been addressed in detail in the earlier chapter.

3.1 Overall research design

The research design of the substudies is summarized in Table 2.

The philosophical assumption that guided the research design of the dissertation was derived from the social constructivism paradigm. This paradigm is inherent for interpretive case studies and ethnography (Denzin & Lincoln, 2011). The social constructivism paradigm and the constructivism paradigm have many similarities; however, the social constructivism paradigm adapts the work of Vygotsky (1896–1934; Vygotsky, 1978), in which learning is understood as a sociocultural process. The social constructivism paradigm focuses on "real-world settings and view[s] people as thinking and acting persons" (Jennings, 2009, p. 43; see also Schwandt, 2000). The paradigm has features similar to participatory research, which make use of direct cooperation with those who are affected by the matter under investigation (Vaughn & Jacquez, 2020, p. 1; see also Hanson et al., 2006).

In the present research, a light version of the social constructivism paradigm was utilized; the research did not fully take advantage of the social constructionist perspectives because, for example, the socially constructed characters of the interview, observation, and data analysis processes (Holstein & Gubrium, 2008; Koro-Ljungberg, 2008) did not receive much attention. In educational contexts, research paradigms comprise four essential elements: epistemology, ontology, axiology, and methodology (Kivunja, 2017; Lincoln & Guba, 2000), which I will next review with respect to the present research from more abstract to more concrete considerations.

Table 2

The Research Design

Substudies	**I.** eHealth use in research literature	**II.** Case of robotic medication-dispensing service	**III.** Case of phone and video conferencing service
Research questions[4]	a) What barriers and enablers are related to the learning and use of eHealth technologies in domestication process among older people living at home? b) How are older people living at home supported in their domestication of eHealth technologies? c) What are the meanings attached to eHealth technologies for older people living in rural and remote areas?	a) How do older people domesticate a robotic medication-dispensing service in their everyday lives? b) What kind of meanings do service users, practical nurses, and other health care professionals assign to the robotic medication-dispensing service during the domestication?	a) What factors contributed to the learning, use, and nonuse of phone and video conferencing service among a select group of older people in Finnish Lapland? b) What kind of meanings select group of older people, volunteer workers, and a service coordinator assigned to the phone and video conferencing service?[5]
Participants[6]	N=31 articles; included participants with a mean age of 60	N=11; Service users (n=5), aged 73–89 years old, *M*=81.4, Practical nurses (n=4), Other health care professionals (n=2)	N=5; Service users (n=2), aged 88 and 89 years old, Volunteer workers (n=2), aged 69 and 71 years old, Service coordinator (n=1)
Participants' living areas	Rural and nonrural settings; 12 countries	Rural Finnish Lapland	Rural Finnish Lapland
Data collection and analysis	Systematic literature review, PRISMA (Liberati et al., 2009) Qualitative thematic analysis	Case study, ethnographic approach Semistructured interviews, observations, photographs Qualitative thematic analysis, semiological and thematic analysis of photographs	Case study Semistructured interviews Qualitative thematic analysis

[4] The spelling of some concepts in the research has been changed to be compatible with the summary chapter, and for this reason, they may be different from the original articles.

[5] The research question has been modified from the original one because of a typographical error in the published article.

[6] Explanations of the abbreviations: N = the total number of research participants, n = the number of participants in a specific group, and M = the median age.

The *epistemology* of a paradigm is used to describe the relationship between the knower and the known (Guba & Lincoln, 1994), or in other words, to describe "how we come to know something" (Kivunja, 2017, p. 27). The social constructivism paradigm follows an intersubjectivist epistemology where the researcher and participant co-create an understanding (Denzin & Lincoln, 2005; Jennings, 2009).

In the present research, the real eHealth service users and related professionals have been involved in the production of the knowledge of eHealth use in the learning and care ecosystem by participating in the research interviews and observations. They provided the data with which the researchers formed their understanding of the phenomenon under study. The research informants did not get to influence what kind of knowledge and findings the research ultimately produced—the coauthors and I did that exclusively. Thus, in the present research, cocreation of the understanding was only partial.

The *ontology* of a paradigm refers to one's worldview (Guba & Lincoln, 1994) and concerns the assumptions we make to declare that something is true (Kivunja, 2017). The social constructivism paradigm adopts a relativist ontology, which means that there are multiple, local, and specific constructed realities (Denzin & Lincoln, 2005; Jennings, 2009). In the present research, every participant had their personal reality of learning to use and using eHealth services in their learning and care ecosystem. As a researcher, together with the coauthors, I created my understanding of the reality both deductively and inductively based on my experiences. According to Tuomi and Sarajärvi (2002), it is impossible to do research purely inductively and without any preconception of the world. My job as a researcher was to interpret the gathered data and form a cohesion of the multiple realities that the informants had provided (Kivunja, 2017). My interpretation of the data is, by the same token, one view of the multiple realities.

The *axiology* of a paradigm refers to ethical and value issues in research (Kivunja, 2017; Lincoln & Guba, 2000). In the social constructivism paradigm, axiology can be characterized as value-laden. When the researcher is intersubjectively involved in the research process and co-creates with participants, values are inextricably and intrinsically embedded in the research process (Jennings, 2009). In the present research, the participants' and researchers' dialogue was open and confidential; however, as noted earlier, the co-creation of the understanding was only partial. Thus, I believe that the values were not such a deep part of the research process as they could have been with more intersubjectivist participation by the researcher. However, in the present research, some interpretation of participants' values could be made and included in the findings.

The concept of *methodology* is probably the most used and familiar of the elements of the paradigm for most researchers, but at the same time, it is the broadest. In the social constructivism paradigm, methodology aims to understand the investigated phenomena from an insider's perspective (Jennings, 2009), which has been a key starting point for the present dissertation. The qualitative methodology of the dissertation mostly utilizes research guidelines and traditions from the educational research field, which have long traditions in the area of qualitative research. However, there is a need for qualitative research conducted outside schools or other institutional environments and studies that focus not only on children and adolescents, but also

other individuals who are the recipient-participants in educational practices, such as older people who are learning to use new digital technology at home (Freebody, 2003). A qualitative in-depth approach, which includes interviews, observations, and other methodologies, is often favored in domestication research to better understand how ICTs are related to the nontechnological aspects of people's lives (Haddon, 2011; Hartmann, 2020).

The answer to the main research question of the dissertation was investigated with a literature review and empirical data. For each substudy of the dissertation, different qualitative data sets were used. Substudy I focused on the learning and use of different eHealth services in the research literature and provided background for the research topic, while substudies II and III aimed to investigate two specific cases of phone and video conferencing services and robotic medication-dispensing services. Substudy III utilized interview data, while substudy II had an ethnographic approach that included interview, observational, and photographic data. All the substudies focused on eHealth services at home. The systematic literature review (substudy I) included 31 empirical studies on older people's use and learning of different eHealth technologies in 12 different countries, in rural and nonrural areas. Only written studies in English were included in the systematic review. Substudies II and III took place in one rural municipality of Finnish Lapland, and a total of seven older people and nine professionals participated. The professionals involved in the research represent the interests of the people who are the focus of the research—that is, older people (Vaughn & Jacquez, 2020). The data collection in substudies II and III was conducted in Finnish, which the authors and all participants speak fluently.

It should be noted that in the interview material of substudies II and III, the participating professionals commented on both older people who participated in the study and older people who did not participate in the study. It is not possible to verify how many older people outside of those who participated in the study the professionals have commented upon. The overarching findings of the present research clearly highlight whether it is known that the findings are related to participating older people. A more detailed description of the methodology is provided in each of the substudy chapters.

A qualitative thematic approach was used for analysis for all the data sets in substudies I–III, including the transcribed interviews, observations, photographs, and previous research literature included in the systematic review. Instead of a social constructivism perspective for the data analysis (Holstein & Gubrium, 2008; Koro-Ljungberg, 2008), I have focused on the content analysis. The coding of the thematic analysis was done through the NVivo 12 qualitative data analysis software program. The qualitative thematic analysis was based on analyzing principles following Braun and Clarke (2006; see also Kiger & Varpio, 2020), including both deductive and inductive analyses, of which deductive analysis was dominant. I define the term *theme* after Braun and Clarke (2006, p. 82), as a "patterned response or meaning

within the data set" in relation to the research questions (see Table 2). In the present research, as a unit of analysis, everything between one word and several sentences was used. Thematic analysis progressed iteratively through the following steps: (1) becoming familiar with the transcript data through its repeated and active reading; (2) generating initial codes from the data, which are more detailed units compared with themes; (3) sorting the different codes into potential themes of broader significance; (4) reviewing the themes in relation to the coded data placed within the themes and in relation to the entire data set; (5) organizing and naming the themes into coherent, higher-level categories that are brief and descriptive; and (6) producing the final manuscript, which should move beyond mere descriptions of codes and themes.

As an example of the data analysis, see Table 3. In the data analysis of substudies II and III, the instances per participant group (users, professionals) were divided inside the codings. Data analysis of substudy I did not include separation of different participant groups.

Table 3

Sample of Data Analysis

Example of meaning units	**Examples of condensed meaning units**	**Subcategories (n = number of codings from user/volunteer worker/coordinator interviews)**	**Clustered category**
"The kind of good folks who I can understand and who understand me. So that the interaction, it's mighty important." (Service user)	"interaction, it's mighty important"	**Social interaction:** networks and loneliness (5/19/17), social presence (0/5/3), deep conversations (0/1/0), confidential relationship (1/0/0) **Meaningful activities:** activities and structure (7/1/5), maintaining cognitive functions (0/3/0), reminiscence (0/3/0) **Positive emotions:** positive and neutral feelings (0/8/3), rewarding (0/5/1), provider of joy (0/2/1), Safety (0/0/2)	Support for social interaction and well-being

Note. The table is part of a summary of the data analysis and findings concerning the meanings assigned to the phone and video conferencing service in substudy III.

3.2 Ethical considerations

The current research was conducted according to the ethical principles of the Finnish National Board on Research Integrity for research with human participants (Kohonen et al., 2019). Additionally, the Ethical Review Committee of the Lapland University Consortium evaluated and approved the research plan for the national team of the HARVEST project. For substudies II and III, research permission from the municipality of Finnish Lapland was sought, and its requirements were followed.

In Finland, researchers in all disciplines are guided by three general ethical principles (Kohonen et al., 2019, p. 8): (1) The researcher respects the dignity and autonomy of the human research participant in accordance with the Constitution (1999/731, Sections 6–23); (2) the researcher respects material and immaterial cultural heritage, as well as biodiversity, in accordance with the Constitution (1999/731, Section 17); and (3) the researcher conducts their research in such a way that the research does not cause significant risk, damage, or harm to the human research participants, communities, or other research subjects. Additionally, the research must comply with the guidelines on the responsible conduct of research drawn by the Finnish National Board on Research Integrity (Varantola et al., 2012). In the present research, adherence to ethical principles was implemented, as discussed below.

In the beginning of substudies II and III, the participants were informed, in writing (see appendices C and D) and orally, about the purpose of the study, actions that would be taken during the study, and the participants' rights. Participation in the research was voluntary, participants gave informed consent, and their ability to terminate their participation in the research at any time was stated (Carpenter, 2018; Kohonen et al., 2019; Nikander & Zechner, 2006). The participants also gave informed consent for audio-recording the interviews. The present research involved older people, whose capacity may be limited because of age or illness. However, as defined in the ethical principles for research with human participants, impairments or advanced age "do not themselves limit right of autonomy or thus the right to decide whether or not to participate in the research" (Kohonen et al., 2019, p. 10). If older people are, in principle, assumed to be vulnerable research participants, this can turn into overprotection and patronage (Luomanen & Nikander, 2017; Nikander & Zechner, 2006). Relying on the ethical principles and the evaluation of our contact personnel in public home care services, my coauthor and I respected the autonomy and self-determination of the older participants and let them respond themselves regarding their participation in the research. The older participants were informed about the research in a way suitable for them, and their specificity was considered when conducting the data collection. Overall, the older people were treated with respect, honoring their diversity (Bytheway, 2005; Harbison, 2019; Lowsky et al., 2013).

With potentially vulnerable research participants, special attention should be paid to the place and timing of the data collection (Luomanen & Nikander, 2017). The data collection for substudies II and III was carried out at the homes of older people, which gave a voice to the older people in their own local context and, therefore, was assumed to be the least stressful and most comfortable environment for the older people to participate in (Fetterman, 2010). There was also a research basis for this: the eHealth technology under study was located at their homes. On the other hand, the home can be thought of as a very personal place, and for that reason, letting a researcher into the home may feel foreign to the research participants (Bernhaupt et al., 2008; Wherton et al., 2012). However, none of the older people who were in the study until the end refused to conduct the study at their homes. One participant, in the case of the robotic medication-dispensing service, expressed that s/he did not wish for observations to be taken because of his/her particularly early and especially late medication schedule. It also requires sensitivity from the researcher to conduct data collection at someone's home. The home environment made me as a researcher think about where I could sit, how long I could stay, and whether I could have some coffee, if they asked me. Compared with a clinical environment as the data collection location, the home environment is more unpredictable.

All the participants were alone at home during the collection of the research data. The research materials included sensitive health-related data, which is why its confidentiality, anonymization, and storage were carefully considered throughout the research (Carpenter, 2018; Kohonen et al., 2019). Data files that included personal data were treated as required by the General Data Protection Regulation (2016/679; European Parliament and the Council, 2016). All research material in digital form was stored on a secured server; data collected on paper was stored in a locked cabinet. Data files containing sensitive information were saved in encrypted form. Only the authors of the substudies have access to the data; five years after the end of the HARVEST project, the data will be destroyed. Finally, the data were analyzed, and the results were reported with accuracy. When reporting the results in substudies II and III, to protect the privacy of the participants, their names, exact living area, and gender were not revealed. The interviewed professionals were aware that despite the protection of their privacy, it might be possible to identify their identities from their titles and working areas because, in Finnish Lapland, their expertise may be rare.

Financial issues were considered during the research. The participants were informed that they would not receive any compensation for taking part in the study (Cohen et al., 2011) but were told that the study was an important part of the development of eHealth service learning and use in the home care of older people, which the participants could eventually benefit from. The source of the research funding of the HARVEST project was reported in each of the published substudies.

