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Navigating Vulnerabilities: Digital Inclusion in Health and Social Care

Birgitta Tetri

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Abstract

This dissertation examines how digitalisation is reshaping access to digital health and social care services, and why, despite increasingly streamlined digital systems, these services often fail to deliver fair outcomes for everyone. In Finland, as elsewhere, health and social care provision is increasingly organised via digital platforms, but real access requires more than connectivity and basic skills. It depends on whether people can handle complex procedures, trust systems, and obtain help when needed.

Conceptually, the dissertation draws on established digital divide, administrative burden, and capability-oriented frameworks to propose a refined model, the Digital Inclusion in Health and Social Services (DIHSS) model, that treats digital inclusion as layered, relational, and sensitive to vulnerability. It defines digital inclusion as people's ability to use digital health and social services in ways that enable them to obtain the support they need in conditions that fit their capacities and circumstances. Within this model, digital access, digital engagement, and digital inclusion are analytically separated, and supported or proxy-based engagement is understood as both a crucial resource and a potential source of structural vulnerability.

Empirically, the dissertation brings together three cross-sectional studies in Finnish health, social and employment service contexts to specify and refine key pathways within the DIHSS model. Substudy I was a survey of adult mental health service users ($N = 121$), conducted between November 2020 and May 2021, examining how general self-efficacy, internet self-efficacy, and proxy efficacy were associated with intention to use digital health and social services, using linear regression and mediation analyses. Substudy II was a survey of socially excluded or marginalised individuals ($N = 345$; prisoners and mental health service users), gathered between November 2020 and May 2021, in which factor analysis and latent profile analysis were used to identify profiles based on digital skills, internet self-efficacy, trust, and intention. Substudy III drew on Abilitator self-assessments from users of health, social and employment services ($N = 39,022$), between 1 January 2017 and 31 December 2021. It examined how vulnerabilities, including low cognitive capacity, emotional distress, learning difficulties, substance dependence, and criminal background, were associated with internet use difficulties and, in turn, with difficulties in using healthcare services, using logistic regression and mediation analyses guided by a directed acyclic graph.

Substudy I showed that both internet self-efficacy and proxy efficacy were independently associated with intention to use digital services among mental health service users, whereas general self-efficacy operated mainly through these specific beliefs, indicating that perceived readiness was already relational. Substudy II identified a high-intention, low-trust profile, suggesting that willingness to use digital channels could reflect necessity or adaptation to institutional requirements rather than endorsement of digitalisation. Substudy III indicated that emotional and behavioural vulnerabilities were partly linked

to difficulties using healthcare services via internet use difficulties, whereas cognitive and learning-related vulnerabilities remained strongly associated with access problems even after accounting for internet use difficulties. The substudies demonstrate that digital inclusion operates as a conditional process. Readiness and intention matter, but they are not sufficient on their own to secure access. Proxy-based engagement follows existing lines of vulnerability and constrained choice. Even when digital interaction occurs, it cannot fully overcome situations where institutional demands exceed users' capacities.

The dissertation argues that digital inclusion in health and social services should be treated as a service-level responsibility rather than an individual attribute. Evaluation of digitalisation needs to move beyond log-ins, usage counts, and self-reported confidence. It should also include indicators that capture experienced difficulty and reliance on formal and informal support, and whether people with different constellations of vulnerabilities and support actually obtain the services they need. From an equity and capability perspective, strategies should acknowledge that people often act together rather than alone. Strategies should also ensure non-digital options remain genuinely accessible and reduce cognitive and procedural burdens. In addition, service systems need to provide safe, well-resourced arrangements for proxy and supported use that respect privacy and informed consent.

Keywords: digital inclusion; health and social care; vulnerability; internet self-efficacy; proxy agency; administrative burden; capability approach; digital health equity; digital services.

Tiivistelmä

Tämä väitöskirja tarkastelee, miten digitalisaatio muokkaa sosiaali- ja terveyspalveluihin pääsyä ja miksi näennäisen sujuvat verkkopalvelut eivät johda kaikkien kohdalla oikeudenmukaiseen lopputulokseen. Suomessa, kuten muuallakin maailmassa, sosiaali- ja terveyspalvelut nojaavat yhä enemmän digitaalisiin palvelukanaviin. Pääsy palveluihin edellyttää internet-yhteyden ja digitaalisten perustaitojen lisäksi kykyä noudattaa monivaiheisia ohjeistuksia, luottamusta järjestelmiin sekä mahdollisuutta saada tarvittaessa apua asiointiin.

Käsitteellisesti työ nojaa tutkimukseen digitaalisesta eriarvoisuudesta sekä kirjallisuuteen hallinnollisesta kuormituksesta ja toimintamahdollisuuksia korostavista lähestymistavoista. Näiden pohjalta rakentuu Digital Inclusion in Health and Social Services (DIHSS) -malli, jossa digitaalinen osallisuus nähdään kerroksellisena, relationaalisena ja haavoittuvuuksille herkkänä ominaisuutena. Mallissa digitaalinen osallisuus määritellään ihmisten kyvyksi käyttää digitaalisia terveys- ja sosiaalipalveluja tavalla, joka mahdollistaa tarvittavan tuen sovitettuna senhetkisiin voimavaroihin ja elämäntilanteeseen. DIHSS-mallissa erotetaan analyttisesti digipalveluiden saatavuus, palveluiden käyttö arjessa ja varsinainen digitaalinen osallisuus. Tuettu tai toisten puolesta tapahtuva asiointi nähdään yhtä aikaa sekä tärkeänä voimavarana että mahdollisena rakenteellisen haavoittuvuuden lähteenä.

Empiirinen osuus kokoa yhteen kolme poikkileikkaustutkimusta suomalaisissa terveys-, sosiaali- ja työllisyyspalveluissa sekä tarkentaa DIHSS-mallin keskeisiä yhteyksiä. Osatutkimus I oli kyselytutkimus mielenterveyspalveluja käyttäville aikuisille ($N = 121$), jonka aineisto kerättiin marraskuun 2020 ja toukokuun 2021 välisenä aikana. Tutkimuksessa tarkasteltiin lineaarisen regressio- ja mediaatioanalyysin avulla, miten yleinen minäpystyvyys, internet-minäpystyvyys ja lähitoimijuus olivat yhteydessä aikomukseen käyttää digitaalisia sosiaali- ja terveyspalveluja. Osatutkimus II oli kysely sosiaalisesti marginalisoiduille henkilöille ($N = 345$; vangit ja mielenterveyspalvelujen käyttäjät), joka toteutettiin marraskuun 2020 ja toukokuun 2021 välisenä aikana. Aineistosta tunnistettiin faktori- ja latenttiprofiilianalyysien avulla profiileja digitaitojen, internet-minäpystyvyyden, luottamuksen ja käyttöaikomuksen perusteella. Osatutkimus III hyödynsi terveys-, sosiaali- ja työllisyyspalvelujen käyttäjien Kykyviisari-itsearviointeja ($N = 39\ 022$), jotka oli kerätty 1.1.2017–31.12.2021 välisenä aikana. Siinä tarkasteltiin logistista regressiota ja mediaatioanalyysiä hyödyntäen, miten yksilötason haavoittuvuudet, kuten heikko kognitiivinen toimintakyky, emotionaalinen kuormitus, oppimisvaikeudet, päihderiippuvuus ja rikostausta, olivat yhteydessä internetin käytön vaikeuksiin sekä edelleen vaikeuksiin käyttää terveyspalveluja.

Osatutkimus I osoitti, että internet-minäpystyvyys ja lähitoimijuus olivat itsenäisesti yhteydessä aikomukseen käyttää digitaalisia palveluja, kun taas yleinen minäpystyvyys vaikutti pääasiassa näiden spesifisten uskomusten kautta. Tämä viittaa siihen, että koettu

digivalmius on jo lähtökohtaisesti relationaalista. Osatutkimus II tunnisti profiilin, jossa korkea aikomus käyttää digitaalisia palveluja yhdistyi matalaan luottamukseen, mikä viittaa siihen, että halukkuus käyttää digikanavia voi kuvastaa pikemminkin koettua pakkoa tai sopeutumista instituutioiden vaatimuksiin kuin digitaalisten palvelujen hyväksyntää. Osatutkimus III osoitti, että emotionaaliset ja käyttäytymiseen liittyvät haavoittuvuudet kytkeytyivät osittain internetin käytön vaikeuksien kautta terveystalouteen pääsyyn liittyviin haasteisiin. Kognitiiviset ja oppimiseen liittyvät haasteet olivat vahvasti yhteydessä palveluihin pääsyn vaikeuksiin myös silloin, kun internetin käytön hankaluus otettiin huomioon. Yhdessä osatutkimukset osoittavat empiirisesti, että digitaalinen osallisuus toimii ehdollisena prosessina. Valmius ja aikomus ovat tärkeitä, mutta eivät yksin riitä palveluihin pääsyyn. Lähitoimijuus rakentuu haavoittuvuuksien ja rajoittuneiden valintamahdollisuuksien ehdoilla. Lisäksi digitaalinen asiointi tuottaa myönteisiä mahdollisuuksia vain siinä määrin kuin palvelujärjestelmän vaatimukset ovat linjassa käyttäjien voimavarojen kanssa, eikä se siksi pysty kokonaan kumoamaan tätä epäsuhtaa.

Väitöskirja esittää, että digitaalinen osallisuus sosiaali- ja terveystalouteen tulisi ymmärtää palvelujärjestelmän vastuuksi, ei yksilön ominaisuudeksi. Digitalisaation toteutumisen arvioinnissa pelkkien kirjautumiskertojen, käyttötilastojen ja itse raportoidun käyttövarmuuden sijaan tulisi huomioida koetut vaikeudet, riippuvuus muiden avusta sekä se, saavatko erilaisia haavoittuvuuksia ja tukiresursseja omaavat ihmiset tarvitsemansa palvelut. Oikeudenmukaisuutta ja toimintamahdollisuuksien teoriaa korostavasta näkökulmasta on keskeistä tunnistaa, että asiointi on usein yhteistoimintaa. Strategioiden tulisi myös varmistaa, että ei-digitaaliset asiointivaihtoehdot säilyvät aidosti saavutettavina ja että kognitiivista ja prosessikuormaa kevennetään. Lisäksi palvelujärjestelmiin tulisi rakentaa riittävästi resursoituja käytäntöjä puolesta ja tuettuun asiointiin, jotka varmistavat yksityisyyden ja turvallisen asiointin toteutumisen.

Avainsanat: digitaalinen osallisuus; terveys- ja sosiaalipalvelut; haavoittuvuus; internet-minäpystyvyys; lähitoimijuus; hallinnollinen kuormitus; toimintamahdollisuusteoria; digitaalisen terveyden tasa-arvo; digitaaliset palvelut.

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List of original publications

This thesis is based on the following publications:

I Tetri, B., & Juujärvi, S. (2022). "Self-Efficacy, Internet Self-Efficacy, and Proxy Efficacy as Predictors of the Use of Digital Social and Health Care Services Among Mental Health Service Users in Finland: A Cross-Sectional Study." *Psychology Research and Behavior Management*, 15, 291–303.

II Tetri, B., Rantanen, T. & Kouvonen, A. 2024. "Digital skills and intention to use digital health care and social welfare services among socially marginalized individuals in Finland: A cross-sectional study." *Finnish Journal of eHealth and eWelfare*, 16(2), 117-130.

III Tetri, B., Harkko, J., Wikström, M., Joensuu, M., Juujärvi, S., & Kouvonen, A. (in review). "Individual-level vulnerabilities, internet use, and difficulties in healthcare service use: A mediation study among health, social, and employment service users."

The publications are referred to in the text by their roman numerals. All substudies are published under an open access license (CC BY 4.0).

1 Introduction

In Finland, digital channels have become a routine way of accessing health and social services. Core transactions such as viewing health records, renewing prescriptions and contacting professionals are increasingly channelled through national portals like MyKanta and other digital services (Heponiemi et al., 2020; Vehko, 2022). The use of digital health and social care services has grown rapidly over the past decade, with a clear majority of adults aged 20 to 79 having used at least some online services during the previous year, even though a minority still do not use them at all (Heponiemi et al., 2022; Vehko, 2022). At the same time, among older adults aged 75 years and over, many still report limited perceived benefits and unmet support needs (Kainiemi et al., 2023).

In international policy debates (ICN, 2023; WHO, 2021) digitalisation has been promoted as a means of creating more efficient, accessible, and user-friendly welfare services and securing the long-term sustainability of welfare states (Badr et al., 2024; OECD, 2019). In the Finnish context, these broad trends are reflected in high levels of connectivity and reported competence: almost all households have internet access and a clear majority of adults (aged 16 to 89) possess at least basic digital skills, even though skill levels decline with age and a sizeable minority still frequently need help with digital devices and services (Digital and Population Data Services Agency, 2023).

Despite this expansion, the digitalisation of public services does not affect all users equally. Older adults and people in weaker socioeconomic positions, or poor health are more likely to experience digital channels as stressful or difficult to use and to report that online services do not improve their ability to obtain help when needed (Heponiemi et al., 2020; Kainiemi et al., 2023; Vehko, 2022). These difficulties extend beyond technical access and skills to include cognitive and emotional strain, reduced confidence, complex procedures, dense language, and demanding authentication requirements, particularly where non-digital alternatives are limited (Herd & Moynihan, 2018; Hoffman, 2022; Safarov, 2024).

Digital channels therefore function as a conditional gateway to services. Being online and having basic skills are necessary but do not, in themselves, ensure timely and adequate access to care and support. The central questions concern what people can do with digital systems and whether digital engagement produces meaningful

outcomes. Differences in skills, confidence, patterns of use, trust, and the capacity to obtain such outcomes constitute key dimensions of contemporary digital inequality (Helsper, 2021; van Deursen & Helsper, 2018; van Dijk, 2020).

In welfare-state contexts such as Finland, these inequalities raise questions of equity and legitimacy, as access to care, income security, and support increasingly depends on navigating digital procedures rather than merely meeting formal eligibility criteria (Fisk et al., 2023; Heaslip & Holley, 2023; Helsper, 2021). The burdens of digitalised systems are particularly consequential for people living with mental health problems, learning difficulties, addictions, or long periods out of work, whose resources may not align with the cognitive, linguistic, and procedural demands of digital welfare services (Greer et al., 2019; Virtanen et al., 2022).

Because of these issues, everyday engagement with digital services is more often relational rather than purely individual. Family members, friends, peers, and professionals often help people navigate online systems, fill out applications or interpret messages, providing crucial support for those who lack skills, confidence, or equipment (Courtois & Verdegem, 2016; Hänninen et al., 2021; Helsper, 2021; Hunsaker et al., 2019; Oliver et al., 2024). However, reliance on such support is unevenly distributed. Better-resourced groups are more likely to have access to formal and informal support, while others lack such help. At the same time, service systems may implicitly assume the presence of informal or professional support when designing procedures and interfaces (Coetzer et al., 2024; Shaw et al., 2024; van Deursen & Helsper, 2018). Proxy-based or supported engagement thus appears as both a vital resource and a potential source of dependency and inequality, especially when institutional arrangements do not acknowledge or adequately accommodate it (Coetzer et al., 2024; Courtois & Verdegem, 2016; Shaw et al., 2024).

Mental health difficulties, cognitive impairments, economic hardship, and migration-related barriers were consistently associated with multiple problems in using digital public services (Buchert et al., 2022; Greer et al., 2019; Kaihlanen et al., 2022). Population-based survey research has also provided important insights into digital divides related to access, skills, and usage, identifying socio-demographic and health-related factors associated with the use or non-use of digital health and social care services (Heponiemi et al., 2022; Kan et al., 2024; Phuong et al., 2023; Vehko, 2022).