3.3 Substudy I: eHealth use in research literature

Methods

The aim of substudy I was to fill the research gap indicating the need for a literature review that examines older people's eHealth learning and use in real home settings from users' perspectives and to determine whether further primary research in the area is needed (Heyn et al., 2019). I decided to conduct a systematic review with a broad overview of the learning and use of eHealth among older people (60 years and older) in several different countries and in rural and nonrural settings. Xiao and Watson (2019) suggest that ideally, a systematic review should be conducted prior to empirical research so that it can be utilized for future studies. However, in the present dissertation, this was the opposite: substudies II and III raised the need for a systematic review, guiding the design of substudy I. While compiling the overarching findings of the present research the substudy I provided background information for the other two substudies.

Literature reviews can be divided into two forms: 1) the "traditional literature reviews" that serve as background for an empirical study and 2) stand-alone reviews that follow a specific methodology systematically (Snyder, 2019; Xiao & Watson, 2019). The methodology of the present systematic review followed the standardized guidelines of the preferred reporting items for systematic reviews and meta-analysis (PRISMA) statement for studies evaluating health care research (Liberati et al., 2009). However, the present substudy did not include meta-analysis, that is, the "use of statistical techniques to integrate and summarize the results of the included studies" (Liberati et al., 2009, p. 2). The leading research discipline is different from the other substudies of the current dissertation, which utilized research guidelines and traditions from the educational research field.

To ensure the clarity of the present systematic review, based on the PRISMA guidelines (Liberati et al., 2009), four different phases were followed in the study process: 1. identify potential studies through database searching, 2. remove duplicates from the studies and screen their titles, abstracts, and keyworks to match with selection criteria, 3. evaluate the eligibility of the full-text articles, and 4. include the selected articles in a qualitative synthesis. Regarding the search strategy, I consulted an information specialist at the university library; the selected international online databases, search terms, and an example search string are presented in Appendix A. After following the structured study selection (Appendix B), full-text articles that met the following criteria were accepted for the final review: published in a peer-reviewed scientific journal, written in English, published between 2010 and January 2020, reports on an empirical study aimed at supporting older people's eHealth use in real home settings, participants principally over 60 years old, and a user-centered approach.

From the 3,612 articles identified through database searching, for the final data, 31 qualitative and quantitative articles were included. The characteristics of the

included articles were diverse in terms of methodology used, number of participants included, participants' age range and gender distribution, and the type of eHealth that was target of the study. The studies were conducted in 12 different counties, dominated by English-speaking and Western countries.

Analysis of the final data had a qualitative thematic approach and deductively followed the concepts of domestication (Haddon, 2007; Lie & Sørensen, 1996; Silverstone & Haddon, 1996) and digital competence (Lipponen, 2010; Rasi & Kilpeläinen, 2015; Vuorikari et al., 2016), as well as previous research on the barriers to and enablers of technology use (e.g., Deutsch et al., 2019; Fischer et al., 2019; Kampmeijer et al., 2016; Yusif et al., 2016). Finally, the themes were divided into four high-level categories based on the phases (appropriation, objectification, incorporation, and conversion) of domestication (Haddon, 2007; Silverstone & Haddon, 1996).

Findings

The substudy found several barriers and enablers (see also Kampmeijer et al., 2016; Spann & Stewart, 2018) related to the learning and use of eHealth among older people living at home in rural and nonrural settings; here, enablers were more commonly discussed. The first phase of domestication, *appropriation*, had the most barriers, suggesting that this phase is critical for the adoption of eHealth (see Kamimura et al., 2012; Mitzner et al., 2019). Technical problems of the eHealth and health-related difficulties of older people challenged the domestication of the technology, whereas older people's satisfaction with the technology, its usability, and possibility for personalization and flexible use enabled domestication. The findings related to the *objectification* phase emphasized the importance of the external design of the technology and its placement at home. In addition, data protection and security issues were stressed. The key findings of the *incorporation* phase indicated that eHealth technologies' suitability into the users' everyday life and daily routine is of great relevance for their domestication. Finally, the *conversion* phase showed that the learning and use of eHealth technologies were related to how good a fit the technology was with the users' existing social and cultural practices, here with an emphasis on different support practices as an enabling factor. Overall, the articles reported less barriers and enablers related to the actual learning process compared with the use of the technology.

The literature review supported the claim that eHealth learning and use happen in a close relationship with both rural and nonrural users' social networks (Lipponen, 2010; Rasi & Kilpeläinen, 2015), and for that reason, adequate support and training should be provided to older eHealth users. Social network support was provided for eHealth users in 27 of the 31 articles. Face-to-face training sessions at the user's home or in a clinical setting were the most common ways to introduce the use of the technology for the users. After the initial phase of domestication, long-distance

support via phone for the users was emphasized. During the entire domestication process, eHealth technology users distributed their digital competence with formal personnel and warm experts (Bakardjieva, 2005). Of all the social network actors, health care professionals were found to be the ones who most supported eHealth learning and its use of older people. In addition to support for digital competence, health care professionals were able to support users in health care–related matters.

Finally, from 17 of the 31 articles, the meanings attached to eHealth technologies for older people in rural and remote areas were investigated. Various kinds of eHealth technologies were found to be primarily needed for rural and remote areas because these technologies facilitate access to health care services for older people by reducing several of the barriers that prevent older people from accessing them, such as logistical, temporal, financial, and weather barriers. Additionally, eHealth technologies had a meaning in fostering a sense of belonging among rural and remote older people (see Hasan & Linger, 2016; Kilpeläinen & Seppänen, 2014; Tsai et al., 2015). eHealth technologies reduced feelings of isolation and promoted social connectedness. However, the eHealth technologies were also a source of inconvenience and concern. Most concerns were related to a lack of adequate internet connections in rural and remote areas and older people's uncertainty in using the internet and, thus, also eHealth technology. These challenges should be targeted for future development.

One of the key aims of the systematic reviews is to determine the need for further primary research in the field. The current review suggests a stronger focus on the learning process from the users' point of view when investigating eHealth domestication among older people. Several articles were excluded from the review because they had solely a biomedical or technical focus or lacked the user's perspective (see Burholt & Dobbs, 2012). Additionally, in line with political objectives (see Kröger & Bagnato, 2017), more studies on eHealth learning and use in real home settings in rural and remote areas are needed. This substudy aimed to conduct the research only on the use of eHealth of rural and remote older people, but not enough relevant studies were found. Several articles focusing on eHealth use in community-dwelling and nursing homes were excluded. Finally, with quantitative studies being dominant in the systematic review, I call for more qualitative studies in the field of eHealth domestication among older people.

3.4 Substudy II: Case of robotic medication-dispensing service

Methods

While substudy I had a broad perspective on eHealth learning and use, substudies II and III focused on the use of a specific eHealth services. The purpose of substudy II was to investigate the domestication of a robotic medication-dispensing service

among older people with impaired memory who were living in Finnish Lapland. The main focus was on learning to use and using the service during its domestication. In addition, the meanings assigned to the service were explored.

The substudy followed a qualitative case study research protocol (Swanborn, 2010; Yin, 2018), exploring a robotic medication-dispensing service and its relation to older people's independence in Finnish Lapland. Within the case study, an ethnographic, multimethod approach provided the opportunity to investigate the phenomenon in more detail in older people's own social and cultural context in their homes (Fetterman, 2010; Hammersley, 2018). Traditionally, ethnography has been the practice of anthropologists living for long period of time among non-Western societies and taking part of everyday life alongside research participants (Gobo & Marciniak, 2011). From this beginning, the practice has spread across social sciences into a fashion phenomenon of multiple research fields (Gobo & Marciniak, 2011, Hammersley, 2018). Nowadays, in the educational field, an "ethnographic approach" often does not actually mean living with the people, but rather, these practices "draw on practices used in ethnography," such as by utilizing a wide range of data in addition to participant observation (Atkins & Wallance, 2012, p. 148; see also Hammersley, 2006, 2018). So far, there have been very few ethnographic studies of older people and eHealth use. Pols (2012) is one of the pioneers in that field; she prefers an ethnographic approach for research because it is developed for real-life settings and, thus, does not require strict research conditions, such as in the laboratory. In addition, ethnography allows one to ask open questions and provides an opportunity to learn, even from a small number of pioneering practices. A case study and ethnographic approach face similar kind of criticism: when conducting small-scale research and/or short-time observations, there is a risk to generalize what has been studied as being always typical for the situations (Atkins & Wallace, 2012; Hammersley, 2006; Hatch, 2002).

The empirical data for substudy II were collected from February to June 2019. The study participants were recruited via the public home care services of the municipality in Finnish Lapland. Five service users (aged 79–89 years old) remained in the study until the end. All lived alone and had impaired memory (based on their subjective health status). They lived in a sparsely populated area of Finnish Lapland but still near a city center. In addition to the service users, there were four practical nurse participants and two other health care professional participants (in this chapter, "professionals"). They worked in the public home care services and were familiar with the robotic medication-dispensing service.

Data collection started with qualitative semistructured interviews (Gillham, 2005) with participating older service users, practical nurses and professionals. The interview questions were specified in advance and addressed the topics of remote care and the robotic medication-dispensing service, older people as service users, learning to how to use the service, and the use experience of the service. In addition,

service users' interview topics included detailed demographics and everyday life routines. The service users were interviewed face-to-face twice in their homes, here with a two-week period between the interviews. Practical nurses were interviewed once on the phone or face-to-face at their office, depending on their work schedules. Professionals' face-to-face interviews were conducted once at their offices. The interviews lasted 14 to 64 minutes, and 67,166 words were transcribed. The time variation occurred because the service users' second interview was shorter than the other interviews. The transcriptions were used for subsequent analysis.

The interviews were complemented with part-time observations and photographs. Four of the five participated service users were observed at home as they took their medication from the robot. In addition, one practical nurse who participated in the interviews and one other practical nurse were observed during the entire home care visit, which included filling the robot with medicines. Except for the latter practical nurse, all of the observations were conducted in conjunction with the interviews. I served as "a complete observer" (Junker, 1960), with the goal of not participating in the activities or interacting with the participants while observing. However, the participants knew they were observed and could see the observer; some of the participants did communicate with the observer during the action. While observing, I wrote handwritten notes related to the robot's use, which, after the observation, were transcribed on a computer. The observations lasted from 1 to 60 minutes, and the field notes totaled 2,139 words. The time variation occurred because observations of the practical nurses lasted longer than those of the service users. With practical nurses the entire home care visit was observed, not just working with the medication-dispensing robot. The transcriptions were used for subsequent analysis.

The photographs were of the robot's location and the robot in each service user's home after the interview or observation. No individuals were shown in the photographs. For final analysis, one photograph from each home (n = 5) with the widest view of the space was chosen.

The data were deductively analyzed using a qualitative thematic approach and guided by the dimensions of domestication (Hynes & Richard, 2009; Silverstone & Haddon 1996) and previous empirical research. As an exception to this, the photographs were analyzed in two stages: to convert the visual data to text format for the thematic analysis, the photographs were first analyzed using Barthes' (1977) semiological analysis and the concepts of denotation and connotation. Denotations describe the obvious meanings of the photograph that the viewer can see, while connotations are more complex and abstract meanings of the photograph, with experimental knowledge and cultural associations being related to what is seen (Bouzida, 2014; Penn, 2000). In the present research, this means that what the participants expressed in their interviews affected the connotations found from the photographs. Finally, the written connotations were utilized in qualitative thematic

analysis as mentioned. Analysis of photographs did not create any new subcategories in addition to what was first found from the interviews and observations, but they were consistent with previously created codings.

Findings

The main findings related to *appropriation,* that is, the acquisition and possession of technology in the domestication process (Hynes & Richard, 2009), revealed that learning to use and using the robotic medication-dispensing service right away was easy for the service users. Practical nurses helped get the service up and running and later provided support for those who needed it. The practical nurses and professionals reported that in the past, there have been some potential service users who did not want to start the service use at all or who first agreed to use it but then rejected its use later (nonusers; Rasi, 2018). The reasons for the rejections were related to the technical and aesthetic features of the robot, cognitive and physical difficulties of the potential service users, situations in which older people were not willing to learn something new because they preferred the old way of dispensing medication, and fear about the cost of the service.

Objectification focuses on the spatial aspects and *incorporation* the temporal aspects of the domestication process (Hynes & Richard, 2009). Here, the service users adapted well to the robot in their home and everyday routines. The place for the robot was decided together by the service user and home care services, and in most cases, it was located in the kitchen area to facilitate medication taking with water. The design of the robot was brought up several times, mostly related to the "big" and "ugly" appearance of the robot, which was not a good fit in the apartments of some of the service users. The service users felt that the robot brought them company and even called it a friend and other nicknames. However, the service users sometimes felt that the robot limited their lives and caused stress because they had to schedule their day around taking their medication at a certain time.

Conversion is the last phase of the domestication process, and it concludes the final meaning of the service, though the domestication of a technology is never fully completed (Hynes & Richard, 2009). For the most part, the service users were satisfied with the robotic medication-dispensing service, and the practical nurses and professionals stated that they would like to have more service users in the future. The technical challenges related to learning and using the service were very few and mainly reported by practical nurses to whom the interaction with the robot (e.g., filling it) was more complicated compared with the use of the service for the service users. The service users and practical nurses were satisfied with the technical support available through the service, if necessary. In case the service users experienced challenges with the service, they would contact their children or home care services. The professionals particularly saw the service useful for older people who wanted to remain independent at home (see Kröger & Bagnato, 2017; Finnish Ministry of

Social Affairs and Health, 2015). However, some service users did not see the service as essential for successful medication at home.

According to the findings, the robotic medication-dispensing service can provide a potential approach for managing the medication intake of older people with impaired memory who are living at home. However, the service users need support from their children and home care personnel for the learning and using the service. It can be described that service users' digital competence (Vuorikari et al., 2016), were distributed among their social networks (Airola et al., 2020; Lipponen, 2010; Rasi & Kilpeläinen, 2015).