However, population-level studies still provide only a partial picture of how individual vulnerabilities, psychosocial mechanisms, and relational resources shape access to health and social care services in everyday life (Heponiemi et al., 2020; THL, 2025). Quantitative studies on digital health and social care services have often treated technical access and digital competence as the main explanations for unequal use of digital services (e.g. Foley et al., 2021; Le et al., 2023). At the same time, theoretical and review work on digital inequality shows that access to

devices, connectivity, and basic skills is insufficient to explain persistent inequalities in digital service use and the benefits people derive from them (Helsper, 2021; van Dijk, 2020). Psychosocial factors such as internet self-efficacy, confidence, motivation and trust are increasingly recognised as important, yet they are often treated as secondary variables rather than central mechanisms linking vulnerability to access (Gillie et al., 2022; Hernandez et al., 2024). Among these factors, trust is particularly salient in the Finnish context. Recent findings from the Healthy Finland (Terve Suomi) survey show that trust in the functioning of health and social care services has declined between 2018 and 2024, while a substantial minority report unmet needs for medical care and difficulties accessing services due to high user fees, despite generally positive ratings of their most recent service contact (THL, 2025).

Research on digital health and social services frequently relies on individualised models of technology adoption that implicitly assume autonomous users who engage independently with digital systems (Courtois & Verdegem, 2016; Oliver et al., 2024). This perspective risks overlooking the extent to which digital engagement is commonly achieved through supported or proxy-based engagement involving family members, peers, professionals, or other intermediaries (Barony Sanchez et al., 2022; Courtois & Verdegem, 2016; Oliver et al., 2024). Although proxy use and social support are widely observed in practice, they remain under-theorised in dominant frameworks, particularly in relation to issues of agency, dependency, and equity (Coetzer et al., 2024; Shaw et al., 2024). Moreover, many studies assess engagement with digital services through proxy indicators such as intention to use, adoption, or frequency of use, without examining in detail whether this engagement translates into meaningful access to services, especially for individuals who may express willingness or confidence but nevertheless encounter substantial difficulties when interacting with digital systems (Heponiemi et al., 2020; Le et al., 2023; Phuong et al., 2023).

There is also a lack of research integrating individual-level vulnerabilities with service system characteristics within a single analytical framework. While studies have documented barriers related to mental health, cognitive difficulties, socioeconomic disadvantages, and migration-related factors, these vulnerabilities are rarely examined in relation to system-level demands and institutional practices embedded in digitalised service systems (Coetzer et al., 2024; Hoffman, 2022; Krukowski et al., 2024). This gap constrains understanding of how digitalisation may unintentionally reproduce or intensify existing inequalities in health and social service access. Recent work underscores the importance of attending not only to individual resources but also to system-level design, administrative burden, and institutional configurations when assessing digital inclusion in health and social services (Badr et al., 2024; Fisk et al., 2023; Helsper, 2021; Herd & Moynihan, 2018).

This dissertation addresses these gaps by examining how digitalisation reshapes access to health and social services for people in vulnerable positions in the Finnish welfare system and by identifying the conditions under which digitalisation supports, rather than undermines, equitable access. It focuses on mental health service users, prisoners, and people in weak labour market positions, whose circumstances reflect diverse psychosocial vulnerabilities across different parts of the welfare system. Across three cross-sectional substudies, the dissertation examines how vulnerabilities, perceived digital abilities, and different forms of support are associated with intentions to use digital services, patterns of digital engagement, and reported difficulties in accessing health and social care services. Building on and contributing to research on digital divides and digital inclusion, the dissertation conceptualises digital inclusion not as a static individual attribute but as a layered, conditional, and relational process shaped by the interaction of individual resources and vulnerabilities, relational support, and system-level demands. From this perspective, digital inclusion is approached as a service- and system-level responsibility, rather than a matter of whether individuals can adapt independently to increasingly digitalised service environments. The conceptual and theoretical framework, including a more precise definition of digital inclusion and the Digital Inclusion in Health and Social Services (DIHSS) model, is presented in Chapter 2, followed by the overall aim and research questions in Chapter 3, and Chapter 4 describes data, measures, and methods of Substudies I–III. Chapter 5 provides an integrated synthesis of the findings, while Chapter 6 discusses their implications for theory, policy, and practice.

2 Conceptual and theoretical framework

Digital inclusion in health and social services involves more than access to devices or connectivity. Existing research on digital inequality shows that participation in digital environments is structured by broader social positions, available resources and institutional contexts, and that disadvantages in these areas tend to accumulate for marginalised groups (Helsper, 2021; Kan et al., 2024; Shaw et al., 2024; van Deursen, 2020). In welfare state settings, the digitalisation of service systems has brought questions of equity, capability, and support needs to the centre of debates on how people access care and income security (Fisk et al., 2023; Herd & Moynihan, 2018).

This chapter develops a conceptual and theoretical framework informed by prior conceptual and empirical literature. It first discusses digital inclusion in health and social care (2.1), individual vulnerabilities and structural disadvantage (2.2), digital abilities, internet self-efficacy and trust (2.3), and relational resources, proxy agency, and supported digital use (2.4). These literature-based strands are brought together in the initial process-oriented Digital Inclusion in Health and Social Services (DIHSS) model presented in Section 2.5 and Figure 1. Section 2.6 then reviews selected empirical studies on digital inclusion, vulnerability, and service outcomes that provide context for the empirical analyses. The initial DIHSS model is subsequently revisited and empirically refined in the discussion chapter, where Figure 2 presents the conditional gateway model derived from the synthesis of the three substudies.

2.1 Digital inclusion in health and social care

Early research on the digital divide focused on basic inequalities in access, such as whether people have suitable devices and reliable internet connectivity (Norris, 2003; Warschauer, 2003). These access-related gaps are commonly described as the first-level digital divide. In this literature, digital divide refers to systematically patterned differences in people's opportunities to access, use, and benefit from digital technologies, rather than to simple distinctions between "users" and "non-users" (Helsper, 2021; van Dijk, 2020). Access remains a necessary precondition for participation, but subsequent scholarship has shown that access alone is insufficient for meaningful inclusion. Second- and third-level digital divides

highlight differences in digital skills, confidence, and the ability to achieve beneficial outcomes from digital engagement (Helsper, 2021; van Deursen & Helsper, 2018; van Dijk, 2020). In the context of health and social services, these divides concern who can navigate digital service systems, manage multi-step processes, and translate online interaction into effective access to care and support (Hoffman, 2022; Kan et al., 2024; Tsatsou, 2022).

Digital inclusion is understood here as people's ability to use digital health and social services in ways that allow them to obtain the support they need under conditions that fit their capacities and circumstances (Helsper, 2021; van Deursen & Helsper, 2018). This definition distinguishes three related but analytically separate notions. Digital access refers to the availability of devices, connectivity, and service channels. Digital engagement refers to actual use and interaction with digital systems, including frequency, intensity, and modes of use. Digital inclusion, in turn, refers to engagement that leads to meaningful and equitable outcomes, such as getting an appointment, securing benefits, or resolving problems (Helsper, 2021; van Deursen & Helsper, 2018). In nursing and integrated care scholarship, digital inclusion is likewise framed as an explicitly equity-oriented goal, closely linked to global agendas such as the UN Sustainable Development Goals and the WHO Global Strategy on Digital Health, and defined as ensuring that digital health innovations do not widen existing health gaps (Heaslip & Holley, 2023).

Survey evidence from high-income countries shows that, although many people report using online health and social services, perceived usefulness and fairness vary markedly across social groups (Helsper, 2021; Kan et al., 2024; Shaw et al., 2024). These findings support an outcome-focused understanding of digital inclusion, in which the key issue is not only who uses digital services but also who can turn that use into positive and equitable outcomes (Helsper, 2021).

In health and social services, these outcome differences reflect not only variation in access and skills but also the demands of navigating complex service systems, understanding instructions, managing administrative processes, and communicating with providers through digital channels (Hoffman, 2022; Kan et al., 2024; Tsatsou, 2022). These tasks often require cognitive effort, emotional stability, and trust, making digital engagement particularly challenging for individuals with limited resources or psychosocial vulnerabilities (Buchert et al., 2022; Greer et al., 2019). Research on migrants in Finland illustrates this vividly when many participants had smartphones and used the internet daily for communication but struggled to access digital health and social services due to language barriers, a lack of online banking credentials required for authentication, limited understanding of the service system, and fears of making mistakes (Buchert et al., 2022). Qualitative work with mental health service users also shows that digital exclusion often stems from cumulative cognitive load, emotional strain, low

trust and lack of tailored support, rather than from device or connectivity gaps alone (Greer et al., 2019).

In health and social care specifically, this implies that digital inclusion cannot be reduced to patients' or clients' ability to log in or use portals but must be assessed in terms of whether digital pathways enable timely and appropriate care across different conditions and care settings and whether they avoid introducing new burdens or exclusions for those already at a disadvantage (Heaslip & Holley, 2023; Heponiemi et al., 2020; Vehko, 2022). Equity-oriented frameworks in nursing and integrated care thus call for evaluations that attend to how digital service configurations shape opportunities to obtain care for people in different social and health positions, rather than assuming that the mere availability of digital channels benefits all groups equally (Heaslip & Holley, 2023; Shaw et al., 2024).

From this perspective, digital inclusion is best understood as a multidimensional process that combines technical, cognitive, emotional, and relational factors. This process-oriented understanding of digital inclusion is consistent with frameworks that integrate individual resources, perceived abilities, relational support, and system-level demands into a single model of digital participation (Fisk et al., 2023; Helsper, 2021; van Deursen & Helsper, 2018).

2.2 Individual vulnerabilities and structural disadvantage

A central element in recent discussions on digital inclusion is the recognition of individual vulnerabilities as key conditions shaping the use of digital services. Vulnerability can be conceptualised here as a relational and situational notion that emerges from the interaction between individual resources and institutional demands, rather than as a fixed personal deficit (Herd & Moynihan, 2018; Selwyn, 2006). At the same time, broader critical debates remind that vulnerability is often mobilised in social policy and legal contexts in ways that can reinforce distinctions between “deserving” and “undeserving” subjects or conceal structural responsibility. Brown (2017) shows how vulnerability labels can reshape power dynamics and social divisions in welfare and criminal justice policy, while Fineman's vulnerability theory reframes vulnerability as a universal and constant human condition that should anchor collective and state responsibility rather than individual deficit (Fineman, 2008).

The administrative burden framework highlights how learning, compliance and psychological costs embedded in bureaucratic procedures can disproportionately affect those with limited cognitive, emotional, or social resources (Herd & Moynihan, 2018). In digitalised service environments, expectations of autonomy, sustained attention, literacy, and procedural competence may therefore

disadvantage individuals whose resources do not align with these demands (Hoffman, 2022; Tsatsou, 2022).

Empirical studies have examined a range of vulnerabilities that are particularly salient in digital contexts, including limited cognitive capacity, emotional distress, older age, learning difficulties, poverty, unemployment, substance dependence, and criminal background (Kaihlainen et al., 2022; Tsatsou, 2022), as well as migration-related barriers such as weak local language skills and unfamiliarity with the service system (Buchert et al., 2022; Safarov, 2024). These factors become especially consequential when users are expected to manage complex information independently and navigate multi-step processes without direct support (Buchert et al., 2022; Hoffman, 2022).

Vulnerabilities often overlap and accumulate, creating layered forms of disadvantage that shape how individuals encounter and experience digital services (Kaihlainen et al., 2022; Tsatsou, 2022). These overlapping constellations can be understood as vulnerability profiles that help capture how multiple disadvantages become consequential in digitalised service contexts. Recent nursing research documents similar intersecting vulnerabilities among people experiencing homelessness, Gypsy, Roma and Traveller communities, and older adults, where low income, discrimination, limited connectivity, and low trust intersect to constrain access to digital health and social care (Heaslip & Holley, 2023). Finnish surveys point in the same direction. Symptoms of depression and anxiety, impaired cognitive functioning, longstanding activity limitation, and loneliness are all linked to lower use of digital services and poorer access to healthcare, and longitudinal analyses suggest that part of these associations is mediated by low digital competence (Heponiemi et al., 2024; Rantanen et al., 2021).

Capability-oriented perspectives, building on Sen and Nussbaum's work on human capabilities and people's real opportunities to act, challenge deficit-based interpretations by emphasising that digital exclusion reflects not only individual limitations but also systemic failures to enable human capabilities through inclusive design (Fisk et al., 2023; Nussbaum, 2011; Sen, 1999). From this perspective, vulnerability arises when digital service environments impose interactional demands that do not align with users' lived circumstances and available support (Fisk et al., 2023; Hoffman, 2022). Digital inclusion, therefore, depends not only on personal abilities but also on whether service systems accommodate diverse needs and provide alternative pathways to access, acting as conversion factors that either expand or restrict users' capabilities in practice (Coetzer et al., 2024; Helsper, 2021).

Within these approaches, vulnerabilities do not deterministically lead to exclusion. Instead, they shape the conditions under which digital engagement occurs, partly by influencing perceived digital abilities and the extent to which people rely on others (Helsper, 2021).

2.3 Digital abilities, internet self-efficacy and trust

Beyond technical skills, digital abilities, especially how confident people feel about using digital systems (internet self-efficacy) and trust in those systems play a central role in shaping digital engagement. Drawing on social cognitive theory, self-efficacy refers to beliefs about one's capacity to organise and execute actions required to achieve desired outcomes (Bandura, 1997). In Bandura's account, such beliefs are a core component of human agency, people's ability to exercise influence over events that affect their lives, and they shape how individuals approach, persist in and withdraw from online interactions (Bandura, 1997). Bandura's socio-cognitive theory is used to describe how people in vulnerable positions judge their own ability to use digital health and social services.

When applied to digital contexts, internet self-efficacy captures confidence in using online systems and navigating digital environments. Research consistently shows that such beliefs strongly predict technology adoption and persistence, often independently of objective skill levels (Helsper, 2021; van Dijk, 2020). Building on this line of work, recent studies likewise emphasise digital competence and related perceived abilities as social determinants of health, shaping who uses and benefits from digital health services (Foley et al., 2021; Gillie et al., 2022; Le et al., 2023).

Internet self-efficacy influences whether individuals attempt to use digital services, how they interpret challenges and how they respond to setbacks (Gillie et al., 2022; Le et al., 2023). High perceived competence can encourage engagement even under adverse conditions, while low confidence may lead to avoidance despite adequate technical skills (Gillie et al., 2022; Le et al., 2023). At the same time, perceived ability does not guarantee successful outcomes. Structural and design-related barriers, such as complex authentication, high cognitive load or unclear instructions, may still impede access, highlighting the limits of interventions that focus solely on individual training (Coetzer et al., 2024; Hoffman, 2022).

Trust in digital systems and service providers is another critical determinant of engagement. Trust shapes attitudes toward technology and influences behavioural intention, as emphasised in the Technology Acceptance Model and related frameworks (Tao et al., 2020). Empirical evidence from recent digital mental health and telehealth research shows that intention and trust do not always align; individuals may report strong willingness to use digital services despite low trust, particularly when digital channels are perceived as unavoidable (Lattie et al., 2022; Oliver et al., 2024; Phuong et al., 2023). In institutional and welfare-service contexts, this kind of configuration can be understood as intention under constraint, referring to situations in which people report a willingness to use digital services not primarily because they trust or prefer them, but because digital channels are perceived as necessary, unavoidable or more realistic than available alternatives (Selwyn, 2006; Tao et al., 2020). A qualitative meta-synthesis of user perspectives on digital mental health interventions similarly highlights that

willingness to try such tools often coexists with ambivalence and concerns about relevance, privacy, and support, emphasising the need to distinguish intention from positive engagement and outcomes (Patel et al., 2020).

Perceived digital abilities and trust thus function as mediating mechanisms between vulnerability and digital engagement. They interact with prior experiences, emotional wellbeing and relational support, making them dynamic rather than static attributes (Helsper, 2021). Understanding these mechanisms is essential for designing interventions that move beyond technical training to address confidence, trust, and usability in digital health and social services (Foley et al., 2021; Gillie et al., 2022; Le et al., 2023).