The cultural aspect of the domestication of the robotic medication-dispensing service relates to where the participants were living—Finnish Lapland—and the culture and history of the older people (Airola et al., 2020; Rasi & Kilpeläinen, 2015). On the other hand, the service was a good fit for older people in Finnish Lapland because despite the service users' educational level or previous experience with digital technology, it was easy to use. On the other hand, the service users were used to coming and going more freely, which made some of them think the service was restrictive and that it did not follow the familiar cultural practices of older people. In addition, the rather dominant appearance of the robot was inconsistent with the compact size of some of the service users' apartments and interior tastes.

3.5 Substudy III: Case of phone and video conferencing service

Methods

The objective of substudy III was to gain a better understanding of a phone and video conferencing service among rural older service users in the sparsely populated area of Finnish Lapland, where long distances may lead to social isolation and loneliness (Kilpeläinen & Seppänen, 2014). In addition, the substudy investigated the meanings assigned to the service.

The substudy followed a qualitative case study research protocol (Swanborn, 2010; Yin, 2018), building the case around the phone and video conferencing service and its relation to social connectedness and loneliness of older people in Finnish Lapland. A case study method was chosen because there was a need to explain the present circumstances of a specific service and explore its relation to contemporary phenomenon within its real-life context in Finnish Lapland (Yin, 2018; Crowe et al., 2011). In addition, a case study approach allows for the use of small data sets, as long as the number of the participants is representative of the case (Swanborn, 2010). Case studies are widely used in educational research, but the definition or distinctions compared with other qualitative methods are not clearly defined (Atkins & Wallace, 2012; Hatch, 2002). The value of the case study approach is not that well recognized in health services research (Crowe et al., 2011). Within the

present case study, traditional qualitative semistructured interview data (Gillham, 2005) were gathered.

Data collection was conducted from February to March 2019. At the time of the data collection, only the possibility for regular calls was available in the service, for example, because of the lack of the devices needed for the video conferencing calls. Even though the video conferencing service was no longer in use, all of the study participants had experience with it. The study participants were recruited via the NGO; however, the requested service users refused to participate in the interviews. This is why we used service user interviews conducted in 2016–2018 in a previous project[7], reanalyzing their interviews according to the research questions of the present study. The service users (n = 2) were 88 and 89 years old and lived in Finnish Lapland, being located about 50 km from the nearest municipality center. In addition, volunteer workers (n = 2; 69 and 71 years old) and a service coordinator participated in the interviews. The interview questions were specified in advance, and they were related to the following topics: the everyday lives of older people, their social relationships and support, and the learning, use, and availability of (technical) services, especially the phone and video conferencing service. Additionally, volunteer workers and the service coordinator were asked about the activities in the NGO. Service users were interviewed two to three times via a phone or video conferencing call. Volunteer workers and the service coordinator were interviewed face-to-face once in a private office in the NGO center. The interviews lasted 24 to 70 minutes, and 44,200 words were transcribed for subsequent analysis.

The substudy had a socially and culturally orientated approach (Gilleard & Higgs, 2015b; Rasi, 2018; Slack & Wise, 2009). In addition, the use of the phone and video conferencing service was explored through two concepts: the concept of domestication (Bakardjieva, 2005; Silverstone & Haddon, 1996) and the concept of digital competence (Vuorikari et al., 2016). The data were analyzed using a qualitative thematic approach, including both deductive and inductive analyses. Deductive analyses were guided by the aforementioned concepts and previous research on barriers and enablers of technology use.

Findings

There were two upper-level categories concerning the learning and use of the phone and video conferencing service: barriers and enablers. The identified barriers and enablers were quite similar to those previously reported of older people's ICT use (Heart & Kalderon, 2013; Rasi, 2018). In the service user interviews, *negative perception of oneself as a technology user* was the most often reported barrier to learning to use and using the service. In addition, *technical problems* and *cognitive*

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and physical difficulties were frequently mentioned barriers in the service user interviews. Particularly, the volunteer workers agreed with the technical problems with the video conferencing devices, such as bad connection and bad audibility. Furthermore, the volunteer workers experienced service users' *lack of experience* in using digital technology and *inappropriate behavior* as one of the main barriers. The latter one was related to romantic feelings that some of the service users started developing toward the volunteer workers, and as a result, for example, a volunteer worker was sexually harassed. The service coordinator reported the least barriers related to learning to use and using the service; however, s/he stressed that some older people refused the service use because they have a *need for face-to-face contact*, which is different from meeting someone through a screen.

The reported enablers went hand in hand with the barriers. In the service user interviews, *positive perceptions of oneself as a technology user and learner* was the most reported enabler. In addition, service users' *willingness and ability to practice and learn* the service was one of the top enablers. *Technical support* was seen as very important, especially when it came to technical problems with the video conferencing devices. Support for service users for learning to use and using the service was provided from service user's children, personnel of public health services, and personnel of the NGO. From this, it can be deducted that older people's digital competence (Vuorikari et al., 2016) related to health and well-being should be seen as distributed competence of older people's social networks. The volunteer workers highlighted that service users' positive and open-minded *attitude* toward new things keep the service running and compensate for the lack of experience. Previous experience was seen as an enabler to learn to use and use the service from a volunteer worker and service coordinator perspective.

Analysis produced three upper-level categories concerning the meanings (Gubrium & Holstein, 2000; Talsi, 2014) assigned to the service: support for social interaction and well-being, new and needed service for sparsely populated area, and a source of inconvenience and concern. *Networks and loneliness* together with *negative feelings* was the most coded meanings for the service. All the participants agreed that the service promoted social contentedness and reduced loneliness of older people. According to the service users and volunteer workers, frustration because of technical problems mainly evoked negative feelings. The volunteer workers and the service coordinator particularly described the service as a needed or much needed service for sparsely populated areas. However, the service users did not express such feelings.

To summarize, the substudy has indicated that the phone and video conferencing service supported Lappish older people's well-being by generating new social relationships and meaningful activities. This is in line with previous research showing that ICT interventions can reduce social isolation and promote social relations for older people in sparsely populated and rural areas (Antunes et al., 2019; Chen &

Schulz, 2016; Kilpeläinen & Seppänen, 2014; Pols, 2012). However, especially from the older people's perspectives, the service was also a source of inconvenience, mostly because of technical problems. Therefore, we agree with previous studies (Antunes et al., 2019; Heart & Kalderon, 2013; Peek et al., 2014) that eHealth for older people should be kept simple, technical problems should be fixed, and adequate support should be available for learning and using the service.

The findings support the claim that older people's competencies in using and willingness to use eHealth cannot be understood without considering their historical, cultural, and social contexts (Lipponen, 2010). Based on the substudy, for older people, being able to distribute digital competence with social networks and follow familiar cultural practices, such as sitting in a rocking chair at home while having a call, supported the domestication of the phone and video conferencing service (Bakardjieva, 2005; Silverstone & Haddon, 1996).

4 DISCUSSION

The present research has focused on eHealth use from the perspective of rural older people and their social networks in a complex learning and care ecosystem. The research aimed to increase the knowledge of the digital competence in eHealth learning and use, clarify in what way the learning process is part of eHealth service domestication, construct a theoretical-conceptual model for eHealth learning and use, and set development proposals for eHealth design and implementation. Older eHealth service users as well as professionals have acted as informants for the research.

In this chapter, first, the overarching findings are presented in section 4.1 and concluded in section 4.2. Based on the theoretical framework utilized in the present research and the overarching findings, in section 4.3, a new theoretical-conceptual model of eHealth learning and use is introduced. In section 4.4, the practical and political implications of the study and ideas for future research are discussed. Finally, in section 4.5, the process and outcomes of the research are evaluated.

4.1 Overarching findings

The aim of this chapter is to combine and analyze the theoretical insights and findings of the three substudies of the present research as the overarching findings. The overarching findings answer the main research question: *How are older people's eHealth learning and use constructed in their everyday lives in rural areas?* The answer arose as a result of a metasynthesis of the substudies.

Metasynthesis refers to an interpretation of findings (Erwin et al., 2011; Zimmer, 2006). In contrast to metasynthesis, meta-analysis is a statistical procedure that attempts to integrate a set of quantitative research (Borenstein et al., 2021; Field & Gillett, 2010). Traditionally, metasynthesis and meta-analysis have been utilized for literature reviews (e.g., Achterbergh et al., 2020; Jang et al., 2021; Ruiz-Pellón et al., 2020), but in the present research, metasynthesis is used to interpret the empirical findings that combine the substudies of the dissertation. Practically, first, a clear research question was formulated, and then I began to determine how the substudies were related by examining the key concepts and themes from their findings (Erwin et al., 2011). Sandelowski et al. (1997, 2007) have expressed their concern that when synthesizing qualitative studies, there is a risk of sacrificing the relevance or integrity of the individual studies. On the other hand, "without developing the connectedness latent within and across qualitative research studies, this important

body of research may exert only a limited impact on policy and practice" (Scruggs et al., 2007, p. 395).

The key findings of the substudies are presented in Table 4. The learning and care ecosystem connects the key findings of the substudies as the overarching findings. After the table, I describe how the key findings of the substudies have contributed to each analytical context of the learning and care ecosystem. At the end of this chapter, the overarching findings of the dissertation are concluded.

Table 4

Key Findings of the Substudies according to the Key Analytical Contexts of the Learning and Care Ecosystem

	I. eHealth use in research literature	**II.** Case of robotic medication-dispensing service	**III.** Case of phone and video conferencing service
Practical	- appropriation phase is the most critical - barriers: technical problems, health-related difficulties - enablers: satisfaction, usability and ease of use, flexibility and personality, social network support -look, weight, and size can challenge domestication	- appropriation phase is the most critical - the effect of attitude on domestication - suitable for people with impaired memory - an easy-to-use and big and ugly robot - temporary technical challenges - social network support needed	- barriers: technical problems (internet connection), cognitive and physical difficulties - the effect of attitude on domestication - social network support needed
Social	- distributed digital competence - social support networks consisted of professionals, spouse, grandchildren, other family members and relatives, family caregivers, peers, and friends - support is not required in digital matter, but also for health care competence	- distributed digital competence - broad set of professionals, but the support did not always meet the need - personal support from warm experts (adult children) - the robot had a social meaning and own role in supporting digital competence	- users' existing social practices need to be considered - distributed digital competence - long distances and far away living social networks - broad set of professionals, but the support did not always meet the need - personal support from warm experts (adult children)
Cultural	- situated digital competence - heterogenous eHealth users - being able to follow familiar cultural practices support the domestication - suitability into everyday lives is a great relevance - cultural values: independence, belonging, togetherness	- situated digital competence - heterogenous eHealth users and nonusers - technology-related cultural understanding influenced use and nonuse of new digital technology - suitability into everyday routines is of great relevance -cultural value: independence	- situated digital competence - heterogenous eHealth users and nonusers - technology-related cultural understanding influenced use and nonuse of new digital technology - being able to follow familiar cultural practices support the domestication -cultural values: belonging, togetherness
Symbolic	- new and needed services for rural areas: facilitate access to health care services and reduce barriers - inconvenience and concern related to lack of access to high-speed internet	- needed service: supports medication, supports independence, it has a meaning as a companion, meaning as a provider a sense of safety - reduce contact with professionals - negative and positive feelings	- new and needed service for sparsely populated areas: new social relationships, meaningful activities - source of inconvenience and concern: technical problems, insufficient support, stigmatizing - positive and negative feelings

Practical context of eHealth use in the learning and care ecosystem

The practical context (Frennert, 2016; Søraa et al., 2021; Van Aerschot & Parviainen, 2020) of eHealth use in the learning and care ecosystem in the present research is based on the barriers, challenges, and enablers found related to digital competence and eHealth domestication on a daily basis, emphasizing physical appearance and interaction with the technology. The present research (substudies II and III) indicates that the appropriation phase of domestication (Hynes & Richardson, 2009; Hynes & Rommes, 2006), which starts the learning process of the eHealth service use, is the most critical in the domestication process (Peek et al., 2014). The systematic review (substudy I) revealed that the first phase of eHealth domestication had the most barriers compared with the other phases.

The present research stressed that eHealth service use in the learning and care ecosystem is driven by the older service user's thoughts and attitudes toward new technology, such as perception of oneself as a technology user (substudy III) and self-efficacy (substudies II and III; Fang et al., 2018; Spann & Stewart, 2018). Furthermore, older people's attitudes toward new technology were related to their acceptance of eHealth services (Fischer et al., 2014; Heart & Kalderon, 2013; Liu et al., 2016; Smarr et al., 2014; Yusif et al., 2016): All five of the older people participating in the robotic medication-dispensing service study (substudy II) had a mainly positive attitude toward the service. In substudy III, the volunteer workers and the service coordinator reported that some service users had a negative attitude and lack of courage when it came to using the service, which were associated with uncertainty about the new service. However, a positive and open-minded attitude of the older people supported the learning and use of the new service and compensated for their lack of experience (Boulton-Lewis et al., 2006; Fischer et al., 2014; Yusif et al., 2016).

The findings from the present research emphasize the *usability* of eHealth services (ISO 9241-11, 2018; see Fang et al., 2018; Kempmeijer et al., 2016; Peek et al., 2014; Spann & Steward, 2018). From the beginning of its domestication, the studied robotic medication-dispensing service (substudy II) appeared as an easy-to-use eHealth service without major or continuous technical issues, which is the kind of eHealth service that researchers believe should be the goal (Peek et al., 2014; Spann & Steward, 2018). One older interviewee (substudy II) described the use of the service by saying, "You just press a button." The systematic review (substudy I) found several (18 of the 31) eHealth studies that reported usability and ease of use of the service as enabling factors. In the systematic review and the study of the phone and video conferencing service (substudy III), technical problems were reported as a main barrier for eHealth learning and use. These were frequently related to a lack of adequate internet connection in rural and nonrural areas. Related to the competence area of *problem solving* in the DigComp framework (Carretero et al., 2017), the participating eHealth service users from both case studies principally

were on the first proficiency level (scale 1–8), which means that they could identify the problems from a list and identify the type of support needed.

Based on the findings of the present research, the possibility to consider older people's *personal special needs* in eHealth design and implementation supported the domestication of the service. The systematic review (substudy I) found the flexibility of eHealth services and the opportunity to personalize them for the users' needs as enabling factors for eHealth learning and use. Previous research (Fang et al., 2018; Spann & Stewart, 2018) also supports this claim: older people differ on what functionalities they prefer in health services, including their health status and design preferences. In the present research, older people's cognitive and physical difficulties were found to be a main barrier to eHealth learning and use, alongside technical problems. Based on professional interviews in substudies II and III, and the findings of the systematic review (substudy I), older people's memory impairments, impaired hearing or vision, poor health, and hand fatigue while holding the phone prevented them from learning to use and using eHealth services. One professional interviewed in substudy II said that in his/her point of view, the best time for older people with impaired memory to start using the service would be when the person is still capable of learning new things. Later on, even with the memory disorder developing, the user still has the competence to use the service. The two interviewed older people in substudy II reported poor health and tiredness as their barriers for the service use. However, based on Peek et al. (2014), in some cases, older people's negative subjective health status may have positively influenced their need and acceptance of technology for *aging in place*. I see a contradiction here: older people with a negative subjective health status have a need and willingness to use eHealth, but their health status may be the main barrier for eHealth learning and use.

The aesthetic design of the eHealth technology and its placing in the home stood out in substudies I and II (Deutsch et al., 2019; Peek et al., 2014; Spann & Steward, 2018). In the systematic review (substudy I), the look, weight, and size of the technology challenged the domestication of the eHealth technology. One participating medication-dispensing service user (substudy II) expressed his/her dissatisfaction with the "big" and "ugly" appearance of the robot. However, s/he got used to it. Another participating service user expressed that s/he didn't think the robot is big. Interviews with professionals revealed that some potential service users, but not the active participants in the study, had refused to take the robot home because of unsuitability for their apartment.

The last factor that arose from the findings related to the practical context of the learning and care ecosystem is the *compatibility of the service for users' culturally situated social practices*. From a practical point of view, the question focuses on older people's existing social networks and the need for them. The present research, in line with previous studies (Fang et al., 2018; Kampmeijer et al., 2016; Peek et al., 2014), clearly displays that the key enabler for older people's eHealth learning and

use is social network support for their digital competence. Although easy-to-use and user-driven eHealth can minimize the amount of additional support and training required to learn to use and to use eHealth services (Fang et al., 2018), the findings of the present research indicate that support from professionals or personal support from warm experts (Bakardjieva, 2005) is still needed (see Carretero et al., 2017). For example, for the robotic medication-dispensing service, nurses who could fill the robot with preloaded medication bags every two weeks were needed (see also Kamimura, 2019). Previous studies of older people's health-related difficulties, which the participants of the present study had, emphasized their need for continuous support from warm experts (Hänninen et al., 2020, 2022; Ligons et al., 2014). In addition to existing support structures, the findings of the present research confirm that the users' expectations associated with the human contacts in health care can challenge the use of eHealth services (Fang et al., 2018). According to the service coordinator, some phone and video conferencing service users (substudy III) refused the service because they had a need for face-to-face contact. The systematic literature review (substudy I) corroborates older people's need for face-to-face contact as a common barrier for eHealth service use.

Social context of eHealth use in the learning and care ecosystem

In the current research, the social context of the learning and care ecosystem is understood as a combination of three different groups of actors: professionals, warm experts (Bakardjieva, 2005), and eHealth technologies (Søraa et al., 2021; Väljataga et al., 2020; Van Aerschot & Parviainen, 2020). Together, they are referred to as a learning community (Gütl & Chang, 2008; Morales et al., 2019; Sarnok et al., 2019). The findings of the present research indicate that older people's eHealth learning and use was a form of continuous informal learning and usually happened through assisted use (Hänninen et al., 2020, 2022). All the different groups of actors of the learning community had their own, different roles in supporting older people's digital competence in eHealth learning and use. Indeed, the digital competence required for eHealth learning and use is actually a *distributed social activity,* rather than just individual skills (Lipponen, 2007, 2010; Olson & Viscovi, 2018; Rasi & Kilpeläinen, 2015; Sentell et al., 2018; Søraa et al., 2021). In this section, first, the roles of professionals and warm experts are discussed, and then I continue with the role of eHealth technologies in the social context.

Both professionals and warm experts (Bakardjieva, 2005) had a significant role in supporting older people in using eHealth services in the learning and care ecosystem. It was found that the support from warm experts was more personal (see Hänninen et al., 2022) and that the set of professionals who provided support was broader compared with warm experts. The findings from substudies II and III are in line with the claim of Olsson and Viscovi (2018) that warm experts support the service users through the whole domestication process (Hynes & Richard, 2009;

Silverstone & Haddon, 1996). However, based on the findings of all the substudies, particularly in the initial phase of the domestication of eHealth services, the support of professionals played a key role. For example, in substudies II and III, most of the time, a technology advisor brought the needed devices to the service users' homes and instructed them on how to get started with the service.

After the everyday use of the eHealth service had begun, technical problems were the main reasons for older interviewees in substudies II and III and older people in substudy I to turn to either a professional or a warm expert (Olsson & Viscovi, 2018), depending on their preference or possibilities. Based on the systematic review (substudy I), during the learning process, face-to-face support, which is the kind of support that older ICT users wish to have (Lindberg & Lindgren, 2022; Taipale, 2019), was more common, and when the domestication process went further, the support more frequently turned into long-distance contact of both professionals and warm experts. However, substudies II and III have revealed that face-to-face support was not possible for everyone because the service users lived in rural Finnish Lapland, where the distances between residences can be long and relatives, friends, and neighbors may live far away (Formosa et al., 2014; Hänninen et al., 2021; Olsson et al., 2019; Taipale, 2019).

In the substudies on the phone and video conferencing service (substudy III) and robotic medication-dispensing service (substudy II), only the adult children of the participating service users acted as warm experts. That is in line with Taipale (2019) but contrary to the broad set of warm experts found in other studies (substudy I; Heart & Kalderon, 2013; Ng, 2007; Olsson & Viscovi, 2018; Rasi & Kilpeläinen, 2015). Intergenerational learning between grandparents and grandchildren did not occur in the present research (Schmidt-Hertha, 2014). In substudy I, rural and nonrural eHealth users' warm experts consisted of spouses, grandchildren, other family members and relatives, family caregivers, peers, and friends. The findings of the present research suggest that in a Finnish rural context, eHealth services can be perceived as more private than everyday technology, which may prevent service users from requesting help from a wide range of warm experts, even though the data show that other potential warm experts, like neighbors, were available.

The studied phone and video conferencing service (substudy III) and robotic medication-dispensing service (substudy II), along with several eHealth services in the systematic review (substudy I), included professional support without an additional charge; thus, the need for easy-to-reach, cost-effective warm expert support was not irreplaceable (Taipale, 2019). This caused three of the participating robotic medication-dispensing service users (substudy II) to primarily request support through the service provider. In addition, according to the interviewed volunteer worker (substudy III), when it came to technical problems during the video conferencing call, the volunteer worker, together with the service user, requested support from the service provider. Previous studies indicate that older people trust in warm experts

more than commercial operators (Nguyen et al., 2015) but, traditionally, also have strong trust in health care professionals (Hirvonen, 2018; Sireni et al., 2017). The present research implies that eHealth services include technology in a new form (see Hänninen et al., 2020), in which case some potential warm experts may not feel competent or comfortable enough in supporting older people's digital competence in the same way as with everyday technology, which the warm experts usually use themselves, too. Professionals are usually trained for eHealth service use, which gives them the competence to also support the service users.

Even though, in the present research, the number of warm experts was narrow compared with professionals, the role of adult children was very meaningful for two participating older people in substudy II and for both of the older interviewees in substudy III. The support provided by the professionals did not always meet the needs and competences of older people in the same way as the warm experts (Bakardjieva, 2005; Hänninen et al., 2022). For example, one interviewed phone and video conferencing service user expressed that after the support provided by his/her son had ended, the desire to use the eHealth service also decreased.

In the case of the robotic medication-dispensing service (substudy II), the practical nurses expressed that they would see the potential for a more active role for warm experts during eHealth domestication. Instead of practical nurses, warm experts could fill the robot with preloaded medication bags, similar to Kamimura (2019). This perspective can be seen as relying on the increasing activity of informal care networks (refamilisation) in Finnish and Western health care systems (Hirvonen, 2018; Jacobs et al., 2018; Kröger, 2019; Kröger & Leinonen, 2011; Milligan & Conradson, 2006). However, refamilisation of care must be viewed critically in terms of the Nordic welfare model, which is based on an individual's right to receive public benefits, such as health care, equally financed with tax funds (Andersen, 2008; Kröger et al., 2019). The past 30 years of refamilisation in Finland can been seen as having an effect on the reduction of the coverage of formal care services, and with it, unequal care depending on family resources (Kröger, 2019). Furthermore, the signs of a narrowing of the communality of the Lappish cultural environment (substudies II and III) do not support the consideration of a more active role of warm experts in the use of the medication-dispensing service.

Finally, the findings of the present research show that help and support from the professionals and warm experts for eHealth learning and use are not required only in digital matters, but also for medical competence (see also Rasi et al., 2020; Sentell et al., 2018). In addition to supporting the digital competence of service users, some professionals—particularly health care professionals—shared their knowledge and skills related to health care, which was needed for the fluent use of the different eHealth services (substudy I).

Next, I will examine the role of eHealth technologies in the learning community (Gütl & Chang, 2008) of learning and care ecosystem. The strongest evidence for

the role of eHealth technologies in supporting the digital competence (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022) of older people was found in substudy II. The robot included in the robotic medication-dispensing service complemented the action of professionals and warm experts in the learning community of the learning and care ecosystem. The robot supported service users' robot literacy (Suto, 2013; Suto & Sakamoto, 2014) by giving instructions they could follow. However, in its simplicity and ease of use, robot use did not require extensive robot literacy. As the service users got into the routine for using the robot, they even remembered the instructions beforehand. All the participating service users had also formed a routine around the instructions, for example, because the alarm on the robot could wake them up or because they had to delay their bedtime because of it.

With regard to the phone and video conferencing service (substudy III), the findings do not clearly present how the device included in the service—that is, a touch screen—supported the service users' digital competence. There were many technical problems in the phone and video conferencing service, and the digital technology did not support users in solving these problems without help.

The present findings about older people's diverse needs for eHealth services at home and the limited operation of a single eHealth technology support the idea of multifunctional domestic eHealth that can promote several components of care at the same time, such as medication and social well-being (Van Aerschot & Parviainen, 2020). However, increasing eHealth use and robotization in care raise a large number of ethical questions related to human dignity (Laitinen, 2020; Leikas, 2017b; Mittelstadt et al., 2011; Niemelä et al., 2021a, 2021b; Turja, 2020; Van Aerschot et al., 2020), such as the reduction of human contact and declining employment of nurses (substudy II). Although the robotic medication-dispensing service somewhat replaced the care tasks of home care professionals, nurses were still needed to fill the robot with medication every two weeks. In addition, because of the limitations of the robot, the nurses still assisted service users in the use of liquid drugs. Furthermore, the new type of care services created needs for new professionals, such as a technology advisor who arranged the service to be placed in the older people's homes, and a security team, which received alerts from the robot. The new type of care service also enabled new operating models in home care, such as re-scheduling the home visits. Professionals also have a new role as learning instructors for eHealth learning and use (see Elo et al., 2022).

In terms of the social context of the learning and care ecosystem, the learning and use of different kinds of eHealth services mostly happened with the assistance and help of the learning community. Both warm experts (Bakardjieva, 2005) and professionals played a significant role in providing support, even though the support from warm experts was more personal and the set of professionals who provided support was broader. The results of the present research indicate that

the different nature of eHealth services compared with everyday technology and the heterogeneity of older eHealth users (Lantela, 2019; Reeder et al., 2013; Spann & Stewart, 2018; Urban, 2017) affected the ways in which older people relied on support. Additionally, eHealth services—in this case the robot included in the robotic medication-dispensing service—had their own limited roles in the social context and learning community of the learning and care ecosystem. Much depends on the nature of the eHealth technology in what kind of role it will have in the learning and care ecosystem. However, eHealth services are expected to make progress and become more multifunctional, indicating that their role in different components of care and as a form of support for users' digital competence is still taking shape (Van Aerschot & Parviainen, 2020).

Cultural context of eHealth use in the learning and care ecosystem

In this section, the cultural context of eHealth use in the learning and care ecosystem is discussed in relation to the heterogeneity of rural older eHealth service users and their cultural identity, life cycle, and cultural values. The present research has confirmed that the *heterogeneity* of digital competence among rural older people also concerns their learning and use of eHealth services (Damodaran et al., 2014; Fang et al., 2018; Hänninen et al., 2020, 2021; Keating & Phillips, 2008; Lantela, 2019; Ofcom, 2019; Rasi & Kilpeläinen, 2015; Reeder et al., 2013; Spann & Stewart, 2018; Statistics Finland, 2020; Urban, 2017). The below overview of the older rural participants of substudies I–III demonstrate their heterogeneity and diversity.

The eHealth service users (substudies I–III) were from all three of the age groups traditionally considered to be older people: youngest-old (65–75 years), middle-old (75–84 years), and oldest-old (>85 years; Lee et al., 2018; United Nations, 2020). In addition, they belonged to both the third age and fourth age (Higgs & Gilleard, 2016) based on their frailty. Older eHealth service users had access to a variety of eHealth services in their everyday lives that promoted their physical, mental, and/or social well-being (Giustini et al., 2009; WHO, 1948). All the studied eHealth service users lived at home, some alone and some with a housemate. Some reported multiple activities outside their homes. Some utilized home care services more than others. The eHealth users in substudies II and III had different educational levels and had made their careers in various lines of business. Three of the participating robotic medication-dispenser service users had previous experience with digital technology use, while two of them and both of the interviewed phone and video conferencing service users did not. In line with the previous literature (Boulton-Lewis et al., 2006; Neter & Brainin, 2012; Schäffer, 2007; Spann & Stewart, 2018; Suopajärvi, 2015), substudies I and III showed a connection between previous experience with digital technology use and digital competence in using eHealth. In substudy II, that connection was not clear. However, based on all the substudies (I–III), previous experience with digital technology and other experiences were related to service

users' technology-related cultural understanding. Service users' (substudies I–III) personal resources varied, and their health and income particularly affected how well they were able to manage eHealth use in the learning and care ecosystem and in their everyday lives (Dobbs & Strain, 2008; Keating & Phillips, 2008).