2.4 Relational resources, proxy agency and supported digital use

Conceptual frameworks of digital inclusion and technology adoption have often assumed autonomous users who engage independently with digital systems, drawing on models such as the Technology Acceptance Model and individual-level accounts of digital skills and self-efficacy (Helsper, 2021; Tao et al., 2020; van Dijk, 2020). However, empirical evidence has shown that digital engagement is frequently supported, shared or delegated within social relationships (Courtois & Verdegem, 2016; Helsper, 2021; Hunsaker et al., 2019). Building on Bandura's (2001) notion of proxy agency, proxy efficacy captures a person's perceived ability to enlist others' assistance when direct control is limited. This differs from social support, which comprises practical, informational, or emotional assistance that may be available, offered, or received through family members, friends, peers, or professionals. Although related, proxy efficacy concerns the perceived capacity to mobilise assistance, whereas social support concerns the assistance itself (Bandura, 2001; Hänninen et al., 2021).

Relational resources can enable access by compensating for limited skills, confidence, or knowledge of systems and languages. Studies in mental health and social care contexts have demonstrated that support from others can be critical for completing essential tasks, such as applying for benefits or booking appointments online (Oliver et al., 2024). Research on so-called warm experts in Finland has shown that digitally more skilled relatives, friends, and peer tutors provide ongoing help with digital tasks and play a crucial role in older adults' digital lives (Hänninen et al., 2021; Korpela et al., 2023, 2024). A similar reliance on relatives, peers, and non-governmental organisation (NGO) staff has been observed among migrants navigating Finnish digital health and social services, where language barriers, a lack of strong e-identification, and limited familiarity with the service system make independent use difficult (Buchert et al., 2022). In these settings, assistance from others can expand the practical possibilities for people living with mental health

problems, long-term unemployment, migration-related challenges, age-related vulnerabilities, and other intersecting disadvantages (Greer et al., 2019; Kaihlanen et al., 2022).

At the same time, proxy-based or supported use is ambivalent. While it may facilitate access in the short term, it may also reinforce dependency and obscure structural shortcomings in service design, especially when digital systems remain cognitively demanding, linguistically complex, or tightly coupled with strong e-identification (Buchert et al., 2022; Coetzer et al., 2024; Shaw et al., 2024). Systems that implicitly assume informal support risk deepening inequalities between individuals with strong social networks and those without (Courtois & Verdegem, 2016). Proxy arrangements can further raise concerns about privacy, consent, and autonomy, particularly in contexts involving sensitive health information or administrative decisions affecting income security or legal status (Buchert et al., 2022; Hänninen et al., 2021; Hunsaker et al., 2019). For people with cumulative vulnerabilities, such as cognitive or learning difficulties, substance use problems or a criminal background, the reliance on others may thus become both a precondition for access and a source of hidden dependency (Kaihlanen et al., 2022; Rantanen et al., 2021).

In addition to informal networks, formal support structures play an important role in digital inclusion. A recent systematic review on social work and digital inclusion (Hartman-van der Laan et al., 2025) showed that social workers identify exclusion across all phases of internet appropriation, from motivation and material access to skills and usage. They address these barriers by providing direct assistance, organising peer support, setting up learning programmes, and advocating organisational change. They also identify structural barriers, including a lack of devices, insecure data practices, and unsuitable software, and seek to address them at organisational and policy levels. Formal support can therefore complement or compensate for unequal informal support, although its availability and quality are themselves shaped by resources, mandates, and organisational priorities (Hartman-van der Laan et al., 2025).

Relational resources, both informal and formal, are therefore integral components of digital inclusion rather than residual coping mechanisms. They interact with vulnerabilities and perceived abilities in shaping whether digital services are accessed independently, through assisted use or not at all (Courtois & Verdegem, 2016; Hänninen et al., 2021; Helsper, 2021). Proxy-based engagement can widen access for older adults, mental health service users, socially marginalised individuals, migrants and people in weak labour market positions. Such engagement can also amplify inequalities and create trade-offs in autonomy and privacy when service systems place heavy procedural demands on users and leave the work of mediation largely to families, peers, and frontline professionals (Buchert et al., 2022; Greer et al., 2019; Hänninen et al., 2021; Kaihlanen et al.,

2022). Reliance on informal support cannot, therefore, be treated as a substitute for organisational responsibility to provide accessible service design, formal support, and genuinely available non-digital alternatives (Coetzer et al., 2024; Hartman-van der Laan et al., 2025; Heaslip & Holley, 2023).

2.5 A process-oriented DIHSS model of digital inclusion

Building on the strands of research reviewed above, this dissertation proposes a Digital Inclusion in Health and Social Services (DIHSS) model as an analytical framework for understanding how digitalisation shapes access to health and social care. The main elements and assumed pathways of this model are summarised in Figure 1. The model conceptualises digital inclusion as a layered process that unfolds across multiple stages of interaction with digitalised services, from access and engagement to concrete service outcomes (Helsper, 2021; van Deursen & Helsper, 2018). The model brings together individual vulnerabilities, perceived digital abilities, relational resources, and system-level demands within this process-oriented framework (Courtois & Verdegem, 2016; Fisk et al., 2023; Hänninen et al., 2021; Helsper, 2021; Herd & Moynihan, 2018; van Deursen & Helsper, 2018; van Dijk, 2020).

The model serves as an overarching analytical framework rather than a single causal model tested within a single dataset. Substudy I examines the role of general self-efficacy, internet self-efficacy, and proxy efficacy in intention to use digital health and social care services. Substudy II examines how digital skills, internet self-efficacy, and trust combine across different profiles and relate to intention, whereas Substudy III examines associations between individual-level vulnerability indicators and difficulties in internet use and in using healthcare services. Altogether, the substudies examine distinct connections within the DIHSS model and provide the basis for the empirical synthesis in Chapters 5 and 6.

Although termed a model of digital inclusion, the DIHSS model foregrounds the conditions under which inclusion may fail to materialise. It therefore functions as a diagnostic tool for locating the barriers, cumulative disadvantages, and service-system demands through which digitalisation may create conditional gateways rather than equitable access to care and support.

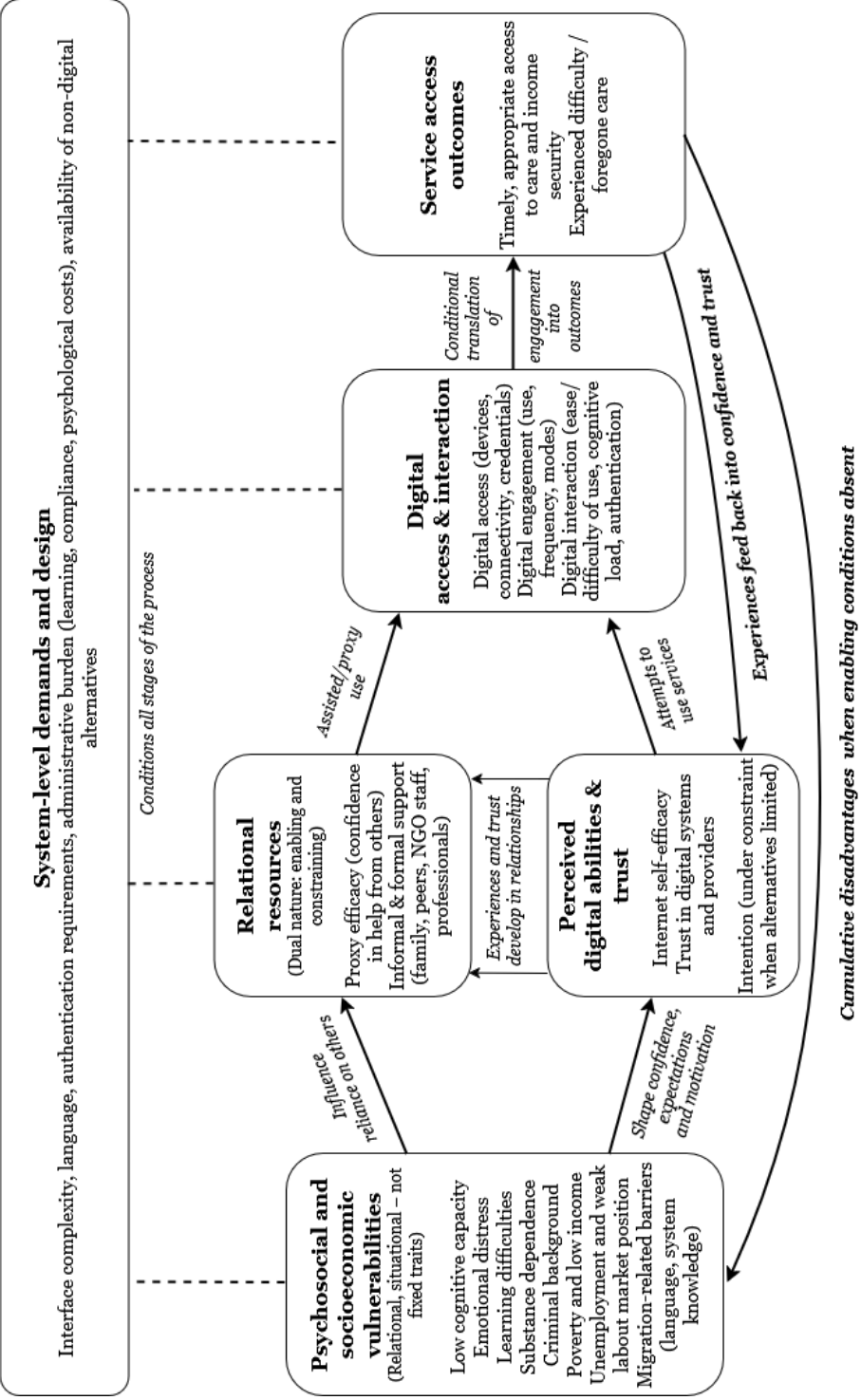


Figure 1 Digital Inclusion in Health and Social Services (DIHSS) model

At the starting point of the model are psychosocial vulnerabilities, understood as relational and situational conditions that shape how individuals encounter digital service environments (Herd & Moynihan, 2018; Selwyn, 2006). In digitalised health and social systems, expectations of autonomy, sustained attention and procedural competence can render these conditions particularly consequential, especially when institutional demands exceed users' cognitive, emotional, or social resources (Hoffman, 2022). Rather than inherent personal deficiencies, vulnerabilities are understood as conditions that structure opportunities and constraints in digital service use (Fisk et al., 2023; Helsper, 2021). At the empirical level, however, the substudies necessarily operationalised vulnerability as individual-level indicators. Critical accounts of vulnerability highlight how policy and institutional arrangements participate in producing vulnerability and call for a shift from individual “deficits” to collective responsibility (Brown, 2017; Fineman, 2008). In this study, these indicators were therefore used as analytical devices to examine how institutional demands interact with specific constellations of disadvantage, rather than as labels for inherently “vulnerable” individuals.

Relational resources constitute a further layer that can either mitigate or amplify the effects of vulnerabilities and perceived abilities. Access to proxy support and social networks can compensate for limited skills or confidence, enabling people to complete digital tasks that they could not manage alone (Hänninen et al., 2021; Oliver et al., 2024). At the same time, reliance on such support is unevenly distributed and may itself become a source of inequality and dependency when service systems tacitly assume its presence (Coetzer et al., 2024; Courtois & Verdegem, 2016; Shaw et al., 2024). Formal support provided by service providers and professionals, including social workers, can help counterbalance these disparities, but is shaped by institutional mandates and resource constraints (Hartman-van der Laan et al., 2025).

Perceived digital abilities and trust form an intermediate layer in the model, mediating the relationship between vulnerabilities and digital engagement. Internet self-efficacy and related beliefs influence whether individuals attempt to use digital services and how they cope with challenges, while trust shapes their willingness to rely on digital channels and providers (Helsper, 2021; Tao et al., 2020; van Dijk, 2020). These psychosocial mechanisms are, in turn, shaped by prior experiences, emotional wellbeing, and the availability of support, making them dynamic over time (Gillie et al., 2022; Helsper, 2021; Le et al., 2023).

Across all stages of the model, system-level demands and design choices form a structural backdrop to digital interaction and service access. Features such as interface complexity, language, authentication requirements, the availability of non-digital alternatives, and the overall complexity of social security and service systems, including whether people can recognise which benefits or services they might be entitled to and where to apply, influence how manageable or burdensome

digital interaction is for different users (Buchert et al., 2022; Hoffman, 2022). Capability-oriented approaches underscore that digital inclusion depends not only on individual capacities and relationships but also on whether service systems are designed to support diverse needs and enable human capabilities (Fisk et al., 2023; Helsper, 2021).

The model views digital inclusion in health and social services as the outcome of interactions between these individual, relational, and system-level conditions over time. In line with recent work on digital inequalities and digital determinants of health, it offers an analytical framework for examining how digitalisation can both enable and constrain access to care and support, and for identifying where interventions might most effectively reduce inequalities in digital service use and outcomes (Coetzer et al., 2024; Helsper, 2021; Kan et al., 2024).

2.6 Research on digital inclusion, vulnerability and service outcomes

Empirical research on digital inclusion in health and social services has expanded rapidly, but remains uneven in how it integrates vulnerabilities, psychosocial mechanisms, relational resources, and outcomes. Many studies focus on access and basic skills, identifying socio-demographic and health-related factors associated with the use or non-use of digital health services (e.g. Kan et al., 2024; Phuong et al., 2023; Vehko, 2022). Others examine specific psychosocial determinants, such as digital literacy, internet self-efficacy, or telehealth literacy, and their associations with adoption or intention to use digital health tools (e.g. Foley et al., 2021; Gillie et al., 2022; Le et al., 2023). A growing body of qualitative work explores users' experiences of digital health and social services, highlighting issues of cognitive load, emotional strain, trust, and support needs, particularly among people with mental health difficulties, migrants, and other marginalised groups (Buchert et al., 2022; Greer et al., 2019; Oliver et al., 2024).

Few studies link vulnerabilities, psychosocial factors, relational support, and service outcomes within a single framework. Some quantitative studies have begun to link mental health symptoms, cognitive difficulties, or socioeconomic disadvantage to digital engagement and health outcomes, often finding that vulnerable groups are less likely to use digital health services and more likely to report negative experiences (Phuong et al., 2023; Rantanen et al., 2021). Research on proxy use and warm experts shows that assistance from relatives, peers, or professionals can be critical for access (Coetzer et al., 2024; Hänninen et al., 2021; Korpela et al., 2023), but this work seldom connects relational support to formal outcome measures or to system-level demands.

This evidence points to the need to conceptualise digital inclusion as a layered process rather than a binary state or individual trait. Nursing and integrated care

scholarship has explicitly framed digital transformation as a new social determinant of health and argued that digital innovations should be evaluated in terms of equity, asking whose access is facilitated or hindered and under what conditions (Heaslip & Holley, 2023). Studies highlight that access, skills, and intention are necessary but insufficient for equitable outcomes, and that psychosocial vulnerabilities, people's perceived abilities, relational resources, administrative, and linguistic demands jointly influence how people navigate digitalised service systems (Helsper, 2021; Kan et al., 2024; Safarov, 2024; Shaw et al., 2024). Building on this body of work, the empirical chapters of this dissertation examine how these dimensions interact within the context of Finnish health, social and employment services, with particular attention to people in vulnerable positions and outcome-relevant indicators, such as difficulties in using healthcare services.

To situate the present dissertation in relation to previous empirical and conceptual work, Table 1 summarises selected studies on digital inclusion, vulnerability, and health and social service outcomes. The table is based on a purposive, theory-informed selection of peer-reviewed literature rather than a systematic review. Studies were selected for their relevance to the conceptual components of the DIHSS model and grouped into six thematic areas through an iterative reading process. The thematic categories cover digital divide frameworks, administrative burden and capability perspectives, perceived abilities and measurement, relational resources and support, vulnerable groups' experiences, and Finnish population-level evidence. It maps the literature informing the framework rather than providing an exhaustive account of the field.