In addition to eHealth users, there were also eHealth nonusers (Hakkarainen, 2012; Rasi, 2018, 2021; Rasi & Kilpeläinen, 2015; see also Hänninen et al., 2022) who refused the service or who had begun but later rejected the service (substudies II and III). This knowledge of nonusers is based on secondhand information obtained from the participating professionals (substudies II and III), which is why the nonusers' detailed demographics and number are unknown. In the case of the robotic medication-dispensing service (substudy II), older people's reasons for nonuse and rejection were the technical and aesthetic features of the robot, cognitive and physical difficulties, being unwilling to start the service because they preferred the old way of taking medication, and worries about the cost of the service. In the case of the phone and video conferencing service (substudy III), the older people's reasoning for nonuse was associated with continuous technical problems with the service; personal difficulties with learning to use and then using it, such as poor health or lack of interest; and insufficient support for the learning and use of the eHealth service. In addition, older people's fear of being stigmatized as lonely might have prevented some older people from starting the phone and video conferencing service. The present research suggests that digital technologies and, thus, eHealth services were newcomers within rural Lappish older people's life cycle, hence causing uncertainty for several potential users. The internet and eHealth—and, accordingly, digital competence—may have played very little or no role in their past or present lives. More research is needed to better understand rural eHealth nonusers in the learning and care ecosystem.

Even though the above descriptions show older eHealth service users' heterogeneity, there are culturally congruent practices that unify their eHealth service use in the learning and care ecosystem, supporting the idea of the situated digital competence of older people, something that cannot be seen outside of their cultural context (Lipponen, 2010; Rasi & Kilpeläinen, 2015). In terms of the concept of the *life cycle* of the learning and care ecosystem (Gütl & Chang, 2008; Kaihovaara et al., 2017), Lappish older people's life experiences and eHealth service suitability affected the learning and use of eHealth services (see Dittmann-Kohli & Jopp, 2007; Haddon, 2000; Lipponen, 2007; Saranto et al., 2020), as presented below.

First, the present research has revealed that service users' technology-related cultural understanding influenced their use of new digital technology, in this case eHealth services. In substudy III, based on volunteer workers' interviews, some phone and video conferencing service users, for example, understood privacy in such a way that they were not comfortable or willing to show their living room via the

video conferencing service, even if they had the digital competence to do it. On the other hand, users' ability to protect their own privacy embodies the competence area of *safety* from the DigComp framework (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022). In the interview of a volunteer worker, one male service user (not participating in the study) expressed that he wished to have the calls with a female volunteer worker because he felt that males cannot have deep conversations together and these deep conversations are what he aimed for. One interviewed volunteer worker said that some phone and video conferencing service users believed, based on their past experiences, that talking via a video conferencing service would increase their phone bill; for that reason, they wanted to keep the calls short. In substudy II, three of the participating robotic medication-dispensing service users expressed that they felt the scheduling of the robot was restrictive because they had to be at home when it was time to take the medications (Aceros et al., 2015). The users had had a schedule for medication through the home care services before the eHealth service; however, their technology-related cultural understanding was at odds with being commanded by a robot. This reflects on the service users' robot literacy and competence to understand and interact with robots (Suto, 2013; Suto & Sakamoto, 2014).

Second, based on the present findings, cultural constructions are also connected to how suitable eHealth services are and how well they fit into older people's everyday lives (see also Haddon, 2010, 2011; Hakkarainen, 2012; Lipponen, 2007, 2010; Olsson & Viscovi, 2010). Compared with the results of the systematic review (substudy I), which was conducted in an international context, the results of substudies II and III show signs of a narrowing of the communality of the Finnish cultural environment. As demonstrated in the social context paragraph, Lappish older people did not rely on the support of warm experts (Bakardjieva, 2005) as widely as in the studies included in substudy I. The findings should draw attention in light of previous research findings (e.g., Formosa et al., 2014) that emphasize the importance of learning in the community, particularly among older people.

In the case of the robotic medication-dispensing service (substudy II), changes in the everyday lives of older people could cause new learning and competence needs in the use of the robot. As brought up in the DigComp framework (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022), competence area *problem solving* also includes the ability to recognize one's own changing competence and learning needs. One participating service user stated that s/he did not know how to change the robot's medication dosing schedule during his/her visit to his/her son and therefore needed the help of a professional.

The research clearly demonstrates that older people's cultural constructions can either support or challenge eHealth services' suitability for their everyday lives. For example, in substudy I, the ability of users to incorporate their religious or spiritual perspectives into the eHealth service (Barrera et al., 2017), or the fact that TVs,

which the service users were already familiar with, were used as devices of the eHealth services (Boquete et al., 2011; Costa, 2017), enabled the integration the eHealth services into the everyday lives of the older people. Substudy III showed that being able to follow familiar cultural practices while having a talk via the video conferencing service, such as while sitting in a rocking chair and having a cup of coffee together, supported both the social presence and domestication of eHealth in everyday life. Four of the participating robotic medication-dispensing service users (substudy II) felt that the service did not follow their familiar cultural practices as active older people because the service controlled or limited their daily schedules.

In the present research, it was found that eHealth service use was also culturally constructed through older people's *cultural values* (Zimmerman Umble, 1999). The main findings can be concluded as a kind of balance between two values: independence (Finnish Ministry of Social Affairs and Health, 2015, 2020a; Kröger & Bagnato, 2017; Rostgaard et al., 2011; Sims-Gould & Martin-Matthews, 2008) and togetherness (Damant et al., 2017; Leikas, 2017b; Nyman & Isaksson, 2015; Tennberg et al., 2020). In the present study, eHealth service use was experienced as enabling independent life, which identified the *aging in place* identity (Chen & Powell, 2019; Kröger & Bagnato, 2017). At the same time, the use of eHealth was also experienced as enabling the belonging and togetherness of rural older people. This was apparent within the phone and video conferencing service (substudy III) that promoted rural older people's social connectedness and reduced their feelings of isolation (see Antunes et al., 2019; Chen & Schulz, 2016).

The findings of the systematic review (substudy I) also support this claim. Several themes related to social interactions, such as social connectedness and belonging, and opportunity for shared experience, show that the use of eHealth was experienced as enabling togetherness. Contrary to this, for example, substudy I described the following themes as barriers for eHealth use: the eHealth service made the user feel like an outsider, or the service did not support communication. It is noteworthy that, although the political aim is to support citizens' independence by increasing electronic services (Finnish Government, 2022; Finnish Ministry of Social Affairs and Health, 2015, 2020a, 2020c; Kröger & Bagnato, 2017; Rostgaard et al., 2011), the concept of digital competence emphasizes those skills related to communication and collaboration (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022). Further interpretation of eHealth service users' cultural values requires a deeper intersubjective participation of the researcher in the research process (Jennings, 2009; Kivunja, 2017; Lincoln & Guba, 2000).

The key message from this section can be summarized as follows: one kind of eHealth does not necessarily fit all older people. The diversity of users' experiences with, perceptions of, and competence in using eHealth should be noticed (Fang et al., 2018; Lantela, 2019; Reeder et al., 2013; Spann & Stewart, 2018; Urban, 2017). In addition, the users' existing cultural constructions (Dittmann-Kohli & Jopp,

2007; Haddon, 2010, 2011; Hakkarainen, 2012; Lipponen, 2007, 2010; Olsson & Viscovi, 2010) and cultural values (Fang et al., 2018; Urban, 2017; Zimmerman Umble, 1999) should be observed for the successful implementation of eHealth services.

The symbolic context of eHealth use in the learning and care ecosystem

The symbolic context of eHealth use in the learning and care ecosystem in the present research is based on the main meanings and emotions assigned to eHealth services and their learning and use. The assigned meanings in substudies I–III can be divided into two categories: *new and needed services for rural areas* and *source of inconvenience and concern*.

The present research identified that the eHealth services appeared as *new and needed services* to rural older people. The systematic review (substudy I) shows that eHealth services may provide solutions to several challenges related to health care services in rural areas (see Begum, 2019a; Dobbs & Strain, 2008; Kilpeläinen & Seppänen, 2014; OECD, 2008; Raugze et al., 2017; Rehunen et al., 2012; Sireni et al., 2017). Based on its findings, eHealth services facilitate access to health care services and reduce barriers that prevent older people from accessing them, such as logistical, time, financial, and weather barriers. However, it cannot yet be said that eHealth services have become established in Finnish Lapland and other rural areas.

The key meaning of the phone and video conferencing service (substudy III) and the robotic medication-dispensing service (substudy II) for the participants was to support the components of care the service was aimed at. The phone and video conferencing service helped establish networks and reduce loneliness while providing meaningful activities for older people in rural areas (Antunes et al., 2012; Chen & Schulz, 2016; Kilpeläinen & Seppänen, 2014; Outila & Kiuru, 2021). The robotic medication-dispensing service was needed because it supported the independence of older people with memory disorders by reminding them to take the medication (Kamimura, 2019; Kamimura & Ito, 2014; Ligons et al., 2014; Reeder et al., 2013).

Although not all the participating service users in substudy II felt that the medication-dispensing service was necessary for their successful medical treatment, four out of five stressed the meaning of the robot as a companion, much like what was found in the study by Pols (2012). They called the robot a "good friend" and "pal," and gave it several nicknames: gizmo, computer, contraption, rollator (a walker on wheels with a seat), bucket, cannikin, clunker, cask, and memory (see Søraa et al., 2021). The older people considered it significant that the robot communicated to them, although the robot did not allow two-way conversations between the robot and a human. Even though some of them would answer the robot, they understood that the robot did not register their speech, which suggests the robot literacy of the older people (Suto, 2013; Suto & Sakamoto, 2014). It can be interpreted that the four participating service users in substudy II with an impaired memory formed a

close, caring relationship with the robot (Pols, 2012; see also Sparrow & Sparrow, 2006), which brought extra value to the service. The literature (Mordoch et al., 2013) on social commitment robots suggests that robots can support the key challenges in the care of older people with dementia, such as maintaining their communication skills. The phone and video conferencing service users (substudy III) did not report an equivalent close relationship with the eHealth technology itself.

The service evokes many different feelings among the older people. The positive emotions from both case studies (substudies II and III) can be condensed into the joy of being in touch with someone, even though it would be a one-way interaction with a robot. In substudy III, the volunteer workers' positive feelings toward the service included the joy of talking to someone and making the service user happy. The two participating service users (substudy III) emphasized the service's meaning as a provider of new social relationships and meaningful activities. Furthermore, both the robotic medication-dispensing service and the phone and video conferencing service, as well as several eHealth services in substudy I, had meaning as providers of a sense of safety for older people and their family members.

Previous studies have shown that eHealth services enable older people to age in place, but also generate negative emotions (Korjonen-Kuusipuro & Saari, 2021; Spann & Steward, 2018; Urban, 2017). In the present research, eHealth services were clearly also *a source of inconvenience and concern* for the users and nonusers in rural areas; negative emotions were principally associated with technical issues and insufficient support in using the eHealth services, as well as uncertainty and a lack of perceived need, interest, trust, or comfort in digital devices or internet usage. Substudies II and III showed that the key meanings of the phone and video conferencing service and the robotic medication-dispensing service were twofold. Whereas the phone and video conferencing service supported the social connectedness of older people, it also created a fear of being stigmatized as lonely (Peek et al., 2014; Yusif et al., 2016). In addition, some service user–volunteer worker relationships did not work, for example, because they did not "click" or because of inappropriate romantic feelings, thus leading to the end of the service relationship. Whereas the robotic medication-dispensing service supported the independence of older people and had meaning as a companion, it also a had meaning as a service that limited and controlled the users' everyday lives. Both the participating older people and the professionals in substudy II expressed fear and sorrow about the reduction of human contact and the declining employment of nurses (Laitinen, 2020; Niemelä et al., 2021b; Turja, 2020, 2021; Van Aerschot et al., 2020). Furthermore, although the eHealth services increased the service users' sense of safety (substudies I, II, and III), they also created concerns about security and privacy issues (Leikas, 2017b; Mittelstadt et al., 2011).

A summary of the overarching findings of the dissertation is presented in Table 5.

Table 5

Summary of the Overarching Findings of the Dissertation based on the Key Analytical Contexts of the Learning and Care Ecosystem

Practical	The eHealth domestication process is the most affected by the usability and functionality of eHealth services and their compatibility for users' culturally situated social practices.
Social	Together with older people, warm experts, professionals, and eHealth technologies form a learning community that enables the digital competence required for the eHealth learning and use as a distributed, social activity, and domestication of eHealth services as a social process.
Cultural	The meaning of rural older people's cultural background for the eHealth service learning and use is twofold: culturally congruent practices can be found, while each eHealth service user is an individual; together, they form a very heterogenous group of eHealth service learners and users.
Symbolic	eHealth services were both new and needed services for rural areas and a source of inconvenience and concern. eHealth learning and use generated both negative and positive emotions.

The appropriation phase (Hynes & Richardson, 2009; Hynes & Rommes, 2006), which starts the learning process of the eHealth service, turned out to be the most critical in the domestication process, thus requiring a great deal of action by the learning community (Gütl & Chang, 2008) of the learning and care ecosystem. The domestication process was the most affected by the usability and functionality of the eHealth services and their compatibility with the older people's culturally situated social practices. Although culturally congruent practices for eHealth learning and use in rural Finnish Lapland were found, the present research has indicated that every rural eHealth user is an individual, confirming that the heterogeneity of digital competence of rural older people also concerns their learning and use of eHealth services (Fang et al., 2018; Lantela, 2019; Rasi & Kilpeläinen, 2015; Reeder et al., 2013; Spann & Stewart, 2018; Urban, 2017). In terms of the concept of domestication (Haddon, 2011; see also Frennert, 2016; Søraa et al., 2021; Talsi, 2014), the interpretation of the meanings assigned to eHealth service learning and use in rural areas revealed that eHealth services were both new and needed services for rural areas yet also a source of inconvenience and concern for the users. eHealth service learning and use generated both negative and positive emotions for older people.

4.2 Concluding remarks

To conclude the overarching findings, the eHealth use of rural older people and their social networks took place in the practical, social, cultural, and symbolic contexts of the learning and care ecosystem. As their cross-cutting theme, eHealth

service learning and use was demonstrated through concepts of digital competence (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022) and eHealth domestication (Haddon, 2007; Lie & Sørensen, 1996; Silverstone & Haddon, 1996).

The research confirmed that learning to use eHealth services in the learning and care ecosystem is not a one-time experience that only happens when the service is introduced, but continues throughout the entire domestication process, requiring continuous and different types of digital competence and social support. This reinforces the idea of Rasi-Heikkinen (2022) that in the future, a stronger inclusion of a learning perspective in a domestication approach is justified. During eHealth domestication, rural older people's eHealth learning and use usually happened through assisted use (Hänninen et al., 2020; Hänninen et al., 2022), thus reinforcing the idea that the digital competence required for eHealth learning and use is a distributed social activity (Lipponen, 2007, 2010; Olsson & Viscovi, 2018; Rasi & Kilpeläinen, 2015; Sentell et al., 2018). With a new kind of care service, professionals and warm experts received an updated role as learning instructors for eHealth service for the elderly in the learning and care ecosystem (see Elo et al., 2022; Martínez & Olsson, 2022).

The competence areas of the DigComp framework (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022) that were applied in eHealth services (Rasi-Heikkinen & Airola, 2022) were emphasized during the domestication process: competence to interact through digital technologies with health care service personnel, peers, and family members (communication and collaboration [2]); competence to protect one's digital devices, personal health data, privacy, and health and well-being (safety [4]); and competence to solve technical problems that occur when using eHealth, and to identify one's own changing competence and learning needs and the support needed (problem solving [5]).

Because learning is such a central part of eHealth domestication, and in terms of the primary scientific discipline of the current dissertation—that is, adult education (Merriam & Brockett, 2007; Schneider, 2005)—the process of learning to use eHealth services could be featured more prominently when planning the domestication of eHealth services in the homes of older people. The learning process could be better planned in advance, and some pedagogical approaches could be inserted into the process (see, e.g., English & Mayo, 2012; Rasi et al., 2020). That being said, I argue that in addition to social and health care professionals, volunteer workers, and technical professionals, as well as warm experts, the learning community of the learning and care ecosystem in eHealth use should include a pedagogical expert. The service provider—in this case, the home care services—should take responsibility for this. This would reinforce the professional consideration of the continuous learning process and different types of digital competence during eHealth domestication (Rasi-Heikkinen, 2022).

4.3 Theoretical-conceptual model for eHealth learning and use

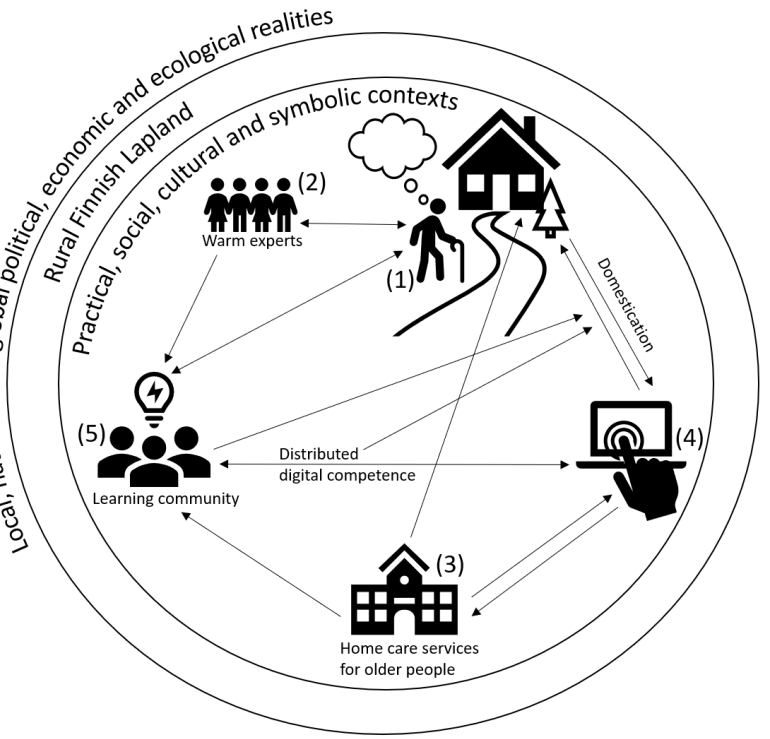
The theoretical underpinning of the current research was built on three theoretical approaches: the framework of the learning and care ecosystem, the concept of digital competence (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022), and the concept of domestication (Hynes & Richard, 2009; Silverstone & Haddon, 1996). The learning and care ecosystem provided the basis for the learning and use of eHealth services, and the concepts of digital competence and domestication focused on the learning and use processes of eHealth services. The theoretical approaches were not separate entities; instead, they complemented and enriched each other during the research. The general hypothesis of the framework was that the use of eHealth services of rural older people living at home takes place in the practical, social, cultural, and symbolic contexts of the learning and care ecosystem.

Based on the theoretical framework utilized in the present research and the overarching findings of the present research (Table 4), I have constructed a new theoretical-conceptual model of eHealth learning and use called the *Learning and care ecosystem in eHealth use* (Figure 3). The model can be utilized when designing and domesticating eHealth services or as an analytical tool for research purposes. The model is intended to adapt to different eHealth learning and use environments and situations as simply as possible. The model demonstrates the complex nature of eHealth learning and use and that the functions of the learning and care ecosystem are not separate from each other and do not take place in a linear, stable, or closed process (Hynes & Richardson, 2009; Kaihovaara et al., 2017). The model accommodates a very wide range of different eHealth service users (Fang et al., 2018; Lantela, 2019; Spann & Stewart, 2018) and their diverse learning processes included in eHealth use (Gütl & Chang, 2008; Hänninen et al., 2020, 2022; Virolainen et al., 2019).

According to the nature of the ecosystems (e.g., Gütl & Chang, 2008; Virolainen et al., 2019), the learning and care ecosystem in eHealth use is based on certain dimensions and interactions between them, as reviewed from the outside of the model going inwards. After Van Aerschot and Parviainen (2020), the model considers local, national, and global political, economic, and ecological realities, but in terms of the present research, the eHealth learning and use is centralized in rural Finnish Lapland. At the core of the model are the practical, social, cultural, and symbolic contexts (Table 1) through which the learning and use of eHealth services are ultimately examined. In the visual model, the contexts are illustrated by different symbols: a finger pointing at a computer (practical), a crowd under a lightbulb (social), a home in a sparsely populated area and walking stick (cultural), and the thought bubble (symbolic).

Figure 3

Learning and Care Ecosystem in eHealth Use



The arrows in the model indicate the interaction between the actors. The advantage of an ecosystem model is that it highlights and enables the complexity of the links between the actors (Virolainen et al., 2019). The key actors of the learning and care ecosystem in eHealth use are as follows: (1) the older person, who is living at home in the rural area of Finnish Lapland; (2) the warm experts (Bakardjieva, 2005) of the older person; (3) home care services for older people, including social and health care professionals and volunteer workers, who implement their new role as learning instructors; and (4) the eHealth services that home care services provide for older people, including their technical support. In addition to eHealth services, home care services also provide alternative services that are not digitalized. Together, the key actors form (5) a learning community (Gütl & Chang, 2008). In some cases, a certain piece of eHealth service, in the case of the present research a robot, can have its own—but limited—role in the learning community (Pols, 2012; Søraa et al., 2021; Van Aerschot & Parviainen, 2020). Warm experts and the older person may also interact outside the learning community, here in relation to other parts of

everyday life and care. It must be kept in mind that for each individual older service user, it is personal how the actors of the learning and care ecosystem will turn out, depending on, for example, their available social networks and services.

The technological aspects of the learning and care ecosystem can be defined as eHealth services. Traditionally, in learning ecosystems, *technology* refers to an application that supports the learning process (e.g., Pornpongtechavanich & Wannapiroon, 2021; Sarnok et al., 2019; Zhao & Frank, 2003), but in terms of the present research, eHealth services are the learning objectives (Gütl & Chang, 2008). Thus, learning to use eHealth services is also the key learning content, and its continuous and informal learning process aims for the digital competence of older people (Lipponen, 2010; Rasi & Kilpeläinen, 2015; Vuorikari et al., 2016, 2022) and the domestication of eHealth services (Haddon, 2007; Lie & Sørensen, 1996; Silverstone & Haddon, 1996). Both digital competence and domestication take into consideration the personal, social, and cultural processes of eHealth learning and use (Haddon, 2011; Lipponen, 2010). A successful domestication of eHealth services requires situated and distributed digital competence (Lipponen, 2010; Rasi & Kilpeläinen, 2015; Silverstone, 2006; Silverstone et al., 1992; Vuorikari et al., 2016, 2022). However, for several reasons, the domestication of eHealth services is not always successful or permanent (Hartmann, 2020; Hynes & Richardson, 2009), and in the model, this action is illustrated by the arrows pointing from home back to the home care services. In the beginning of the domestication process, an older person becomes either a user or nonuser (Hakkarainen, 2012; Hynes & Richardson, 2009; Hynes & Rommes, 2006; Rasi, 2018; Rasi & Kilpeläinen, 2015). Over time, reassessment of the eHealth service can happen, and uses can change or end (Hynes & Richardson, 2009).

4.4 Implications and future directions

Above all, the scientific contribution of the current dissertation is that it has indicated that older people's eHealth learning and use is much more than placing the technology in their homes and starting to benefit from the service. It requires continuous and different types of digital competence and social support through the entire domestication process.

It is not enough to consider the use of eHealth services from a purely societal perspective, nor is it appropriate to simply place the burden solely on the eHealth service users; service developers, service providers, policymakers, and social and health care professionals should also do their part when designing and implementing eHealth services. Successful eHealth design and implementation requires considering eHealth use in the complex learning and care ecosystem. The learning and care ecosystem framework is a new and needed approach to those theories informing eHealth implementation (Heinsch et al., 2021). The conclusions of the systematic

review of Heinsch et al. (2021) call for future research in developing and testing theoretical models that "recognize and reflect the multidimensional, dynamic, and relational nature" (abstract, para. 5) of the implementation of eHealth interventions. In particular, Heinsch et al. (2021) found a need for theories that reflect the "various disorderly social processes" (Conclusions section, para. 1) of the implementation. Next, I will outline the practice and policy implications of the current dissertation's findings.

Based on the overarching findings of the present dissertation, the following four practical development proposals for eHealth design and implementation in the learning and care ecosystem can be set. First, the study has revealed that the usability and functionality of eHealth services, along with considering older people's special needs, are key facilitating factors of eHealth service learning and use (Kaihlanen et al., 2021). Therefore, the design process of eHealth services should have a user-centered approach and involve real service users—in this case older people—in the design process (Cornet et al., 2020; Finnish Ministry of Finance, 2019). This would support the consideration of the heterogeneity of older people, their diverse ways of learning to use and using eHealth services, and their personal preferences regarding eHealth technologies and services. The starting point for the design process should be an eHealth service that is as easy to use as possible and, from a technical point of view, that implements the idea of "you just press a button." The usability of eHealth services is strongly related to their existing technical problems. Solving technical problems should be prioritized. The present research reveals that, for example, the lack of adequate broadband connections in rural areas has a strong negative impact on older people's eHealth service learning and use. The Digi Arkeen [Digital Everyday life] Advisory Board (Finnish Ministry of Finance, 2021) confirms that some digital services are not accessible to everyone because of problems regarding the availability of high-quality broadband connections (see also Kyytsönen et al., 2021).

Second, older people's existing individual, culturally situated social practices should be considered in the learning and care ecosystem. The findings of the present research indicate that older people's eHealth learning and use was continuous informal learning (Park et al., 2021) and usually happened through assisted use (Hänninen et al., 2020, 2022). In the learning and use of eHealth services, the older people relied primarily on the support of professionals and their adult children. This shows that the learning community of the learning and care ecosystem played a significant role in distributing the digital competence of older people. Thus, adequate, easily approachable technical and emotional support should be available for service users through the entire domestication process, but this should especially be the case in the early stages (Kaihlanen et al., 2021). In addition, the importance of different actors of the learning community to uphold and nurture ongoing support need to be acknowledged. The provision of pedagogical support as part of the learning community should be considered.

The social meaning of eHealth technologies should be further emphasized. The findings of the present research indicate that even a simple eHealth technology, such as the robot included in the robotic medication-dispensing service, has a place in supporting the digital competence of older people and as their "friend." Therefore, it is reasonable to state that eHealth technologies and services have their own important but limited role in the learning community of the learning and care ecosystem (Pols, 2012; Søraa et al., 2021; Van Aerschot & Parviainen, 2020). Their role should be kept up to date as eHealth advances. Furthermore, it should be ensured that the digital competence and attitude of home care personnel are not obstacles for eHealth domestication (Konttila et al., 2018; Savela et al., 2017). There is a need for a discussion among home care personnel about the role of eHealth now and in the future.

Third, the findings indicate that the meaning of older people's cultural background when it comes to eHealth service use in the learning and care ecosystem is twofold. On the one hand, culturally congruent practices can be found in the rural Lappish older people's learning and use of eHealth services (e.g., Begum, 2019a, 2019b). For example, the service users' technology-related cultural understanding influenced their use of eHealth services, such as how they understood related privacy issues. In addition, specific cultural identities seemed to affect how support networks were formed and used (or not used) in the rural Finnish settings. However, each eHealth service user is an individual, and together, they form a very heterogenous group of eHealth service learners and users (e.g., Hänninen et al., 2020; Lantela, 2019). The diversity of older people's needs for, access and willingness to, and competence in using eHealth services should be noted in eHealth design and implementation (Kaihlanen et al., 2021). In addition to digitalized home care services, alternative ways to access home care services for older people must be provided (Finnish Ministry of Finance, 2019; Kaihlanen et al., 2021).