Table 1 Previous research on digital inclusion, vulnerability and health/social service outcomes

Author(s)	Year	Country / context	Sample / material	Design / publication type	Main concepts / measures	Main contribution for this dissertation
Frameworks for access, skills and outcomes						
Helsper	2021	Broad international/digital inequalities	Theoretical synthesis drawing on prior quantitative and qualitative research	Monograph / theoretical synthesis	Digital inequalities, access, skills, engagement, outcomes, social positioning	Shows that digital inequalities involve structured differences in access, skills, engagement, and outcomes, shaped by social position and resources
Selwyn	2006	UK; general population	Non-users and low users of ICTs	Cross-sectional survey	Access, use/non-use, reasons for non-use, socio-demographic factors	Demonstrates that non-use and limited use can be understandable adaptations to structural constraints, not just the absence of access
van Deursen & Helsper	2018	Netherlands; general population	Adult internet users	Cross-sectional survey	Internet access, skills, uses, outcomes/ benefits	Provides evidence that different internet uses are linked to distinct kinds of outcomes, justifying a separation between use and benefit
van Deursen	2020	Netherlands; COVID-19-related internet use and outcomes during the pandemic	General population	Cross-sectional online survey	Internet skills, uses, outcomes, resource differences	Shows that inequalities in specific internet uses and related outcomes are central, not just inequalities in access or devices
van Dijk	2020	Netherlands; international debates on digital skills and digital inequalities	Theoretical and empirical synthesis	Monograph	Internet skills typology, access, use, outcomes	Provides a systematic account of digital skills and levels of the digital divide, and their links to outcomes
System-level demands, burden and capabilities						

Author(s)	Year	Country / context	Sample / material	Design / publication type	Main concepts / measures	Main contribution for this dissertation
Coetzer et al.	2024	International; eHealth and marginalised groups	Studies on digitally marginalised populations	Qualitative meta-review	eHealth interventions, marginalisation, support, barriers, paradoxes	Synthesises evidence that eHealth can both support and burden marginalised groups, including through reliance on proxies and system-level barriers
Fisk et al.	2023	International; digital services and vulnerability	Conceptual literature and examples	Conceptual review	Capability approach, inclusive design, digital exclusion	Introduces a capability-oriented view in which digital exclusion reflects failures of systems to enable capabilities, not only individual deficits
Heaslip, V., & Holley, D.	2023	UK / international digital health and nursing context	Conceptual argument with illustrative cases and policy links	Conceptual and integrative review	Digital inclusion/exclusion in healthcare, equity, social determinants, SDGs, WHO digital health strategy	Frames digital transformation as a new determinant of health and calls for an explicitly equity-oriented evaluation of digital health initiatives
Herd & Moynihan	2018	USA; social safety net programmes	Administrative systems and clients	Conceptual/empirical framework	Administrative burden: learning, compliance, psychological costs	Develops the administrative burden framework of learning, compliance and psychological costs in public programmes
Hoffman	2022	USA; telehealth and digitalised welfare	Policy analysis with patient/system perspective	Conceptual/empirical analysis	Telehealth, digital divide, administrative burden, policy assumptions	Argues that telehealth and digitalised welfare systems can deepen digital divides and administrative burdens if underlying assumptions remain unexamined
Holmes & Burgess	2022	UK; poverty and digital exclusion	Low-income households	Qualitative study	Access, affordability, use, and experiences of exclusion	Shows how poverty and everyday precarity shape digital exclusion and limit the capacity to benefit from digital services

Author(s)	Year	Country / context	Sample / material	Design / publication type	Main concepts / measures	Main contribution for this dissertation
Kan et al.	2024	International; paediatric digital determinants of health	Conceptual argument with empirical examples	Conceptual paper	Digital determinants of health across individual, family, system and policy levels	Presents a multi-level 'digital determinants of health' framework spanning individual, family, system, and policy levels
Krukowski et al.	2024	International; digital health interventions	Studies of digital health interventions	Systematic review	Inclusion/ exclusion across design, recruitment and implementation	Shows that digital health interventions can exclude vulnerable groups at several stages, from design to implementation
Shaw et al.	2024	International; digital health equity	Various populations	Qualitative systematic review	Barriers and facilitators to equitable digital health access	Synthesises qualitative evidence on digital health equity, highlighting system and user-level barriers and enablers
Perceived digital abilities and literacy						
Foley et al.	2021	Australia; digital health services	Adult users and non-users of digital health services	Cross-sectional survey	Access to, use of and benefits from digital health services; socio-demographic and psychosocial factors	Shows that benefits from digital health services are unevenly distributed according to psychosocial and socio-economic factors
Gillie et al.	2022	USA; vulnerable older adults	Patients at risk of cognitive decline	Instrument development study	Telehealth literacy screening; social determinants	Develops a telehealth literacy screening tool and situates such literacy as a social determinant of health
Heponiemi et al.	2024	Finland; access to care and digital competence	Finnish adults participating in the 2017 and 2020 FinHealth surveys	Longitudinal population-based survey	Digital competence, access to care, healthcare utilisation, poor health, activity limitation, cognitive functioning, mental distress, loneliness	Shows, using longitudinal Finnish data, that digital competence partially mediates the association between vulnerability-related factors and poorer access to care

Author(s)	Year	Country / context	Sample / material	Design / publication type	Main concepts / measures	Main contribution for this dissertation
Hernandez et al.	2024	USA; digital health access screening	Multi-site collaborative material	Mixed-methods study	Development and implementation of a digital health use screening tool	Provides practical insights into developing and implementing screening tools for digital health use barriers
Le, Galperin & Traube	2023	USA; telehealth	Adults using or eligible for telehealth	Cross-sectional survey	Digital competence; telehealth utilisation; socio-demographics	Shows that digital competence is a key predictor of telehealth use among adults
Tao et al.	2020	International; digital health technology acceptance	Surveys / meta-analytic evidence from patients and service users	Review / meta-analytic synthesis	Trust, perceived usefulness/ease of use, intention to use	Reinforces that trust, perceived usefulness and ease of use are central determinants of intention and use in digital health
Relational resources and proxy support						
Courtois & Verdegem	2016	Belgium; general population	Adults with varying digital engagement	Cross-sectional survey	Social support for digital activities, digital use, and digital skills	Demonstrates that social support plays a substantive role in digital inequalities, not just a background factor
Hartman van der Laan et al.	2025	International; social work and digital inclusion	Studies on how social workers support digital inclusion	Systematic literature review	Social workers' support, exclusion indicators, and structural barriers	Shows how social workers support digital inclusion and address organisational barriers across motivation, access, skills and use
Hunsaker et al.	2019	USA; older adults	Older adults using digital technologies	Qualitative study	Support practices, reciprocity, and everyday technology help	Highlights that older adults both give and receive technology support, and that such support is embedded in everyday reciprocal relationships
Hänninen et al.	2021	Finland; older adults and warm experts	Older adults and close contacts	Qualitative study	Warm experts, informal support, and everyday digital practices	Shows how 'warm experts' in close networks act as informal intermediaries and co-users in older adults' digital practices

Author(s)	Year	Country / context	Sample / material	Design / publication type	Main concepts / measures	Main contribution for this dissertation
Korpela, Pajula & Hänninen	2023	Finland; peer support in later life	Older adults acting as peer tutors	Qualitative study	Non-formal support, peer help, learning	Describes non-formal peer support for digital skills in later life as negotiated and reciprocal
Korpela, Pajula & Hänninen	2024	Finland; warm experts and later life digital support	Older adults and digitally skilled close others	Qualitative study	Warm experts, digital skills, autonomy	Shows that warm experts can both strengthen digital participation and contribute to dependence, affecting autonomy
Vulnerabilities and lived service experiences						
Greer et al.	2019	UK; mental health services	Adult mental health service users	Qualitative interviews	Experiences of digital technologies and online mental health services	Shows that digital exclusion among mental health service users often stems from cognitive load, emotional strain, low trust, and limited tailored support
Lattie, Stiles-Shields & Graham	2022	International; digital mental health	Users and non-users of digital mental health services	Narrative review	Accessibility, barriers, recommendations	Summarises barriers and recommendations for digital mental health, including design, literacy and support issues
Oliver, Chandler & Gillard	2024	UK; mental health service context	Users of a digital inclusion initiative	Qualitative interview study	Experiences of targeted digital inclusion support; mental health service access	Shows that targeted digital inclusion support can facilitate access to mental health services but does not remove structural and relational barriers
Phuong et al.	2023	USA; telehealth and digital health	Diverse patient groups	Mixed-methods study	Access barriers and facilitators in telehealth/digital health	Describes a 'mixed landscape of access' to telehealth and digital health where structural, technical and psychosocial factors interact
Tsatsou	2022	International; digital inequalities	Vulnerable and marginalised groups across prior studies	Conceptual and empirical synthesis	Intersectionality, cumulative disadvantage in digital participation	Offers a conceptual and empirical synthesis of how intersecting and cumulative

Author(s)	Year	Country / context	Sample / material	Design / publication type	Main concepts / measures	Main contribution for this dissertation
Finnish evidence across vulnerabilities and outcomes						
Buchert et al.	2023	Finland; migrants using public services	Adult migrants using public health and social services	Qualitative study	Language, identification, trust, system knowledge, service use	vulnerabilities shape digital participation Shows that having devices and internet is insufficient without language skills, identification tools, and system knowledge; supports the distinction between access, engagement, and meaningful inclusion
Heponiemi et al.	2020	Finland; national population survey	Adult Finnish population	Cross-sectional survey	Use and perceived benefits of online health and social welfare services	Identifies a “digital divide in perceived benefits” of online services, showing that digitalisation does not guarantee equal value, supporting the outcome-focused definition of digital inclusion
Kailanen et al.	2022	Finland; vulnerable groups in healthcare	Older adults, migrants, people with long-term conditions	Qualitative interviews	Barriers and facilitators in digital health services, including usability, support, trust and language	Highlights interconnected barriers to digital health services among vulnerable groups, including usability, support, trust, and language issues
Kainiemi et al.	2023	Finland; older adults	Older adults in a population-based survey	Cross-sectional survey	Perceived benefits of digital health and social services	Shows that perceived benefits of digital health and social services differ markedly among older adults
Safarov	2024	Finland; digitalised public services/welfare state	Russian-speaking migrants in Finland	Qualitative study (participant observation + interviews)	Administrative literacy, digital skills, language skills, welfare system navigation, administrative burdens	Shows how administrative literacy, language and digital skills, and welfare system knowledge shape migrants' use of digital public services and access to social protection,

Author(s)	Year	Country / context	Sample / material	Design / publication type	Main concepts / measures	Main contribution for this dissertation
Vehko et al.	2022	Finland; national monitoring / wellbeing survey	Adult Finnish population	Cross-sectional survey	Ability to use eHealth / eWelfare services, difficulties, non-use	highlighting system-level demands as key barriers. Provides national data on ability to use eHealth and eWelfare services, reported difficulties and non-use across groups

3 Aim of the study and research questions

The overall aim of this dissertation is to examine how individual vulnerabilities, internet self-efficacy, and relational resources, such as proxy efficacy and social support, are associated with people's ability to use digital health and social services to enable access to care and support. Rather than viewing digital inclusion as a static condition or an individual attribute, the dissertation conceptualises it as a dynamic process shaped by psychosocial mechanisms and system-level demands. The main research question is how individual vulnerabilities, perceived digital abilities, and relational resources are associated with digital inclusion, understood as digitally mediated access to health and social services among people in vulnerable positions. This overarching question is addressed through three substudies conducted among users of health, social and employment services in Finland.

1. Substudy I: (1) How are general self-efficacy, internet self-efficacy, and proxy efficacy associated with intention to use digital social and health care services among mental health service users? (2) Does internet self-efficacy mediate the association between general self-efficacy and intention to use digital services?

2. Substudy II: (1) What kinds of profiles can be identified based on digital skills, internet self-efficacy, and trust in digital health and social welfare services among socially marginalised individuals? (2) How are these profiles associated with intention to use digital health and social welfare services?

3. Substudy III: (1) How are individual-level vulnerabilities (e.g. cognitive capacity, emotional wellbeing, learning difficulties, substance dependence, criminal background) associated with difficulties in using healthcare services among people in a weak labour market position? (2) Are these associations mediated by difficulties in internet use?

These substudies examine how different constellations of vulnerabilities, perceived digital abilities, and relational resources are linked to intentions to use digital services, difficulties in internet use, and difficulties in using healthcare services and explore theoretically informed pathways between these factors. The empirical findings are then interpreted through a relational and vulnerability-sensitive framework of digital inclusion in health and social care. Table 2 in Chapter 4 summarises the main methods and key findings of Substudies I–III.

4 Data and methods

4.1 Methodological orientation

This dissertation adopts a post-positivist quantitative orientation, informed by a critical realist understanding of health and social care research. Ontologically, it assumes that vulnerabilities, digital resources, relational support, and institutional service arrangements have real consequences for people's opportunities to access services, even though these phenomena are only partially observable and may be experienced in different ways across contexts. In this view, digital inclusion and exclusion are not treated solely as individual attributes but as outcomes arising from interactions among individuals' resources and vulnerabilities, relational resources, and the demands of service systems.

Epistemologically, the dissertation treats survey responses and routine self-assessment data as fallible, though informative indicators of these underlying processes. The cross-sectional analyses identify statistical associations and patterns that are compatible with theoretically specified pathways. They do not establish definitive causal relationships or entirely capture the lived meanings of digital service use. The conceptual framework and interpretation of findings therefore situate observed associations within wider social, relational, and institutional conditions.

The research is also equity-oriented in that it studies how the digitalisation of health and social care may distribute opportunities and burdens unevenly across groups in vulnerable positions. This orientation informs the selection of research questions, the interpretation of results, and the focus on service-system responsibilities alongside individual-level factors.

4.2 Data sources and study populations

Substudy I was a cross-sectional survey of adult mental health service users in Finland. Participants (N = 121) were recruited between November 2020 and May 2021 via four community-based mental health organisations in southern Finland. Inclusion criteria were age 18 or older, current or recent use of mental health services, and the ability to complete a Finnish-language questionnaire.

Data were collected using a paper or digital questionnaire, which participants completed either at the service premises or at home and returned in prepaid envelopes when completed on paper. The questionnaire covered background variables, internet access and use, self-efficacy beliefs, proxy efficacy and intention to use digital social and health care services. The mean age of respondents was 43.9 years ($SD = 12.6$); 63% were women. Most participants used the internet daily or almost daily (90%), and the vast majority had access to a smartphone (87%), a personal computer (74%), and online banking (89%).

Substudy II was a cross-sectional study of digital skills and the intention to use digital healthcare and social welfare services among socially marginalised individuals in Finland. The sample comprised 225 prisoners and 120 mental health service users, recruited between November 2020 and May 2021 from 11 Finnish prisons and four community-based mental health organisations.

Service staff informed clients about the study and invited them to participate during visits. Respondents completed a paper or digital questionnaire independently or, where needed, with assistance from staff or researchers. In prisons, data were collected using paper questionnaires only. The final sample ($N = 345$) included participants aged 18–70 years (mean age 39.9, $SD = 12.3$); 72% were men, and more than half had secondary or higher education (56%). Most used the internet daily or almost daily (69%), and smartphones were the most common device (80%), followed by personal computers (56%).

The mental health service user sample in Substudy II largely overlapped with that used in Substudy I. The analytical samples nevertheless varied across analyses because of item-specific missing data.

Substudy III was a cross-sectional mediation study among adults in a weak labour market position who used health, social and employment services in Finland. It used data from 39,022 adults aged 18–74 years who completed the Abilitator self-assessment between 1 January 2017 and 31 December 2021 as part of employment and social service programmes.

The Abilitator is a multidimensional self-assessment tool used in Finnish employment and social services to evaluate work ability, functioning and service needs among people whose labour market position is challenging (Wikström et al., 2020). Participants completed the Abilitator together with service professionals or independently, typically at the beginning of service processes. For this study, the analytical sample included respondents who had completed the items on internet use and healthcare service use.

Substudies I and II were conducted as part of the DigiIN project, Towards a Socially Inclusive Digital Society: Transforming Service Culture. The doctoral candidate contributed to developing the questionnaire and attended some data collection sessions to answer participants' questions. The populations in these two substudies were selected because mental health difficulties and criminal

background can be associated with challenges in social participation, service access and digital engagement. Data collection took place during the COVID-19 period, when restrictions limited face-to-face contact and made recruitment more demanding. Despite these constraints, the final survey samples included 120 mental health service users and 225 prisoners.