Fourth, the topicality of this research topic was especially relevant with the COVID-19 pandemic. The epidemic broke out in Finland in the spring of 2020. Studies (Kaihlanen et al., 2021; Kyytsönen et al., 2021) conducted in the Finnish context reveal that COVID-19 has increased the provision of eHealth services (different electronic, remote, and digitalized social and health care services) and their use. According to Kaihlanen et al. (2021), the increased provision of eHealth services seems to have both benefited and challenged vulnerable groups, such as older people, during the epidemic. These findings are in line with the present research, which has shown that for older people, eHealth services have a meaning as new and needed services for rural areas, but can also be a source of inconvenience and concern. During the pandemic, one of the barriers to eHealth learning and use was ignorance of the provision of eHealth services and its possibilities (Kaihlanen et al., 2021). Substudy III reported challenges in marketing the phone and video conferencing service without stigmatizing older people as lonely. Ignorance can contribute to the

meanings older people assign to eHealth service learning and use. Therefore, the final practical development proposal for eHealth design and implementation in the learning and care ecosystem is that the marketing of eHealth services should focus on reaching the right target people.

From a political perspective, the present research brought about the following three implications. First, the research has an impact on the further development of the DigComp framework (Carretero et al., 2017; Ferrari, 2013; Punie, 2013; Vuorikari et al., 2016, 2022). The research has indicated that older people's eHealth use in the learning and care ecosystem requires continuous and different types of digital competence during the entire domestication process. In the DigComp framework, it should be noted that the digital competence of older people is not a permanent state and can be affected by various actions during the life cycle of older people (Kaihovaara et al., 2017; Saranto et al., 2020). For example, older people's health-related issues or social networks may challenge the learning and use of eHealth services. Furthermore, the competence areas of the DigComp framework are quite practical, lacking a deeper reflection of the social, cultural, and symbolic contexts of the learning and care ecosystem. For example, the present research clearly demonstrated that the digital competence of older people in the learning and care ecosystem can be understood as situated social practices (Lipponen, 2010; Rasi & Kilpeläinen, 2015); therefore, in the DigComp framework, eHealth learning and use cannot be seen as merely individual skills outside of the cultural context. In addition, the effect of emotions on eHealth learning and use should be included in the DigComp framework. Thus, the DigComp framework should be supplemented with the identified complex competence requirements related to the eHealth learning and use of older people, as has been done in the Digital Competence Framework for Care Workers and Caregivers (Valenta, 2013; Valenta et al., 2013).

Second, the Finnish and European care policies emphasize how the aim of eHealth services is to support the independence and *aging in place* of older people (Finnish Ministry of Social Affairs and Health, 2015, 2020a; Kröger & Bagnato, 2017; Rostgaard et al., 2011). However, the policy documents ignore older people's need for human contact, belonging, and togetherness, which also proved to be culturally important values in the present research. In addition, from several perspectives, the present research shows that the learning community of older people plays a significant role in eHealth use in the learning and care ecosystem. Thus, the complexity of the learning and care ecosystem—particularly its social context—should be considered in Finnish and European care policies when referring to eHealth services (see also Valokivi et al., 2021).

Finally, on a political level, the findings of the present research show the need to pay more attention to social and health care services in rural areas (Begum, 2019a; Valokivi et al., 2021). The specific features of rural areas should be considered in the ongoing social and health care reform in Finland (Finnish Government, 2022).

Rural areas in particular are in need of eHealth services because of their poor access to and availability of physical facilities for social and health care services (Dobbs & Strain, 2008; OECD, 2008; Raugze et al., 2017; Sireni et al., 2017). Despite this, eHealth services in rural home care are still underused, and their use is hampered by, for example, a lack of adequate broadband connections, as the empirical findings of the current research have demonstrated. Despite strong digitalization of social and health care services, alternative services should be available alongside eHealth services to prevent the health inequalities and digital divide of rural older people (Finnish Ministry of Finance, 2019; Kaihlanen et al., 2021; Sandberg et al., 2022).

On behalf of the HARVEST project, the main findings of the research have been presented to the research community in several national and international conferences and in the final seminar of the HARVEST project. Additionally, the findings related to the phone and video conferencing service and the robotic medication-dispensing service and areas for improvement have been presented in Finnish and discussed with the key stakeholders of the aforementioned services in Finnish Lapland. The findings related to the social support networks of the services will be published in Finnish in one chapter of a science book (Rasi-Heikkinen & Airola, 2022) intended for higher education and professionals on the learning of older people and effects of digitalization. I hope the findings of the dissertation will reach eHealth service developers and providers, as well as Finnish social and health care policymakers, creating an understanding of eHealth use as a complex process in the learning and care ecosystem. These practical and policy actions are needed so that new eHealth services may be smoothly domesticated into the everyday lives of older people in rural Finnish Lapland.

The present research found several research gaps and future directions that researchers can utilize that are related to eHealth learning and use. First, attention should be paid to the research methods used in eHealth learning and use studies. More qualitative studies that bring out the voice of rural eHealth service users and nonusers are needed (Finnish Ministry of Finance, 2019). To accomplish this, I encourage strengthening the ethnographic research practices in the field of eHealth use of older people. The benefit of the ethnographic approach is that it shows the overall picture of eHealth domestication in the service users' real-life environments. In addition, it provides an opportunity to strengthen the knowledge of eHealth use of older people in various cultural settings (Haddon, 2011). A stronger focus on older people's learning processes and pedagogical approaches is also required in research on eHealth learning and use. In particular, the systematic review (substudy I) calls for more investigations of the eHealth learning process as part of the domestication research. In relation to the social aspect of eHealth use in the learning and care ecosystem, I call for research in which older eHealth service users are not, in principle, in need of support, but will be explored as warm experts themselves.

As demonstrated by substudies II and III, in a Finnish context, the warm experts of older people were principally eHealth service users' adult children, who were possibly older people themselves. Exploring this would strengthen the understanding of the role of warm experts in eHealth learning and use.

Although the present research focused on eHealth learning and use from the perspective of individuals emphasizing local and national realities, it lacks three important aspects of the learning and care ecosystem that I hope will be emphasized in further research: the global, economic, and ecological realities of eHealth learning and use (Hartmann, 2020; Heinsch et al., 2021; Van Aerschot & Parviainen, 2020). The systematic review (substudy I) focused on the global aspect of eHealth learning and use; however, it excludes a broader global view outside welfare states. It is imperative to understand that developing countries have unequal access to eHealth services (Henriquez-Camacho et al., 2014). The present research describes eHealth services as "cost-effective" according to the WHO (2005, p. 109), revealing that the costs of social and health care services, including eHealth services, make older people wary. However, the literature does not directly talk about money, though I agree with Van Aerschot and Parviainen that eHealth services cannot be implemented in the learning and care ecosystem "without profound evaluation of how the devices are produced and financed" (2020, p. 253). This leads us to the ecological realities of eHealth service use: before eHealth services are produced and implemented, it needs to be clarified "how the needed raw materials and waste are managed" (Van Aerschot & Parviainen, 2020, p. 253; see also Emmanouila et al., 2013; Heinsch et al., 2021). From the perspective of the Nordic domestication approach, it is important to deal with these societal issues that are related to new technology adoption and use (Hartmann, 2020).

4.5 Evaluation of the process and outcomes

The current research met its initial aims. The research concluded that rural Lappish older people's eHealth learning and use is constructed through practical, social, cultural, and symbolic contexts of the learning and care ecosystem. This research has increased the knowledge of distributed and situated digital competence of older people in eHealth learning and use and clarified that the learning process is an inseparable part of eHealth domestication. Furthermore, the research has been used to form a theoretical-conceptual model of eHealth learning and use, illustrating the complex structures of the process and setting development proposals for eHealth design and implementation.

The current research stresses the voices of older people and their heterogeneity. The voices of older people have been brought up by involving real older eHealth service users living at home in rural Finnish Lapland in the research. They were

able to express their experiences of learning to use and using eHealth services in several different ways; in addition to the interviews, their eHealth use was observed and photographed. The systematic review included the experience of hundreds of rural older people's eHealth learning and use and brought background information for the research. Furthermore, social and health care professionals and volunteer workers shared their experiences of older people's eHealth learning and use. The goal was not to see the older people only as eHealth service users, but to understand their eHealth learning and use more broadly as a part of their everyday lives in rural areas in the complex learning and care ecosystem.

However, the findings must also be evaluated critically. It can be criticized that the assumptions of eHealth services as helpful and relevant are not sufficiently questioned. The findings and conclusions of the present research mainly encourage the further development of eHealth services among rural older people.

Four other main limitations of the present research merit mentioning. First, although the substudies complemented and supported each other, they could have formed an even more complete whole. Unlike substudies II and III, the systematic review (substudy I) focused on eHealth use in several different countries in both rural and nonrural settings. Substudy I enabled comprehensive data collection and additional knowledge on the use of eHealth in non-Finnish cultures but complicated the dialogue between the substudies. Either the scope of the literature review could have been refined or a fourth substudy could have been added, which would have strengthened the position of Finnish Lapland in the current dissertation. In addition, the scope of the research could have been narrowed. A risk of the domestication approach is that the topic is considered from various directions, yet not concentrating on the main focus of the research—that is, the learning perspective.

Second, the case studies of the phone and video conferencing service (substudy III) and the robotic medication-dispensing service (substudy II) involved a rather small number of participants, and the data collection phase was brief. However, all older people who met the criteria and were willing to participate in the substudies were included. Despite the small sample size, they were sufficient for being representative cases (Swanborn, 2010). At the time of data collection, the phone and video conferencing service had a total of four older service users, and half of their interviews were included in the study. In autumn 2019, a few months after the data collection regarding the robotic medication-dispensing service, the service had 17 older service users in the municipality. Almost a third of them participated in the study. Based on the assessment of our contact personnel in home care services, not all the service users would have been capable of participating in our study. Complementary data collection methods, such as observations in substudy III and a more in-depth ethnographic approach in substudy II, would have increased the knowledge of eHealth learning and use from the perspective of the older residents

living in Finnish Lapland (Fusch & Ness, 2015). Because of the nature of the data, the findings cannot be generalized to be always typical among rural older people for the learning and use of different kinds of eHealth services (Atkins & Wallace, 2012; Hammersley, 2006; Hatch, 2002).

Third, the dominant data collection methodology used in the two case studies (substudies II and III) was semi-structured interviewing. Although special attention was paid to the interview techniques used with older people (Luomanen & Nikander, 2017; Robertson & Hale, 2011), it can be questioned whether interviewing is the most appropriate way to investigate older people, at least as the only research methodology. Cognitive changes in particular, such as impaired memory among older participants, may have affected the outcome of the interviews (Gerolimatos et al., 2014; Luomanen & Nikander, 2017; Nikander & Zechner, 2006). The coauthors and I based our evaluation of whether to interview the service users on an opinion of our contact person in home care services, who is a health care professional. While interviewing, we made sure the participants understood the questions and offered the opportunity for breaks in between the questions. Despite the criticism of the interviews, I wish I had the chance to also interview the older eHealth nonusers. The findings related to nonusers are based on secondhand information from participating professionals' interviewees (substudies II and III). It is not possible to verify how many nonusers or users outside of those who participated in the study the professionals have commented on. The findings of Poli (2021) indicate that the participation of older people in digital health research is biased, excluding the oldest-old and those older people with a lower digital competence and social position. This can cause an overestimation of the positive effects of digital health technologies and, thus, be an incorrect estimation of the effects on the targeted group.

As the last limitation, in substudies I and II, I was the only author who was involved in the data analysis. The quality and reliability of the studies would have increased if additional authors would have engaged in the analysis process and challenged the decisions related to thematic analysis (Graham, 2007; see also Braun & Clarke, 2006). However, the independence of the doctoral candidate is one of the key aims set in the graduate school learning instructions of the University of Lapland, so a practice of independent work is needed.

To evaluate my role as a doctoral candidate in the present research, my contribution has been sufficient in all of the substudies. I conducted the systematic review (substudy I) and its reportage independently during 2020 in the HARVEST project. There were no coauthors with me in the study. Substudies II and III were developed in collaboration with the HARVEST project. Before I came to the project, the second author,[8] who was the principal investigator of the Finnish HARVEST

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research team, had already asked for research permission from one municipality of Lapland and started contacting the potential study participants from public home care services. After obtaining permission, the research work of substudies II and III was organized side by side in spring 2019.

In substudy II, I was the corresponding author and responsible for designing and writing the structure and content of the study, with the support of the second author. I supplemented our research permission for the municipality with permission to collect diary data to better understand the service use in older people's everyday lives. However, the diary data did not become part of the final research data. With the second author, I modified the interview questions into their final form. The second author and I did the first interview together; other than that, I collected the interview and observation data of the professionals, service users, and practical nurses as well as the visual data from the homes of older people. Together with the second author, I analyzed the first interview together, thus creating the preliminary coding categories. Thereafter, I analyzed the rest of the data and created new subcategories to better describe the data. I was responsible for writing the results of the manuscript, here with the help of the second author's comments and suggestions. In addition, I was primarily responsible for the changes made based on the review and copyediting comments from the journal. Both authors had final manuscript review authority.

In substudy III, the order of the authors of the paper was discussed early in the study, and as the first author, I acted as the corresponding author. Together with the second author, I wrote the introduction of the article. I was responsible for designing the structure and content of the qualitative interviews. Together with the second author, I modified the interviews into their final form and interviewed the first of the participants together. After that, I interviewed two volunteer workers for the service by myself. We were about to interview the service users, but all the users we asked to participate in the study refused. At that point, we asked the third author,[9] also part of the Finnish HARVEST research team, to join the study. She had already carried out service user interviews in her previous project,[10] which she reanalyzed according to the research questions of our study. I first analyzed the interviews of the service coordinator and volunteer workers, and then, with the second author, we collaboratively checked and completed them. I was responsible for writing the methods and results regarding the participating service coordinator and volunteer workers. The third author wrote the results regarding the service users. All authors had final manuscript review authority.