Because people with mental health difficulties and criminal backgrounds are also often in weak labour market positions, the Abilitator data provided a broader empirical context for the survey findings. Its larger sample enabled a more detailed examination of individual-level factors, including cognitive capacity, emotional wellbeing, learning difficulties, substance dependence, and criminal background, and their associations with difficulties in internet use and healthcare service use. Thus, the Abilitator data did not replicate the survey studies but extended the analysis beyond perceived digital abilities, trust, and support to a wider set of factors that may shape access in digitalised service environments.

In all three substudies, the research was conducted in accordance with applicable national and institutional ethical guidelines, including those issued by the Finnish National Board on Research Integrity (TENK) (TENK, 2019). For Substudies I and II, formal ethical review was obtained from the appropriate ethics committees in line with TENK guidelines. Participation in the survey studies was voluntary and based on informed consent. Data management complied with institutional data protection regulations. Access to data was restricted to the research team, and analysis were conducted using de-identified datasets. The original articles describe ethical approvals and data protection procedures in more detail.

4.3 Measures and variables

4.3.1 Vulnerabilities

Across the three substudies, vulnerability was addressed differently through participant selection and measurement. Substudies I and II recruited participants from service contexts in which psychosocial and structural disadvantage may shape digital access, namely community-based mental health services and prisons. Substudy III focused on adults in weak labour market positions who used health, social and employment services and measured specific individual-level vulnerabilities directly. Thus, vulnerability was not treated as a single characteristic shared by all participants, but rather as a context-dependent combination of service position, life circumstances and measured constraints relevant to digital and service access.

In Substudy III, individual-level vulnerabilities were operationalised using selected Abilitator items, developed and validated by the Finnish Institute of

Occupational Health, to assess functioning and work ability among people in weak labour-market positions (Wikström et al., 2020, 2021). While vulnerability is conceptually defined as relational and situational in the theoretical framework, the quantitative analyses necessarily rely on individual-level indicators of disadvantage. This tension is discussed in more detail in Chapter 6. Cognitive capacity was measured with a three-item scale assessing the ability to process, retain and apply information in everyday situations; exploratory factor analysis supported a one-factor solution (item loadings > 0.74), and the resulting sum score was z-standardised for use as a continuous predictor (Cronbach's $\alpha = 0.72$). Emotional wellbeing was assessed with a nine-item scale covering optimism, sense of usefulness, relaxation, ability to deal with problems, clarity of thought, social closeness, independent decision-making, initiative-taking, and enjoyment of meaningful activities; factor analysis indicated a one-factor structure (item loadings > 0.64), and the scale was likewise transformed into a z-score (Cronbach's $\alpha = 0.89$). Substance dependence and criminal background were measured as barriers to work participation using five-point items (1 = extremely difficult to 5 = not difficult at all) and recoded into binary indicators (1 = reported difficulty [responses 1–4]; 0 = no reported difficulty [response 5]). Learning difficulties were captured with a single item asking whether the respondent had been diagnosed with learning or concentration difficulties, or was unsure. Responses were categorised into three groups: no learning difficulty, diagnosed learning difficulty and uncertain status ("don't know"). The latter was treated as a distinct indicator of diagnostic uncertainty rather than as missing information. These vulnerability indicators were entered as predictors in the logistic regression and mediation models, alongside age, gender and education as covariates.

4.3.2 Perceived digital abilities, digital skills and trust

In Substudy I, perceived abilities were measured with two established scales. General self-efficacy was assessed with the 10-item General Self-Efficacy Scale by Schwarzer and Jerusalem (1995), using a four-point response format (1 = not at all true to 4 = exactly true; Cronbach's $\alpha = 0.92$). Internet self-efficacy was measured with an eight-item scale adapted from Eastin and LaRose (2000), capturing confidence in using internet hardware and software at a general level on a five-point Likert scale (Cronbach's $\alpha = 0.94$). In Substudy I, proxy efficacy and the behavioural intention outcome were treated as continuous index variables in the regression and mediation analyses.

In Substudy II, digital skills, internet self-efficacy, and trust were measured with multi-item scales. Digital skills were assessed using 12 items adapted from the Australian Digital Inclusion Index (Wilson et al., 2019), covering general internet use, mobile phones, banking, shopping, community and information skills, and

online activities. Exploratory factor analysis yielded two factors: basic skills (Skills B; seven items, Cronbach's $\alpha = 0.94$) and advanced skills and activities (Skills A; five items, Cronbach's $\alpha = 0.87$). Internet self-efficacy was measured with an eight-item, one-factor scale adapted from Eastin and LaRose (2000) that assessed confidence in using the internet (Cronbach's $\alpha = 0.95$). Trust was measured with a seven-item scale based on Carter and Bélanger's (2005) e-government trust instrument, capturing trust in both the internet and health and social welfare service providers (Cronbach's $\alpha = 0.96$).

In both Substudies I and II, behavioural intention to use digital health and social care services was measured with a five-item scale using a five-point Likert response format. The scale covered overall readiness to use digital services, likelihood of future use, willingness to manage social welfare benefits and health-related matters online and preference between remote and face-to-face appointments. It showed good internal consistency (Cronbach's $\alpha = 0.83$ in Substudy I and 0.85 in Substudy II).

4.3.3 Relational resources

In Substudy I, relational resources were captured through proxy efficacy and questions about actual assistance received when using digital services. Proxy efficacy was measured with an eight-item scale assessing confidence in being able to obtain help from others (including family members, friends, acquaintances, professionals) when using digital services, with responses using a five-point Likert response format (1 = totally disagree to 5 = totally agree; Cronbach's $\alpha = 0.77$). Additional items asked whether participants had received help with digital services and, if so, from whom, including family members, friends, health and social care professionals, NGOs, libraries, and municipal service points. These were analysed descriptively to characterise sources of support.

Relational resources were not included as main explanatory or outcome variables in the statistical models of Substudies II and III and are therefore not detailed here.

4.3.4 Internet use and service access outcomes

In Substudy I, internet use and access were described through frequency of internet use (daily or almost daily; weekly or less often; once a year or never), access to devices (e.g. smartphone, personal computer, tablet) and access to e-identification methods (online bank IDs, mobile IDs, none). The main outcome variable was intention to use digital health and social care services, measured with the five-item intention scale described above.

In Substudy II, descriptive measures covered the frequency of internet use and the devices and digital products used. The main outcome variable was intention to use digital health and social care services, analysed both as a continuous index and in relation to the latent profiles identified by basic skills, advanced skills, internet self-efficacy, and trust.

In Substudy III, two binary outcome variables were used. Internet use difficulty captured self-reported difficulties in using the internet, such as problems understanding online content, remembering steps, logging in, or completing tasks; responses on a five-point coping scale (from “unable to cope” to “cope well”) were dichotomised so that “unable to cope”, “a lot of trouble” and “some trouble” were coded as 1, and “very little trouble” and “cope well” as 0. Healthcare service use difficulty indicated self-reported difficulties in using healthcare services, irrespective of channel (digital or non-digital), such as problems getting appointments, contacting providers, or using services effectively; responses were dichotomised using the same cut-off. These outcomes were used to examine how vulnerabilities were associated with difficulties in internet use and healthcare service use, and whether internet use difficulty mediated these associations.

4.4 Statistical methods

All statistical analyses were conducted using standard software packages. IBM SPSS Statistics (versions 27 and 28) was used for descriptive analyses, correlation and regression models, and Jamovi (version 2.3.18) for latent profile analysis in Substudy II. Mediation analyses in Substudy I were performed with Hayes’ PROCESS macro for SPSS (version 3.5.3) (Hayes, 2018). Across all three substudies, analyses were tailored to the respective study designs and research questions, with relevant sociodemographic factors considered where appropriate.

4.4.1 Substudy I

In Substudy I, descriptive statistics were used to characterise the sample, internet access, use of digital products and services, and sources of support when using digital services. Average indices were calculated for general self-efficacy, internet self-efficacy, proxy efficacy, and behavioural intention to use digital health and social care services, and the internal consistency of these indices was assessed using Cronbach’s alpha. Pearson product–moment correlations and point-biserial correlations were used to explore associations between the main constructs and background variables, including age, gender, relationship status, and educational level. Linear regression models (Enter method) were estimated to examine whether general self-efficacy, internet self-efficacy and proxy efficacy, together with background variables, predicted intention to use digital services. Model

assumptions, including normality and homoscedasticity of residuals, linearity and the absence of multicollinearity, were checked graphically and using variance inflation factors. To test whether internet self-efficacy mediated the association between general self-efficacy and intention, a mediation analysis was conducted using Hayes' PROCESS macro (version 3.5.3) with 5,000 bootstrap samples; the indirect effect was considered statistically significant if the 95% confidence interval did not include zero.

4.4.2 Substudy II

In Substudy II, descriptive statistics were first used to describe participants' sociodemographic characteristics, internet access, and digital product use in the combined sample of prisoners and mental health service users. Exploratory factor analysis was applied to identify the measurement structure of the digital skills, internet self-efficacy, trust, and intention scales and to compute indices with satisfactory reliability; Harman's single-factor test indicated that common method bias was not a major concern. Latent profile analysis (LPA) was then conducted in Jamovi to identify distinct profiles based on basic skills (Skills B), advanced skills (Skills A), internet self-efficacy, and trust. Competing profile solutions were compared using several goodness-of-fit indices, the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), Consistent AIC (CAIC), Sample-Adjusted BIC (SABIC), Approximate Weight of Evidence (AWE), entropy and the Bootstrapped Likelihood Ratio Test (BLRT). Lower information-criteria values, higher entropy, and a significant BLRT informed the selection of a four-profile solution. After selecting the best-fitting profile model, a Kruskal–Wallis test was used to test whether intention to use digital health and social care services and age differed across profiles. Mann–Whitney U tests were then used to compare skills, internet self-efficacy, and trust across subgroups defined by setting (prison vs community-based mental health services), gender, and educational level.

4.4.3 Substudy III

In Substudy III, the analytical strategy was guided by a directed acyclic graph (DAG) specifying hypothesised relationships between individual-level vulnerabilities, internet use difficulty and healthcare service use difficulty. Descriptive comparisons were first conducted across three learning difficulty categories (“no learning difficulty”, “diagnosed learning difficulty”, “don't know/uncertain”) using chi-square tests for categorical variables and one-way analysis of variance (ANOVA) for continuous variables, with Games–Howell post hoc tests where appropriate.

To examine associations between vulnerabilities and difficulties, separate logistic regression models were estimated for two outcomes: internet use difficulty

and healthcare service use difficulty. Cognitive capacity, emotional wellbeing, substance dependence, and criminal background were entered as predictors, and all models were adjusted for age, gender, and education. To address class imbalance (as most respondents reported little or no difficulty), inverse probability weighting was applied to both outcomes.

Mediation was assessed using a series of logistic regression models aligned with the DAG. First, each vulnerability indicator was regressed on internet use difficulty. Second, each vulnerability indicator was regressed on healthcare service use difficulty. Third, both the vulnerability indicator and internet use difficulty were included in the same model predicting healthcare service use difficulty. Evidence consistent with partial mediation was observed when the association between a vulnerability indicator and healthcare service use difficulty was attenuated after controlling for internet use difficulty. Finally, a hierarchical model was estimated to test whether diagnosed and uncertain learning difficulties were independently associated with healthcare service use difficulty after adjusting for cognitive capacity, emotional wellbeing, substance dependence, criminal background, internet use difficulty, and sociodemographic covariates. Model performance was evaluated using the likelihood-ratio chi-square statistic, Nagelkerke's R^2 , and overall classification accuracy.

Table 2 summarises the main characteristics of the three substudies, including their aims, populations, data sources, key measures, and analytical approaches, and illustrates how they address different aspects of the overall research aim.

Table 2 Main characteristics of the Substudies

Item	Substudy I	Substudy II	Substudy III
Research context	Mental health service users' self-efficacy and use of digital health and social care services in Finland	Digital skills, self-efficacy, trust, and intention to use digital health and social care services among socially marginalised individuals in Finland	Vulnerabilities, internet use difficulty, and healthcare service use difficulty among users of Finnish health, social and employment services
Aim	To examine how self-efficacy, internet self-efficacy, and proxy efficacy are associated with intention to use digital health and social care services	To identify profiles based on digital skills, internet self-efficacy, and trust, and to examine how these profiles are associated with intention to use digital health and social care services	To investigate how individual-level vulnerabilities are associated with internet use difficulty and healthcare service use difficulty, and whether internet use difficulty mediates these associations
Design	Cross-sectional survey	Cross-sectional survey	Cross-sectional study
Data source	A questionnaire available in paper and digital formats was	A questionnaire available in paper and digital formats was	Abilitator self-assessment data collected in employment,

Item	Substudy I	Substudy II	Substudy III
	distributed via four community-based mental health organisations in southern Finland	administered in 11 Finnish prisons (6 closed, 5 open) and in four community-based mental health organisations in southern Finland; in prisons, only paper questionnaires were used	rehabilitation and social services as part of routine service processes
Data collection period	November 2020 – May 2021	November 2020 – May 2021	January 2017– December 2021
Study population and setting	Adult users of community-based mental health services in southern Finland	Prisoners and adult mental health service users in institutional and community-based services	Adults in weak labour market positions using social, health and employment services
Sample	N = 121; age 18–65 years (mean 43.9, SD = 12.6); 62.5% women; 75.4% with secondary education; 90.1% used the internet daily or almost daily	N = 345; 225 prisoners, 120 mental health service users; age 18–70 years (mean 39.9, SD = 12.3); 71.6% men; 55.8% with secondary or higher education; 68.7% used the internet daily or almost daily	N = 39,022; aged 18–74 years; 51% women; 76% with upper secondary or higher education
Key independent variables	General self-efficacy; internet self-efficacy; proxy efficacy; background characteristics; internet access and use; sources of support	Digital skills (basic and advanced); internet self-efficacy; trust in the internet and in health and social care services; sociodemographic variables; internet access and devices	Vulnerabilities: cognitive capacity; emotional well-being; substance dependence; criminal background; diagnosed and uncertain learning difficulties; sociodemographic covariates
Key dependent variables	Intention to use digital health and social care services	Intention to use digital health and social care services	Internet use difficulty; healthcare service use difficulty
Main statistical methods	Descriptive statistics; Pearson and point-biserial correlations; linear regression; mediation analysis (Hayes' PROCESS, 5,000 bootstrap samples)	Descriptive statistics; exploratory factor analysis; latent profile analysis (LPA); Kruskal–Wallis tests; Mann–Whitney U tests	Descriptive group comparisons (chi-square tests, ANOVA, Games–Howell post hoc tests); logistic regression with inverse probability weighting; mediation analysis using a series of logistic regression models guided by a DAG

5 Synthesis of findings

This chapter synthesises the empirical findings from the three substudies to examine how digital inclusion unfolds as a layered and conditional process in health and social services. Instead of merely repeating the results reported in the individual articles, the chapter brings the findings of the different substudies into dialogue to identify patterns, interconnections, and points of divergence. Particular attention is paid to how vulnerabilities, perceived abilities, and relational resources operate at different stages of engagement and how misalignments between these stages contribute to unequal access outcomes. Unless otherwise stated, references to associations and differences in this chapter refer to statistically significant findings reported in the original substudies. Exact effect estimates and statistical test results are presented in Publications I–III.

The chapter first situates digital inclusion as a multilayered process (5.1) and then examines how vulnerabilities, perceived abilities, and relational resources interact (5.2). It subsequently examines the mediating roles of internet self-efficacy, trust, and proxy efficacy (5.3), considers how difficulties in internet use are associated with healthcare service use difficulties (5.4), and concludes with an integrated summary (5.5).

5.1 Digital inclusion as a multi-stage conditional process

The three substudies collectively showed that digital inclusion in health and social services did not follow a simple linear pathway but unfolded through multiple interconnected stages.

Substudy I examined the preconditions for engaging with digital health and social care services by analysing how different forms of self-efficacy were related to willingness to use these services online. Substudy II identified distinct user profiles based on combinations of digital skills, internet self-efficacy, and trust in digital health and social welfare services, revealing substantial heterogeneity in how socially marginalised individuals approach and evaluate digital channels. Substudy III focused on concrete access barriers by examining how individual-level vulnerabilities were associated with difficulties in everyday internet use and, in turn, with self-reported problems in using healthcare services among adults in weak labour market positions.

Across the analyses, progression from one stage of the digital inclusion process to the next was not uniform. In particular, intentions to use digital health and social care services did not necessarily translate into the ability to navigate digital environments without difficulty or into equitable access to healthcare services. The associations between emotional and behavioural vulnerabilities and healthcare service use difficulties were partly consistent with an indirect pathway through internet use difficulty, whereas cognitive and learning-related vulnerabilities remained strongly associated with healthcare service use difficulties after internet use difficulty was taken into account. The findings indicated that digital inclusion in health and social services operates as a layered, conditional process rather than a simple binary distinction between users and non-users. They also supported conceptualising digital inclusion as a dynamic, context-dependent achievement that can be disrupted at multiple stages.

5.2 Navigating vulnerabilities through perceived abilities and relational support

Viewed together, the three substudies indicated that vulnerabilities, perceived digital abilities, and relational resources were linked to both readiness to engage with digital health and social care services and difficulties encountered in internet and healthcare service use. These elements appeared in different combinations in the empirical material rather than as separate, isolated factors. They can be understood as intersecting vulnerability conditions and support configurations that shape how digital inclusion unfolds in practice.

Substudy III showed that low emotional wellbeing, substance dependence, low cognitive capacity, criminal background, and diagnosed or uncertain learning difficulties were each independently and statistically significantly associated with reported difficulties in using healthcare services. The analyses further showed that these vulnerability indicators could co-occur and that healthcare service use difficulties were more common among participants with multiple vulnerability-related constraints. At the same time, there was variation within groups defined by individual vulnerability indicators, so that not everyone with a given vulnerability reported healthcare service use difficulties.

Substudies I and II provided additional information on how such vulnerability conditions were managed in relation to digital services. Substudy I showed that both internet self-efficacy and proxy efficacy were independently and statistically significantly associated with intention to use digital health and social care services, whereas general self-efficacy was associated with intention indirectly through internet self-efficacy.

Substudy II identified four distinct profiles of digital skills, internet self-efficacy, and trust that differed significantly in intention to use digital health and

social care services. These findings indicated that perceived abilities and confidence in receiving help from others were important to how people approached digital channels in contexts marked by vulnerability.

Relational resources were examined directly in Substudy I through proxy efficacy and reported sources of assistance. Family members and friends were the most commonly reported sources of help with digital tasks, and higher proxy efficacy was associated with a greater intention to use digital services. The role of relational resources in the broader synthesis is interpreted alongside the findings of Substudies II and III, which examined perceived abilities, trust, vulnerabilities, and service-use difficulties rather than direct measures of support. Within this overall pattern, Substudy III showed that learning difficulties, including cases with uncertain diagnoses, remained associated with healthcare service use difficulties even after accounting for other vulnerabilities and internet use difficulties. This suggested that support needs linked to learning difficulties were not fully captured by general measures of internet use difficulties or other vulnerability indicators.

5.3 The mediating roles of internet self-efficacy, trust and proxy efficacy

The intention to use digital services emerged as an important yet conditional factor in the digital inclusion process. In Substudies I and II, intention was consistently associated with perceived digital abilities, while its relationship to trust and subsequent service-access outcomes appeared more complex.

Substudy I showed that both internet self-efficacy and proxy efficacy independently were associated with intention to use digital health and social care services, with general self-efficacy operating primarily through internet self-efficacy. This meant that reported willingness to use digital channels was linked to both confidence in one's own abilities and confidence in being able to obtain help from others.

Substudy II added to this picture by showing that intention to use digital health and social care services could coexist with low trust. A latent profile combining high intention with low trust illustrated this configuration, as participants in this group reported a willingness to use digital channels while simultaneously expressing doubts about the systems they were expected to use. Both Substudies I and II indicated that intention was shaped by perceived abilities and relational resources but did not always align with positive evaluations of digital services.

The transition from intention to successful digital engagement and equitable service access was likewise not uniform. Substudy I showed that internet self-efficacy and proxy efficacy were independently associated with the intention to use digital health and social care services, but it did not examine realised digital service use. Substudy III demonstrated that emotional and behavioural

vulnerabilities were partly linked to difficulties in using healthcare services through internet use difficulties, and that cognitive and learning-related vulnerabilities remained strongly associated with healthcare service use difficulties even after accounting for internet use difficulties. These findings indicated that readiness or intention to use digital services alone did not ensure progression to digitally mediated access to care, particularly for participants with vulnerability-related constraints.

5.4 Digital interaction to healthcare access outcomes

Digital interaction and healthcare service use difficulties constituted the final stage examined in this dissertation. Substudy III provided key evidence that these two dimensions, while related, were not fully aligned.

Difficulty using the internet was independently associated with difficulties in using healthcare services and was consistent with a partial mediating role in the associations between certain vulnerabilities and healthcare service use difficulties, particularly low emotional wellbeing, substance dependence, and criminal background. In contrast, low cognitive capacity and learning-related vulnerabilities remained strongly associated with healthcare service use difficulties after adjustment for internet use difficulty

In particular, individuals with learning difficulties, including those who were uncertain whether they had a diagnosis, formed a group for whom support needs were not fully captured by internet use indicators alone, or by other individual-level vulnerability indicators. These findings indicate that difficulties in internet use represented one element in a broader conditional process shaping healthcare service use.

5.5 Summary of the empirical synthesis

Taken together, the empirical findings support understanding that digital inclusion in health and social services progressed as a multi-stage process rather than as a single step. In this process, an early stage concerned the readiness to use digital channels, shaped by vulnerabilities, perceived abilities, and relational resources. A subsequent stage involved intention to use digital health and social care services, which was linked to internet self-efficacy, proxy efficacy, and profiles that also incorporated trust. A further analytical layer concerned difficulties in everyday internet use and their relationship to reported difficulties in using healthcare services. Throughout these stages, progression was neither linear nor uniform. Intention did not automatically lead to smooth use of digital services, and the ability to use digital channels did not by itself guarantee equitable access to healthcare services. Inclusion and exclusion were shaped by combinations of individual

circumstances, available support, and service configurations considered across the three substudies.

Three main empirical patterns stood out. First, the vulnerability indicators examined in Substudy III were independently associated with healthcare service use difficulties and could co-occur. Participants with different vulnerability-related constraints nevertheless varied in whether they reported difficulties in using healthcare services. Second, perceived abilities were linked to how participants approached digital services and to reported difficulties, while Substudy I showed that proxy efficacy served as an additional relational resource associated with the intention to use digital services. Third, Substudy II identified profiles in which high intention coincided with low trust, and Substudy III showed that internet use difficulties and healthcare service use difficulties were particularly pronounced among respondents with cognitive and learning-related vulnerabilities. These findings indicate that willingness to use digital channels alone was insufficient to ensure equitable access to healthcare services.

6 Discussion

This chapter discusses how the findings of the three empirical substudies advance our understanding of digital inclusion in health and social services as a layered, conditional, and relational process. It brings the results into dialogue with the conceptual framework developed in Chapter 2 and with previous research on digital inequalities, vulnerability, and proxy-based forms of engagement, indicating where this dissertation nuances, challenges or extends existing work. The discussion proceeds thematically by examining, in turn, how the substudies illuminate digital inclusion (6.1), how its layered and processual nature can be conceptualised in institutional settings (6.2), how vulnerability operates in digitalised service contexts (6.3), how perceived abilities and intention function under constraint (6.4), how relational resources and proxy forms of engagement shape access (6.5), and the implications of these findings for digital health and social services (6.6), before turning to limitations and directions for future research (6.7).

6.1 Interpreting digital inclusion across the three studies

Digital inequality research has argued that access, skills, engagement, and outcomes form related but distinct layers of participation rather than a simple divide between the “included” and “excluded” (Helsper, 2021; van Deursen & Helsper, 2018; van Dijk, 2020). In the conceptual framework of this dissertation, these layered models were applied to Finnish health and social service contexts by examining how individual vulnerabilities, perceived digital abilities, relational resources, and system-level demands jointly shape opportunities for digital inclusion. The three empirical substudies extend this layered perspective across different service settings, showing how these conditions may combine when people in vulnerable positions encounter digitalised services.

Debates on “second-level divides” have treated perceived digital abilities as key resources that condition whether users adopt digital technologies and translate them into meaningful practices (Helsper, 2021; van Deursen & Helsper, 2018). Substudy I supports this view to some extent by showing that internet self-efficacy was independently associated with the intention to use digital health and social services, whereas general self-efficacy was associated with intention primarily through internet self-efficacy. At the same time, it extends prevailing models by

demonstrating that proxy efficacy, confidence in being able to draw on others' help, forms an additional, independent route to readiness that does not presuppose autonomous mastery of digital systems. This finding brings Bandura's (2001) notion of proxy agency into the field of digital health and social services and connects it with qualitative research on "warm experts" and shared use, which has emphasised that everyday digital participation is often supported by family members and peers rather than achieved alone (Courtois & Verdegem, 2016; Hänninen et al., 2021). Quantitatively capturing proxy efficacy among mental health service users shows that relational forms of agency are not just descriptive themes but measurable components of digital readiness alongside personal efficacy.

Outcome-oriented frameworks have increasingly shifted attention to the benefits and harms people derive from digital services, but often still assume that higher skills, more positive attitudes, and greater trust will point in the same direction and jointly support digital engagement (Helsper, 2021; van Dijk, 2020). Substudy II complicates this assumption by identifying profiles in which skills, perceived competence, trust, and intention do not align straightforwardly. In particular, the "digitally proficient but lack of trust" profile among prisoners and mental health service users combined relatively high basic and advanced skills and high internet self-efficacy with low trust in digital health and social services, alongside a strong intention to use them. This configuration lends empirical weight to concerns raised in the conceptual literature on "compelled" or instrumental engagement. Willingness to use digital channels can reflect adaptation to institutional expectations when alternatives are limited, rather than endorsement of digitalisation or confidence in the system (Helsper, 2021; Selwyn, 2006). In the context of this dissertation, such profiles highlight that digital "readiness" among socially marginalised groups may signify coping with digitalised welfare obligations rather than enthusiastic adoption.

Third-level divide and capability-oriented perspectives have argued that digital inequalities are ultimately reflected in differences in outcomes, and that these outcomes depend not only on access and skills but also on institutional arrangements and the conditions under which people are able to convert digital resources into valued functionings (Fisk et al., 2023; Helsper, 2021). Substudy III contributes to this line of work by examining how individual-level vulnerability indicators, such as low emotional wellbeing, substance dependence, low cognitive capacity, learning difficulties, and criminal background, are associated with difficulties in using both the internet and healthcare services among adults in weak labour market positions. Earlier research has linked emotional distress, substance use and cognitive strain to barriers in digital and healthcare use but has often considered these vulnerabilities separately (Greer et al., 2019; Kaihlanen et al., 2022). The present findings show that emotional and behavioural vulnerabilities were partly associated with healthcare service use difficulties through internet use

difficulty, whereas cognitive and learning-related challenges remain strongly associated with healthcare service use difficulties even after adjustment for internet use difficulty. This pattern supports capability-based arguments that some barriers arise from a direct mismatch between system-level cognitive demands and users' resources rather than internet-use difficulties alone (Fisk et al., 2023).

6.2 Digital inclusion as a layered and processual phenomenon

The concept of digital inclusion has often been operationalised as a question of access to devices, connectivity, or specific applications. The present findings support a more layered and processual view, in line with resource and appropriation-based frameworks that conceptualise digital inequalities as a sequence from the possession of resources and access to the appropriation of technology and the attainment of outcomes, with each stage shaped by social position and available support (Helsper, 2021; van Deursen & Helsper, 2018). From this perspective, digital inclusion in health and social services is better understood as a trajectory through successive stages than as a static condition.

Across the empirical data, digital inclusion appears as a process that extends well beyond initial access and basic skills. Substudy I indicated that readiness to use digital services was associated not only with internet self-efficacy but also with proxy efficacy, highlighting the relationally embedded character of perceived digital ability. Substudy II showed that a high intention to use digital services could coexist with low trust, suggesting that willingness may reflect constrained choice or perceived necessity rather than positive endorsement of digital channels. Substudy III showed that individual-level vulnerabilities were associated with difficulties in internet use and healthcare service use. Cognitive and learning-related vulnerabilities remained associated with healthcare service use difficulties after internet use difficulty was accounted for. These findings together show that the conditions associated with readiness, internet use, and healthcare service use are related but not interchangeable.

This processual understanding clarifies why digitalisation can simultaneously expand and constrain access. On the one hand, digital platforms may reduce certain barriers, such as geographic distance or opening hours, and create new opportunities for convenience and flexibility. On the other hand, they may introduce or exacerbate other barriers, such as cognitive load, authentication demands, language complexity and the need to coordinate activities across multiple channels and time points (Buchert et al., 2022; Herd & Moynihan, 2018; Hoffman, 2022). Such demands are likely to be particularly consequential when users' cognitive, emotional, or social resources do not align with expectations of autonomy, sustained attention, and procedural competence.

The distinction between digital interaction and service access is central to this interpretation. Digital interaction in this dissertation refers to engaging with digital systems, for example, by navigating internet-based tasks or digital procedures, whereas access refers to whether people are ultimately able to obtain the care or support they need. This distinction is relevant as Substudy III showed that difficulties in internet use were associated with difficulties in healthcare service use but did not fully explain them. Internet use difficulty should therefore be interpreted as one potential constraint on healthcare service use, rather than as a direct measure of service access or of digital inclusion itself.

The layered and processual view developed here also helps reconcile findings that might otherwise appear contradictory in the digital inclusion literature. Surveys reporting high levels of access and frequent use can be understood as capturing earlier layers of the process, whereas research documenting persistent inequalities in outcomes highlights later layers where vulnerabilities, administrative burdens, and relational resources become especially consequential (Coetzer et al., 2024; Helsper, 2021; Herd & Moynihan, 2018). Viewed as different entry points into the same underlying process, these strands jointly illuminate how digitalisation can both broaden and narrow access, depending on where attention is focused and which constellations of vulnerability and support are under examination.

This interpretation also refines the initial DIHSS model (Figure 1). The model retains the same core elements but more clearly specifies three pathways. First, the findings show that intention to use digital services should not be treated as a straightforward sign of trust, preference, or expected benefit. The high-intention, low-trust profile identified in Substudy II indicates that intention may also be formed under constraint, when digital channels are perceived as necessary rather than genuinely optional.

Second, the refined model distinguishes supported and proxy-based engagement from autonomous digital use. Substudy I showed that proxy efficacy was independently associated with readiness to use digital services, while the broader findings and the theoretical framework indicate that such support can both enable access and create dependence when it is unevenly available or informally assumed by service systems. Third, Substudy III indicates that some vulnerabilities, particularly cognitive and learning-related difficulties, may be associated with healthcare service use difficulties beyond their associations with internet use difficulties. This suggests a more direct pathway from certain vulnerabilities to healthcare service use difficulties when service procedures exceed users' cognitive or procedural resources.

The refined model therefore presents digital inclusion as a conditional gateway in which vulnerabilities, perceived abilities, trust, and relational resources shape how people approach and use digital channels, while system-level demands

condition whether these forms of engagement can contribute to access to care and support. System-level demands, including interface complexity, authentication requirements, language, and the availability of non-digital alternatives, condition each stage of this process. Figure 2 summarises these empirically refined pathways.