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APPENDIXES

Appendix A: Online databases, search terms, and example search string in substudy I

A literature search in the systematic literature review included the following international online databases:

- ProQuest (ERIC—Education Collection, Social Science Database, Applied Social Sciences Index & Abstracts, Sociological Abstracts, Sociology Database)
- Ebsco (AgeLine, Academic Search Elite, CHINAL Complete)
- Web of Science (Arts and Humanities Citation Index, Social Sciences Citation Index, Science Citation Index Expanded, Emerging Sources Citation Index)
- Scopus (Elsevier)

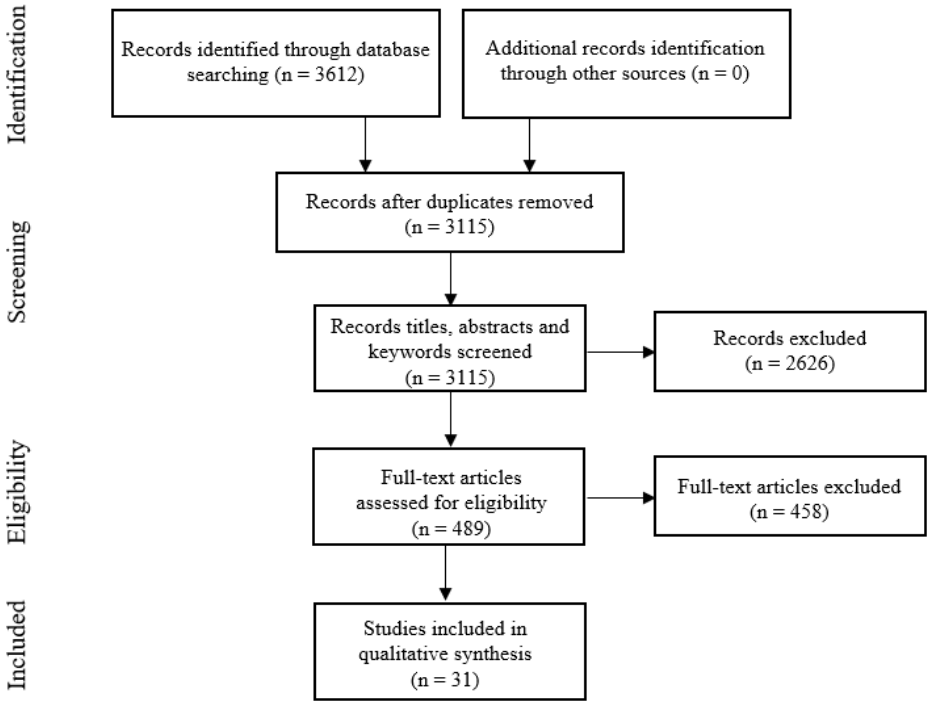
The content and search terms of a literature search in the systematic literature review:

Content	Search terms
Older people	older, senior, elderly, aged people, old age user, elder
Rural	rural, remote, sparsely populated area
Use	education, learn*, competence, digital skill, geragogy, use, reject, active aging, adoption, acceptance, barrier, enabler, facilitator
Digital technology	online, ICT, information, computer, Internet, electronic, technolog*, digital, smart, management tool, virtual, mobile, robot, tele*, monitoring, assist*, gerontechnology, compliance, reminder, dispens*, video, application, device
Health	health, care, wellbeing, physical, mental, social
Home	aging in place, independent, home, everyday life, living, daily life, domestication

An example search string for Scopus (Elsevier) was as follows:

TITLE-ABS-
KEY (*older* OR *senior* OR *elderly* OR *aged* OR *old* AND *age* AND *user* OR *elder*) AND (*rural* OR *remo te* OR *sparsely*) AND (*online* OR *ict* OR *information* OR *computer* OR *Internet* OR *electronic* OR *tech nolog** OR *digital* OR *smart* OR *''management* AND *tool''* OR *virtual* OR *mobile* OR *robot* OR *tele** O R *monitoring* OR *assist** OR *gerontechnology* OR *compliance* OR *reminder* OR *dispens** OR *video* OR *application* OR *device*) AND (*use* OR *education* OR *learn** OR *competence* OR *''digital* AND *skill''* OR *geragogy* OR *reject* OR *''active* AND *aging''* OR *adoption* OR *acceptance* OR *barrier* OR *enabler* OR *f acilitator*) AND (*health* OR *care* OR *wellbeing* OR *physical* OR *mental* OR *social*) AND (*''aging* AND *in* AND *place''* OR *independent* OR *home* OR *''everyday* AND *life''* OR *living* OR *''daily* AND *life''* OR *d omestication*) AND (LIMIT-TO (PUBYEAR , *2019*) OR LIMIT-TO (PUBYEAR , *2018*) OR LIMIT-
TO (PUBYEAR , *2017*) OR LIMIT-TO (PUBYEAR , *2016*) OR LIMIT-TO (PUBYEAR , *2015*) OR LIMIT-
TO (PUBYEAR , *2014*) OR LIMIT-TO (PUBYEAR , *2013*) OR LIMIT-TO (PUBYEAR , *2012*) OR LIMIT-
TO (PUBYEAR , *2011*) OR LIMIT-TO (PUBYEAR , *2010*)) AND (LIMIT-
TO (DOCTYPE , *"ar"*)) AND (LIMIT-TO (LANGUAGE , *"English"*))

Appendix B: Flow of information through different phases in substudy I



Appendix C: Request sent to older people participants in substudy II

Request to participate in the research

Hi,

We are conducting research on the use of digital home care services for older people in [name of the municipality omitted], as well as for learning how to use the services. Our research is part of the international HARVEST project (2018–2021) funded by the Academy of Finland.

For the research, we are asking for permission to interview You one to two times at Your home (approximately 60 minutes/time) and, if necessary, also by telephone. The interview questions focus on the use of [name of the service omitted]'s medication-dispensing service and Your experiences with it. In addition, we ask for permission to take pictures of the dispenser in Your home and write down our observations when You use the dispenser. Your participation in the study is completely voluntary, and You can withdraw from the study at any time.

We will treat all the research material we receive from You as strictly confidential and in a manner that does not reveal Your identity. The research materials will be treated confidentially, as required by the EU Data Protection Regulation (2016/679, GDPR), and will not be disclosed to individuals outside the HARVEST project. In electronic form, the material will be stored on a server of the University of Lapland protected by usernames and passwords. The research material will be disposed of five years after the end of the project.

The research results will be presented in a forthcoming dissertation, scientific publications conferences and other events, university teaching, and, if possible, in other media. The presentation of the research findings in the abovementioned contexts may also involve the images taken from the dispenser in Your home.

There will be no direct benefit to You from participating in the study, but the findings of the research can be used to develop [name of the municipality omitted]'s home care services and, more broadly, to increase understanding of the introduction of technology-mediated services. Therefore, Your experience with the [name of the service omitted]'s service is important.

We will be happy to provide more information about the research:

Ella Airola, Junior Researcher
p. 044 4744389, e-mail: ella.airola@ulapland.fi

Päivi Rasi, Associate Professor, Principal Investigator
p. 040 4844 240, e-mail: paivi.rasi@ulapland.fi

University of Lapland
Faculty of Education
Media Education Hub

Pyyntö osallistua tutkimukseen

Hei,

teemme tutkimusta [kunnan nimi poistettu] ikäihmisille tarjottavien digitaalisten kotihoitopalveluiden käytöstä sekä palveluiden käytön oppimisesta. Tutkimuksemme on osa Suomen Akatemian rahoittamaa kansainvälistä HARVEST-hanketta (2018–2021).

Tutkimustamme varten pyytäisimme lupaa haastatella Teitä kotonanne 1-2 kertaa (noin 60 min/kerta) sekä tarvittaessa myös puhelimitse. Haastattelukysymykset kohdistuvat [palvelun nimi poistettu] lääkeannosteluautomaatin käyttöön ja siihen liittyviin kokemuksiinne. Lisäksi pyydämme lupaa saada ottaa kuvia lääkeannosteluautomaatista kotonanne ja kirjoittaa ylös havaintojamme, kun käytätte automaattia. Tutkimukseen osallistuminen on täysin vapaaehtoista ja voitte halutessanne vetäytyä tutkimuksesta minä tahansa ajankohtana.

Tulemme käsittelemään kaiken Teiltä saamamme tutkimusaineiston ehdottoman luottamuksellisena ja siten, ettei henkilöllisyytenne tule ilmi. Tutkimusaineistoja käsitellään luottamuksellisesti EU:n tietosuoja-asetuksen (2016/679, GDPR) edellyttämällä tavalla, eikä aineistoa luovuteta HARVEST-hankkeen ulkopuolisille henkilöille. Sähköisessä muodossa oleva aineisto säilytetään Lapin yliopiston käyttäjätunnuksilla ja salasanoilla suojatulla palvelimella. Tutkimusaineisto hävitetään 5 vuotta hankkeen päättymisen jälkeen.

Tutkimustulokset esitellään valmisteilla olevassa väitöskirjassa, tieteellisissä julkaisuissa, konferensseissa ym. tilaisuuksissa, yliopisto-opetuksessa sekä mahdollisuuksien mukaan muissa tiedotusvälineissä. Tutkimustulosten esittelyyn edellä mainituissa yhteyksissä voi liittyä myös lääkeannosteluautomaatista kotonanne otettujen kuvien käyttöä.

Tutkimukseen osallistumisesta ei seuraa Teille suoranaista hyötyä, mutta tutkimuksen tuloksia voidaan käyttää [kunnan nimi poistettu] kotihoidon palveluiden kehittämiseen sekä laajemmin ymmärryksen lisäämiseen teknologiavälitteisten palveluiden käyttöönotosta. Kokemuksenne lääkeannosteluautomaatin käytöstä ovat siksi tärkeitä.

Annamme mielellämme lisätietoja tutkimuksesta:

Ella Airola, nuorempi tutkija
p. 044 4744389, sähköposti: ella.airola@ulapland.fi

Päivi Rasi, apulaisprofessori, tutkimuksen vastuullinen johtaja
p. 040 4844 240, sähköposti: paivi.rasi@ulapland.fi

Lapin yliopisto
Kasvatustieteiden tiedekunta
Mediapedagogiikkakeskus

Appendix D: Request sent to older people participants in substudy III

Request to participate in research

Hi,

We are conducting research on the use of digital home care services for the older people in [name of the municipality omitted], as well as for learning how to use the services. Our research is part of the international HARVEST project (2018–2021), funded by the Academy of Finland.

For the research, we are asking for permission to interview You one to two times at Your home (approximately 60 minutes/time) and, if necessary, also by telephone. The interview questions focus on the use of [name of the service omitted]'s service and Your experiences with it. Your participation in the study is completely voluntary, and You can withdraw from the study at any time.

We will treat all the research material we receive from You as strictly confidential and in a manner that does not reveal Your identity. The research materials will be treated confidentially, as required by the EU Data Protection Regulation (2016/679, GDPR), and will not be disclosed to individuals outside the HARVEST project. In electronic form, the material will be stored on a server of the University of Lapland protected by usernames and passwords. The research material will be disposed of five years after the end of the project.

The research results will be presented in a forthcoming dissertation, scientific publications conferences and other events, university teaching, and, if possible, in other media.

There will be no direct benefit to You from participating in the study, but the findings of the research can be used to develop [name of the municipality omitted]'s home care services and, more broadly, to increase understanding of the introduction of technology-mediated services. Therefore, Your experience with the [name of the service omitted]'s service is important.

We will be happy to provide more information about the research:

Ella Airola, Junior Researcher
e-mail: ella.airola@ulapland.fi

Päivi Rasi, Associate Professor, Principal Investigator
p. 040 4844 240, e-mail: paivi.rasi@ulapland.fi

University of Lapland
Faculty of Education
Media Education Hub

Pyyntö osallistua tutkimukseen

Hei,

teemme tutkimusta [kunnan nimi poistettu] ikäihmisille tarjottavien digitaalisten kotihoitopalveluiden käytöstä sekä palveluiden käytön oppimisesta. Tutkimuksemme on osa Suomen Akatemian rahoittamaa kansainvälistä HARVEST-hanketta (2018–2021).

Tutkimustamme varten pyytäisimme lupaa haastatella Teitä kotonanne 1-2 kertaa (noin 60 min/kerta) sekä tarvittaessa myös puhelimitse. Haastattelukysymykset kohdistuvat [palvelun nimi poistettu] -palveluun ja siihen liittyviin kokemuksiinne. Tutkimukseen osallistuminen on täysin vapaaehtoista ja voitte halutessanne vetäytyä tutkimuksesta minä tahansa ajankohtana.

Tulemme käsittelemään kaiken Teiltä saamamme tutkimusaineiston ehdottoman luottamuksellisena ja siten, ettei henkilöllisyytenne tule ilmi. Tutkimusaineistoja käsitellään luottamuksellisesti EU:n tietosuoja-asetuksen (2016/679, GDPR) edellyttämällä tavalla, eikä aineistoa luovuteta HARVEST-hankkeen ulkopuolisille henkilöille. Sähköisessä muodossa oleva aineisto säilytetään Lapin yliopiston käyttäjätunnuksilla ja salasanoilla suojatulla palvelimella. Tutkimusaineisto hävitetään 5 vuotta hankkeen päättymisen jälkeen.

Tutkimustulokset esitellään valmisteilla olevassa väitöskirjassa, tieteellisissä julkaisuissa, konferensseissa ym. tilaisuuksissa, yliopisto-opetuksessa sekä mahdollisuuksien mukaan muissa tiedotusvälineissä.

Tutkimukseen osallistumisesta ei seuraa Teille suoranaista hyötyä, mutta tutkimuksen tuloksia voidaan käyttää [kunnan nimi poistettu] kotihoidon palveluiden kehittämiseen sekä laajemmin ymmärryksen lisäämiseen teknologiavälitteisten palveluiden käyttöönotosta. Kokemuksenne [palvelun nimi poistettu] -palvelusta ovat siksi tärkeitä.

Annamme mielellämme lisätietoja tutkimuksesta:

Ella Airola, nuorempi tutkija
sähköposti: ella.airola@ulapland.fi

Päivi Rasi, apulaisprofessori, tutkimuksen vastuullinen johtaja
p. 040 4844 240, sähköposti: paivi.rasi@ulapland.fi

Lapin yliopisto
Kasvatustieteiden tiedekunta
Mediapedagogiikkakeskus

ORIGINAL PUBLICATIONS

This dissertation is based on the three original article publications, which have been referred to in the text as substudies by their Roman numerals I to III.