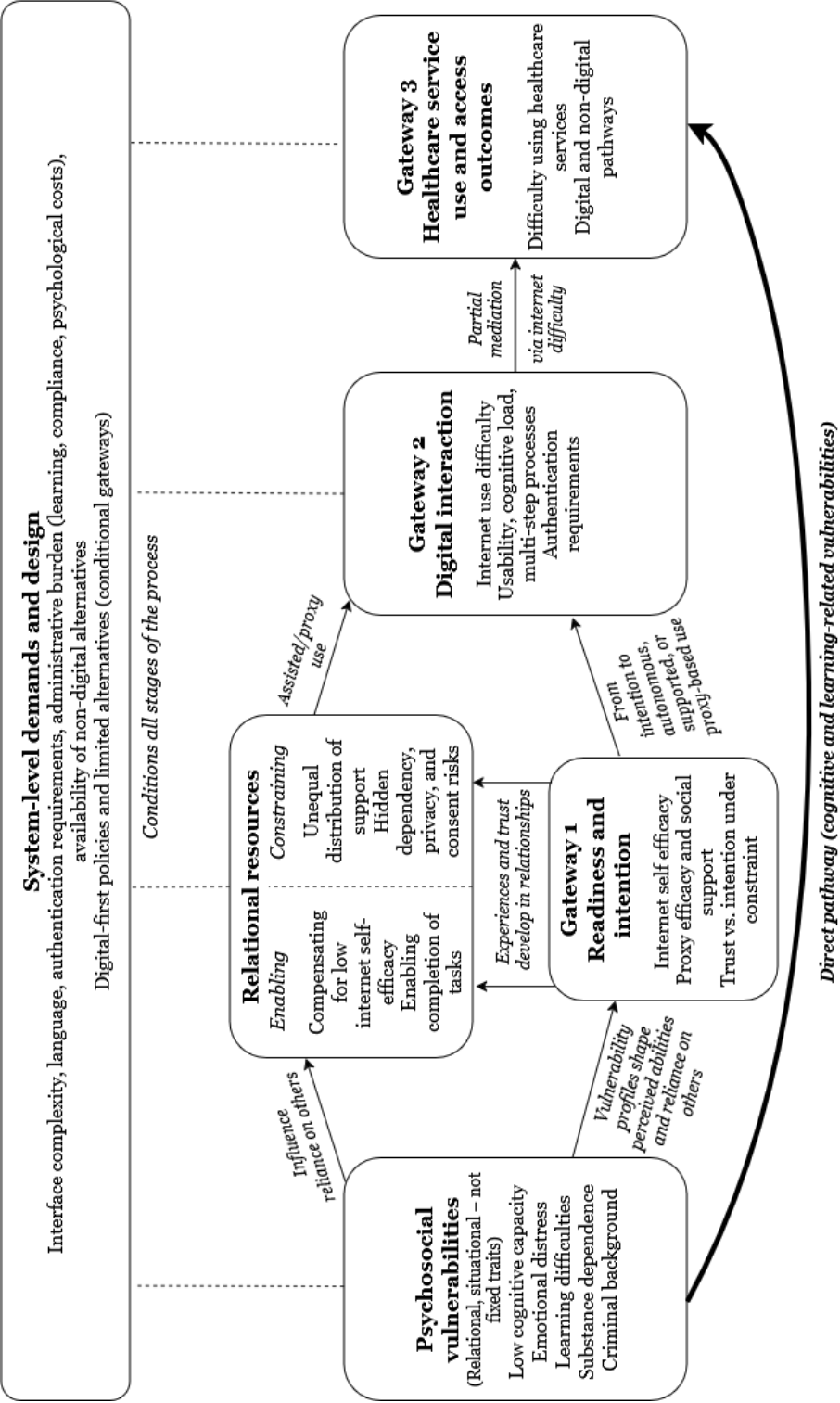


Figure 2 Empirically refined layered process model of digital inclusion in health and social services .

6.3 Vulnerability in digitalised service contexts

Chapter 2 defined vulnerability as a reduced capacity to anticipate, cope with, or recover from adversity, arising from the interplay of individual limitations and structural conditions rather than as a fixed individual trait. Previous research on the digitalisation of Finnish health and social services has shown that emotional strain, low cognitive capacity, and socioeconomic disadvantage, including low income, unemployment, and migration-related barriers, often intersect with complex life situations. This makes it harder to use digital channels, especially when services are designed around assumptions of independence, fluent literacy, and stable functioning (Buchert et al., 2022; Kaihlanen et al., 2022; Rantanen et al., 2021; Vehko, 2022). From a capability perspective, these disadvantages constrain the real opportunities people have to use digital services in ways that support their health and wellbeing, highlighting systemic design failures rather than mere individual deficits (Fisk et al., 2023; Nussbaum, 2011; Sen, 1999). Substudy III extends this line of work by examining, in a large sample of adults in weak labour market positions, how selected individual-level vulnerability indicators were associated with both internet and healthcare services. In doing so, it connects discussions of digital exclusion, health inequalities, and administrative burden that have often been considered separately.

Earlier studies have typically focused on single vulnerabilities at a time, such as mental distress or limited literacy, and have often treated digital and non-digital healthcare use as separate outcomes (Gillie et al., 2022; Phuong et al., 2023; Rantanen et al., 2021). Substudy III instead examined several vulnerability indicators within the same analytical framework. The indicators were independently associated with either internet use difficulty, healthcare service use difficulty, or both, after adjustment for sociodemographic factors. This finding supports the theoretical approach adopted in this dissertation, which understands vulnerability as a constellation of emotional, cognitive, and behavioural challenges that interact with service demands, rather than as a single isolated deficit to be remedied. In the refined process model, these individual-level vulnerability indicators represent conditions that may shape how people encounter digitalised service systems and experience difficulties in internet and healthcare service use.

The mediation analyses refine this picture by showing that the associations between vulnerabilities and healthcare service use difficulties may involve partly different pathways. For low emotional wellbeing and substance dependence, difficulties in using the internet were consistent with a partial mediating role in the association with difficulties in using healthcare services. This suggests that, for these groups, digitalisation can introduce an additional layer of friction on top of already demanding service interactions, echoing concerns raised in earlier Finnish studies that digital reforms may exacerbate inequalities if emotional and

behavioural vulnerabilities are not taken into account in design (Buchert et al., 2022; Kaihlanen et al., 2022). By contrast, low cognitive capacity and learning difficulties remain strongly associated with healthcare service use difficulties even after internet use difficulty was included in the models, indicating that many barriers arise at stages where users must understand complex information, remember instructions, or navigate multi-step procedures across digital and non-digital channels. In capability-oriented terms, this pattern underscores that some mismatches between service systems and users' resources are fundamentally cognitive and procedural, not merely "digital".

A distinctive contribution of Substudy III to vulnerability research concerns learning difficulties, particularly diagnostic uncertainty. The substudy differentiates between respondents with diagnosed learning difficulties, those without such difficulties, and those who reported not knowing whether they have learning or concentration problems. The empirical analyses show that both diagnosed learning difficulties and uncertainty are associated with higher risks of difficulties with internet and healthcare use, with the most pronounced difficulties among respondents uncertain about their learning problem status. Earlier work on digital exclusion and health inequalities has highlighted diagnostic gaps and unrecognised needs but has rarely distinguished analytically between diagnosed and uncertain learning difficulties in large-scale quantitative data (e.g., Fisk et al. 2023; Kaihlanen et al. 2022). In the theoretical framework, vulnerability was partly conceptualised as something produced within service systems, depending on whose needs are recognised and whose are left implicit (Buchert et al., 2022; Helsper, 2021). Substudy III provides empirical visibility into this issue by showing that uncertainty about learning difficulties may mark a position in which people report substantial difficulties but lack a clearly recognised explanatory category.

This observation moves the discussion beyond the question of who has a formal learning difficulty towards asking whose needs remain invisible to systems that implicitly assume that relevant limitations are already identified and documented. It suggests that self-reported diagnostic uncertainty, "I do not know whether I have learning difficulties", could serve as a practical marker of hidden vulnerability in digitalised service contexts. From a research perspective, this opens up a methodological avenue for future studies to treat uncertainty as a meaningful category rather than as missing information. From a service perspective, it points towards the potential value of simple screening questions that could help identify users whose support needs are currently unaddressed and who may be at heightened risk of difficulty in both digital and non-digital service encounters.

The findings also illustrate the potential accumulation of vulnerability-related constraints. Co-occurring cognitive, emotional, learning-related, and substance-related difficulties may intensify the challenges people face when using internet-based and healthcare services. This finding resonates with the dissertation's

broader argument that digital inclusion in health and social services cannot be reduced to individual effort or motivation alone, given that users carry overlapping cognitive, emotional, and behavioural burdens. It also illustrates how vulnerabilities and system-level demands can become mutually reinforcing. Digital interfaces that require concentration, memory, and sustained trust may be especially taxing for those whose life situations already undermine these capacities, thereby intensifying existing inequalities rather than levelling them.

The results of Substudy III support the dissertation's broader claim that responsibility for digital inclusion should be understood at the level of service systems rather than at the level of individual users. Expecting standardised digital pathways to serve all users equally well is unrealistic when people's circumstances, resources, and support needs differ substantially and when some forms of vulnerability are not formally recognised within service categories. Instead, the findings point to the need for cognitively lighter, more flexible service arrangements, explicit consideration of overlapping vulnerabilities, and systematic attention to diagnostic uncertainty as a marker of hidden need. In this way, the dissertation contributes to theoretical and empirical debates by showing how vulnerability operates within digitalised service contexts and by clarifying why vulnerability-sensitive design is a precondition, rather than a supplementary consideration, for equitable digitalisation in health and social care.

6.4 Perceived digital abilities and intention under constraint

Debates on digital inclusion and digital health have increasingly highlighted perceived digital abilities, telehealth literacy, and related forms of confidence as important determinants of engagement and benefit (Foley et al., 2021; Gillie et al., 2022; Le et al., 2023). Substudy I showed that internet self-efficacy and proxy efficacy were independently associated with intention to use digital health and social services among mental health service users, while general self-efficacy was associated with intention primarily through internet self-efficacy. This pattern is consistent with social cognitive theory's emphasis on domain-specific efficacy beliefs as key determinants of behaviour but extends that perspective by examining the role of proxy efficacy as confidence in being able to rely on others for digital tasks alongside one's own internet self-efficacy (Bandura, 1997; Hänninen et al., 2021). Perceived digital abilities thus appear as both individual and relational: intention reflects not only "can I do this myself?" but also "can we manage this together?", a nuance often underspecified in digital literacy and telehealth frameworks. The finding also suggests that generic self-efficacy alone may be insufficient as an indicator of digital readiness in health and social service contexts, because it does not capture confidence in handling internet-related tasks.

Proxy efficacy refers specifically to confidence in obtaining help from professionals, family members, friends, or volunteers when using digital services. This builds directly on Bandura's concept of proxy agency, according to which individuals may act through others when they lack direct control over conditions (Bandura, 2001), and on qualitative research about "warm experts", which describes how relatives and peers provide practical and emotional support for digital tasks (Courtois & Verdegem, 2016; Hänninen et al., 2021). By operationalising proxy efficacy and showing that it was independently associated with intention alongside general and internet self-efficacy, Substudy I extends this literature from conceptual and qualitative discussion to quantitative modelling in the specific context of digital social and health care services. It thereby indicates that proxy-based support is not simply a contextual condition but may form a measurable component of digital agency and readiness.

The profile analysis among prisoners and mental health service users further complicates individualistic views of perceived ability and intention. One profile, labelled "digitally proficient but lack of trust", combines relatively high basic and advanced internet skills and high internet self-efficacy with low trust in digital health and social welfare service providers, while still showing a strong intention to use digital services. Technology acceptance models and digital divide frameworks typically emphasise that trust and perceived usefulness are important determinants of behavioural intention (Helsper, 2021; Tao et al., 2020). The high-intention, low-trust profile identified in Substudy II shows that these elements need not align. In the institutional settings considered here, this pattern can be understood as constrained agency when people indicate that they will use digital channels because they perceive them as necessary routes to benefits and services, rather than because they fully endorse or trust them (Helsper, 2021; Rantanen et al., 2021). The dissertation thus adds nuance to earlier research by suggesting that, in digitalised welfare contexts, behavioural intention may reflect adaptation to structural constraints as much as it reflects positive attitudes or voluntary acceptance.

Taken together, the two substudies suggest a layered account of agency under constraint. Internet self-efficacy and proxy efficacy were associated with intention among mental health service users, whereas the high-intention, low-trust profile illustrates that willingness to use digital services may coexist with scepticism towards the systems involved. These findings suggest that readiness to use digital services can take different forms, including confidence in one's own abilities, confidence in obtaining help from others, and willingness shaped by constrained choice.

6.5 Relational resources and proxy forms of engagement

Relational resources emerged directly in Substudy I as integral to digital readiness rather than as exceptional workarounds. Read alongside the broader literature and the findings of Substudies II and III, this suggests that support should be understood as a potentially important condition of digital inclusion rather than as a peripheral response to individual deficits. Family members, friends, and peers frequently enable participation under constrained conditions, but this reliance on informal support is unevenly distributed and not universally available (Courtois & Verdegem, 2016; Digital and Population Data Services Agency, 2023). The findings therefore support understanding digital readiness as partly relational. People's capacity to use digital services may depend not only on their own perceived abilities but also on their confidence in being able to obtain assistance when needed.

This reliance is nevertheless ambivalent. Informal support can help people complete applications, book appointments, and communicate with providers, thereby expanding the practical possibilities of digital participation. However, it may also conceal shortcomings in service design and deepen inequalities when support is inaccessible, unreliable, or of uneven quality (Courtois & Verdegem, 2016; Helsper & van Deursen, 2017). When service configurations implicitly assume the presence of helpers, people with limited social networks may be placed at a further disadvantage. This finding extends earlier research on social support and "warm experts", which has largely described informal assistance as part of everyday digital practices, by showing that confidence in mobilising such assistance was independently associated with intention to use digital health and social care services among mental health service users (Courtois & Verdegem, 2016; Hänninen et al., 2021).

Substudy II provides a complementary, although indirect, perspective on engagement under constraint. The latent profiles were defined by skills, perceived competence, trust, and intention rather than by direct measures of support. The high-intention, low-trust profile therefore cannot be interpreted as evidence of proxy support. Rather, it indicates that willingness to use digital services may coexist with reservations or perceived necessity, reinforcing the need to distinguish intention from autonomous, positive engagement. This interpretation is consistent with research that characterises digital engagement as potentially shaped by constrained choice rather than voluntary adoption (Selwyn, 2006; Helsper, 2021).

These dynamics resonate with capability-oriented perspectives that conceptualise vulnerability as arising from misalignments between institutional demands and people's resources, rather than from individual deficits alone (Fisk et al., 2023). For some, proxy and supported use function as enabling arrangements that help convert digital access into real opportunities to obtain care and support. For others, limited access to informal or formal assistance may constrain these opportunities, particularly when digital service pathways are complex or when non-

digital alternatives are difficult to access. This dual role of relational resources underscores the need to view proxy-based engagement not only as a compensatory mechanism but also as a potential axis of inequality in its own right (Buchert et al., 2022; Coetzer et al., 2024; Courtois & Verdegem, 2016; Shaw et al., 2024).

At the same time, formal support structures remain crucial for mitigating these inequalities. Professionals in health, social and employment services, including social workers and other frontline staff, often act as intermediaries in digital processes, helping clients navigate portals, interpret information and complete applications. However, the availability and quality of such support are shaped by organisational mandates, workloads and resource constraints, which can limit the extent to which formal systems compensate for unequal informal support (Hartman-van der Laan et al., 2025). Service systems should therefore not tacitly presume that either families, peers, or frontline workers can absorb the work of digital mediation without explicit recognition and resourcing.

These observations support the dissertation's broader argument that digital agency in health and social services is distributed and conditional. People's ability to engage with digital systems is co-produced through their own resources, relationships with others and institutional arrangements. It cannot be fully understood through individual-level indicators alone. The implications for service design, support arrangements, and safeguards are considered in Section 6.6.

6.6 Implications for digital health and social services

The findings point towards repositioning digital inclusion in health and social services as a service- and system-level responsibility rather than an individual attribute. Across the substudies, difficulties in digital engagement arise most clearly when users' cognitive, emotional, or learning-related resources collide with the linguistic, procedural, and authentication demands embedded in digital platforms, rather than simply when skills or motivation are lacking. This supports equity-oriented accounts of administrative burden, which argue that complex systems can themselves generate vulnerability when they require users to bear high learning, compliance, and psychological costs (Fisk et al., 2023; Herd & Moynihan, 2018). The findings further indicate that intention, perceived ability, trust, and service-use difficulties should not be treated as interchangeable indicators of digital inclusion. Substudy II showed that high intention could coexist with low trust, while Substudy III showed that learning-related uncertainty and other individual-level vulnerability indicators were associated with persistent healthcare service use difficulties. Evaluations of digital services would therefore benefit from including indicators of experienced difficulty, reliance on support, and concrete access outcomes alongside measures of channel use, so that proxy-mediated transactions and assisted log-ins are not misinterpreted as straightforward evidence of

individual digital inclusion (Courtois & Verdegem, 2016; Hänninen et al., 2021; Shaw et al., 2024). Such metrics would align evaluation practices with system-sensitive approaches to digital health that attend to both psychosocial and structural determinants of access (Kan et al., 2024; Shaw et al., 2024).

A further implication is that supported and shared forms of digital engagement need to be recognised as legitimate modes of access rather than informal workarounds. Substudy I showed that mental health service users reported reliance on family members, friends, and other sources of assistance, and that proxy efficacy was independently associated with intention to use digital services. Substudy II showed, separately, that high intention could coexist with low trust. When services silently rely on such proxy arrangements, inequalities can deepen between those who have access to support and those who do not, and users may need to trade off autonomy and confidentiality for access when sensitive information or strong e-identification is involved (Buchert et al., 2022; Courtois & Verdegem, 2016; Hänninen et al., 2021). Making these support pathways visible and institutionally recognised for example by enabling trusted representatives or “digital buddies” to assist within secure, privacy-respecting frameworks can therefore be seen as an equity intervention rather than an exception, provided that proxy arrangements are accompanied by clear consent practices, appropriate authorisation, and safeguards against unwanted dependency (Fisk et al., 2023; Hartman-van der Laan et al., 2025). This does not replace the need for genuinely accessible non-digital alternatives and hybrid service models, particularly for people with persistent cognitive or learning-related difficulties, emotional strain, or limited social networks (Heaslip & Holley, 2023; Ojeikere et al., 2024).

A capability-oriented perspective shifts the focus from the mere availability of digital channels to what people can actually do with them in practice. Designing digital health and social services means not only offering online channels but also ensuring that interaction demands, language, authentication procedures, and available support enable users with different constellations of vulnerabilities to convert digital access into real opportunities to obtain care (Coetzer et al., 2024; Fisk et al., 2023). Substudy III adds to this discussion by showing that people with low cognitive capacity, emotional strain, substance dependence, criminal background or uncertain learning difficulties reported elevated risks of difficulties in both internet and healthcare service use, even when services are formally available. Comparable patterns emerge in population-based data from the FinHealth study, where impaired cognitive functioning, activity limitations and loneliness predicted poorer access to care, and these associations were partly mediated by low digital competence (Heponiemi et al., 2024). Interventions focused solely on improving individual skills or confidence are therefore unlikely to be sufficient if service complexity and procedural demands remain high and pathways continue to assume autonomous, digitally competent users, as critical

analyses of mental health service digitalisation also suggest (Bond et al., 2023; Herd & Moynihan, 2018; Hoffman, 2022).

For healthcare organisations, this means that digital strategies should be embedded within broader quality, safety, and equity agendas rather than treated as standalone technical projects. Nursing and midwifery scholarship has highlighted digital transformation as a new determinant of health that requires the active involvement of practitioners and policymakers in identifying who is excluded or overloaded by digital pathways and under what circumstances (Heaslip & Holley, 2023). Situating digital inclusion within clinical governance and leadership structures can help ensure that decisions about authentication, communication channels, and the design of patient interfaces are routinely assessed for their impact on those with limited cognitive resources, fluctuating mental health, or constrained support networks.

An administrative-burden and capability-oriented lens also frames digitalisation as a reconfiguration of where learning, compliance, and psychological costs are located within the welfare system (Fisk et al., 2023; Herd & Moynihan, 2018; Hoffman, 2022). Treating digital inclusion as a service-level responsibility implies not only supporting individual users but also systematically redesigning procedures, language, and authentication requirements so that people with constrained cognitive, emotional, or social resources are not asked to carry disproportionate burdens when accessing essential care and income security. In practical terms, this points towards service models that combine simplified digital journeys with visible, resourced support options, such as integrated digital helpdesks in health and social care settings, proactive screening for digital barriers during intake and the routine recognition of proxy and supported use in service protocols rather than treating such arrangements as informal exceptions.

Concerns about access and equity remain central to policy in the Finnish context. National surveys indicate that while many people use digital health and social services, perceived benefits and fairness are unevenly distributed (Heponiemi et al., 2020; Kainiemi et al., 2023; Vehko, 2022) and monitoring of digital skills similarly shows that a substantial minority of adults frequently need help with digital devices and services, despite high overall competence levels (Digital and Population Data Services Agency, 2023). The present findings invite reflection on digital-by-default strategies. Although digitalisation is often promoted as a route to efficiency and accessibility, it may also shift burdens onto individuals least equipped to manage them. This underscores the importance of maintaining alternative access channels, monitoring distributional effects, and explicitly resourcing support in systems serving populations with overlapping vulnerabilities, such as those examined in this dissertation.

6.7 Limitations and directions for future research

Several methodological limitations frame the interpretation of the findings. All three substudies are based on cross-sectional data, which constrains conclusions about temporal ordering and limits causal inference, even though such designs can still provide useful evidence on plausible associations when interpreted with caution (Savitz & Wellenius, 2023). Mediation analyses likewise offer insight into indirect associations and theoretically relevant pathways, but they do not establish causality in the absence of stronger temporal or experimental designs. Future research would therefore benefit from longitudinal, register-linked, and intervention-based approaches that examine how digital inclusion processes develop over time and how earlier experiences of success, failure, or support shape later perceptions of ability, trust, and willingness to engage.

Questions of measurement also require attention. In Substudy III, difficulty using healthcare services was measured with a single Abilitator item capturing perceived problems with healthcare service use, regardless of whether the encounter was digital or non-digital. This limits the precision with which channel-specific mechanisms can be isolated and reflects the lived reality that digital and non-digital pathways are often intertwined in practice. More broadly, the dissertation relies heavily on self-reported measures of vulnerabilities, perceived digital abilities, trust, and experienced difficulty. Such reports may be affected by recall bias, social desirability bias, and differences in interpretation, especially regarding sensitive issues such as substance dependence, criminal background, or uncertainty about learning difficulties (Althubaiti, 2016). At the same time, because the dissertation is centrally concerned with perceived ability, trust, confidence, and experienced strain, subjective reports are not merely imperfect proxies but, in many cases, the phenomena of interest themselves. Future studies could strengthen both validity and reliability by combining self-report with behavioural and administrative indicators, such as log data, appointment records, proxy authorisations or recorded help-seeking.

A related limitation is the mismatch between the relational, context-dependent definition of vulnerability adopted in the conceptual framework and the need to measure vulnerability as individual-level indicators in the quantitative analyses. Section 6.3 discusses this tension in detail and notes that the indicators are used for analytical purposes rather than to categorise people as inherently “vulnerable”. From a methodological perspective, future research could address this gap by including measures that more directly capture relational and institutional dimensions of vulnerability, for example, service-level information on procedural demands, the availability of support and non-digital alternatives, or qualitative accounts of how people with different resources navigate digitalised processes in everyday life.

The analytical strategies used in the dissertation bring further limitations. The directed acyclic graph and mediation models in Substudy III, the regression and mediation models in Substudy I, and the profile-based analyses in Substudy II rest on assumptions about variable ordering and the absence of substantial unmeasured confounding that cannot be fully verified with cross-sectional data (Hernan & Robins, 2020). Causal claims would be strengthened by repeated measurements of vulnerabilities, perceived abilities, trust, and relational support, and by quasi-experimental or experimental studies that alter specific service features, such as authentication requirements, interface complexity, or the availability of proxy support. These designs would enable more precise identification of which institutional features intensify exclusion and which modifications improve access for users with different constellations of vulnerability.

The composition of the samples also limits generalisability. The dissertation focuses on mental health service users, prisoners and adults in weak labour market positions, that is, groups for whom digitalisation may have particularly consequential effects. This focus is a strength in relation to equity, but it means the findings cannot be directly generalised to the wider population or to service settings where digital contact is less optional. In prison settings, in particular, digital service use may occur under highly constrained conditions because alternative routes are restricted, making engagement qualitatively different from contexts where people can more freely choose among service channels. Similar “under constraint” dynamics may nevertheless arise outside prisons when face-to-face services are geographically distant, administratively burdensome, or practically inaccessible, for example in remote areas or in systems that operate on strongly digital-by-default principles. Comparative research across welfare-state contexts would therefore be valuable, particularly because countries differ in how digital self-service redistributes administrative burdens to citizens, as illustrated by research from Denmark (Madsen et al., 2022).

The samples also shape who becomes visible in the data. All three substudies draw on people who were already in contact with health, social or employment services and who were willing and able to participate in the survey studies or complete self-assessments. The findings, therefore, describe vulnerabilities under conditions in which at least some institutional connection was in place and do not capture individuals who did not reach services at all or disengaged before contact was established. Self-reported accounts of vulnerabilities, perceived digital abilities, and service-use experiences may also be shaped by recall, interpretation, shame, uncertainty, or concern about the consequences of disclosing difficulties. Underreporting and nonresponse, therefore, affect not only reliability and validity but may also reflect strain and constrained agency among people whose everyday lives are already heavily burdened.

An important invisible group consists of people who remain both digitally and institutionally “off the radar”, for whom digitalisation may function primarily as a barrier to support rather than as a pathway to it. The patterns identified here thus apply to service users in vulnerable positions and cannot be straightforwardly extended to those who remain outside institutional reach. Future research should develop outreach-oriented, mixed-methods approaches capable of identifying forms of exclusion that remain invisible in service- and survey-based datasets.

Interpretation of the vulnerability indicators used in this dissertation raises additional ethical questions. Measures such as reduced cognitive capacity, emotional distress, learning difficulties, substance dependence, and criminal background were constructed for analytical purposes rather than to label individuals. Within the conceptual framework of this thesis, they are treated as relational and situational conditions that become consequential in digitalised service environments characterised by high procedural and cognitive demands. Even so, there is a risk that such categories may reinforce deficit-oriented images of “problematic” users if they are read without attention to institutional context and system-level expectations. The analyses, therefore, consistently seek to shift attention away from individual deficits and towards mismatches between people’s resources and the design of service pathways.

A similar tension applies to indicators of digital ability and engagement. Internet self-efficacy, perceived skills, and intention to use digital services can produce optimistic-looking profiles even when rooted in a sense of compulsion or a lack of alternatives, as illustrated by the high-intention, low-trust profile in Substudy II. It would be misleading and ethically problematic to interpret high intention, self-reported digital competence, or reported use of digital channels as straightforward evidence of empowerment if these coexist with low trust, exhaustion, or dependence on others’ help. In this dissertation, such discrepancies are treated as substantively important findings rather than anomalies, and they inform a critique of evaluation models that rely solely on system-centred indicators of uptake and use.

Finally, the research design itself helps define which vulnerabilities, forms of digital engagement, and access outcomes count as relevant. The categories and outcome measures applied here primarily reflect institutional and academic perspectives rather than co-produced definitions. Critical scholarship partly mitigates this limitation by conceptualising digitalisation as a process that can reproduce inequalities and by foregrounding service users’ accounts of strain, distrust, and dependency. However, quantitative indicators and statistical models cannot fully capture the experiential and moral dimensions of what digitalisation means for people in vulnerable positions. Future research could therefore benefit not only from longitudinal and mixed-methods designs but also from participatory and co-produced approaches in which people with lived experience help define what counts as difficulty, support, and meaningful access.

Building on these limitations, future research could advance the field in several directions. Longitudinal and register-linked studies could examine the cumulative effects of digital encounters over time, including how repeated success, failure, or reliance on help reshapes trust, self-efficacy, and service use. Mixed-methods and multi-source studies could clarify how proxy use, hidden disengagement, and experienced barriers are reflected in administrative records and everyday service practices. Intervention and implementation studies would be particularly important for testing whether concrete changes, such as simplified authentication, embedded digital support roles, secure proxy arrangements, or redesigned service journeys, improve access for people with different vulnerability profiles. Taken together, these directions would help move the field beyond documenting inequality towards identifying institutional arrangements that reduce cognitive, administrative, and relational burdens in access to health and social services.

7 Conclusions

This dissertation examined digital inclusion in health and social services as a relational, vulnerability-sensitive process. Drawing on three empirical studies among users of health, social and employment services in Finland, it explored how individual vulnerabilities, perceived digital abilities, and relational resources interact with system-level demands to shape readiness to use digital services, difficulties in internet use, and healthcare service use difficulties.

The findings show that digital inclusion cannot be reduced to access to technology, technical skills, or willingness to use digital services. Instead, it is shaped by the relationship between psychosocial vulnerabilities, perceived abilities, relational resources, and the cognitive, linguistic, and procedural demands of digitalised service systems. Digital interaction and healthcare service use difficulties emerged as related but analytically distinct dimensions. Substudy III showed that internet use difficulty was associated with healthcare service use difficulty and was consistent with a partial mediating role in the associations between some vulnerability indicators and healthcare service use difficulties. Cognitive and learning-related vulnerabilities nevertheless remained strongly associated with healthcare service use difficulties after internet use difficulty was considered.

Intention to use digital services was likewise an insufficient indicator of digital inclusion. High intention and perceived competence could coexist with low trust, as shown by the high-intention, low-trust profile in Substudy II. This finding suggests that willingness to use digital channels may reflect perceived necessity or constrained choice rather than positive evaluation or voluntary adoption. It therefore supports distinguishing intention, digital engagement, and service-use outcomes when evaluating digital inclusion in welfare contexts.

Perceived digital abilities, particularly internet self-efficacy, were associated with readiness to use digital health and social services. Substudy I further showed that proxy efficacy, or confidence in being able to obtain help from others, was independently associated with intention to use digital services. A digital agency, therefore, cannot be understood solely as an individual capacity. It may involve both confidence in one's own abilities and the capacity to mobilise relational support. At the same time, neither perceived ability nor proxy-supported engagement removes barriers created by demanding service procedures or unequal access to assistance.

The findings support viewing digital inclusion as an ongoing, conditional process rather than a fixed state. The three substudies indicate that different forms of mismatch may constrain this process: low confidence in one's own abilities, low trust despite high intention, limited access to support, and cognitive or learning-related difficulties in navigating complex service pathways. Rather than treating these conditions as competing explanations, the refined DIHSS model presents them as interconnected elements that shape whether digital channels can contribute to meaningful access to care and support.

A central contribution of this dissertation is the development of an empirically informed refinement of the DIHSS model. The refined model does not claim to establish a single causal pathway. Instead, it offers a structured way to examine how vulnerabilities, perceived digital abilities, trust, and relational resources relate to engagement with digital channels and service-use outcomes under different system-level conditions. It may therefore be applied, specified, and tested further in other welfare contexts and changing service environments.

From an equity- and capability-oriented perspective, the central question is not only who can log in or express willingness to use digital services, but who can turn digital access into real opportunities to obtain care and support under fair conditions. This requires sustained system-level attention to how interactional demands and administrative burdens are distributed across populations. It also requires evaluation frameworks that go beyond uptake, log-ins, and self-reported readiness to include experienced difficulty, reliance on support, and the extent to which people obtain the services they need.

Building on these conclusions, future research should use longitudinal, register-linked, and intervention-based approaches to examine how digital encounters accumulate over time and how success, failure, and reliance on help reshape trust, self-efficacy, and service use. Mixed-methods and multi-source designs could clarify how perceived difficulties, proxy use, and disengagement that remains “off the radar” appear in service records and everyday practice. Participatory and co-produced research, in which people with lived experience help define what counts as difficulty, support, and meaningful access, would further strengthen knowledge about equitable digitalisation.

For transparency, Grammarly was used for language editing, including suggestions on grammar, spelling, punctuation, and style in the English-language text. All suggestions were critically reviewed and edited by the author.

Elicit was used as a supplementary tool to support purposive literature search during the development of the conceptual framework. It helped the author identify potentially relevant scholarly literature. Elicit was not used to automate the selection, appraisal, or interpretation of literature. The conceptual framework, the

selection and interpretation of literature, and all analytical decisions were made by the author. All references and substantive claims in this dissertation were checked against the original publications cited.

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