



TALLINN UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING

Department of Mechanical and Industrial Engineering

**FROM FAMILY DISTANCE TO EMOTIONAL PRESENCE: A  
HYBRID DESIGN SOLUTION FOR GEOGRAPHICALLY  
SEPARATED FAMILIES**

**PERELIIKMETE VAHELISEST VAHEMAAST  
EMOTSIONAALSE LÄHEDUSE JA KOHALOLUNI:  
HÜBRIIDNE DISAINILAHENDUS GEOGRAAFILISELT  
ERALDATUD PEREDELE**

MASTER THESIS

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Tallinn 2026

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(in Estonian) „Pereliikmete vahelisest vahemaast emotsionaalse läheduse ja kohaloluni: hübriidne disainilahendus geograafiliselt eraldatud perelele"

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2. Explore inclusive opportunities to support emotional connection at a distance.
4. Design an inclusive solution that offers elderly users individualized support.

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## ABSTRACT

Population ageing, migration and regional depopulation are reshaping family life in Estonia, leaving many independently living elderly physically and emotionally distant from their closest relatives. While formal contact through phone calls and occasional visits often continues, qualitative interviews in this study reveal that older adults frequently experience social invisibility — feeling like background figures in their families' narratives — while distant family members grapple with guilt, time pressure and digital overload. A pronounced media mismatch emerges: elderly participants value tangible artefacts such as printed photos and letters, whereas younger relatives rely on fast, visual digital channels that many older users find confusing or exhausting. Existing communication tools tend to privilege either families' digital-first apps or elderly recipients' print-only services, rarely reconciling immediacy with tangibility or supporting elderly people as active narrators of family life.

To address this gap, the thesis combines theoretical and policy analysis, market and competitive mapping, and qualitative fieldwork with concept-oriented design development. The empirical material includes semi-structured interviews with independently living elderly people and geographically distant family members, contextual observations, and analysis of Estonian ageing and family policy documents. Through thematic analysis, the study identifies recurring tensions related to emotional disconnection, guilt-driven communication, digital exclusion and preferences for tangible media, and translates these into design requirements, principles and opportunity areas.

The result is FAMILY HEARTBEAT, a family communication concept that repurposes an existing tablet as a senior-friendly home display linked to a mobile and web app for family members. Everyday photos, short clips and voice notes shared by relatives are transformed into two outputs: calm, daily "heartbeats" on the elderly person's tablet and a weekly printed family newspaper delivered by post. The elderly interface emphasizes radical simplicity, large and legible visuals and one-tap voice replies, with an optional dementia-sensitive mode supporting reminiscence and emotional expression. On the family side, one-tap sharing, automated layout, gentle prompts and prominent display of elderly responses reduce friction and help redistribute narrative agency back to older adults.

The thesis contributes an integrated conceptual framework linking social invisibility, emotional presence, hybrid media and digital exclusion; empirical insight into how Estonian families negotiate distance, guilt and media preferences in later life; and an evidence-informed design proposal that demonstrates how communication services can turn mere connectivity into felt presence. While FAMILY HEARTBEAT remains a conceptual and scenario-based proposal, the work shows how human-centered design can create realistic pathways towards services that support ageing in place by making older adults not only reachable, but seen and emotionally present in their families' everyday lives.

## ABSTRAKT

Rahvastiku vananemine, ränne ja piirkondlik rahvastiku vähenemine muudavad peresuhteid Eestis, jättes paljud iseseisvalt elavad eakad oma lähisugulastest nii füüsiliselt kui emotsionaalselt kaugemale. Kuigi formaalne kontakt telefonikõnede ja aeg-ajalt toimuvate külastuste näol sageli säilib, näitavad magistritöös läbiviidud kvalitatiivsed intervjuud, et eakad kogevad sageli sotsiaalset nähtamatust. Tunnet, et nad on oma pere loos pigem taustategelased. Samal ajal kui geograafiliselt eraldatud pereliikmed maadlevad süütunde, ajasurve ja digiväsimusega. Esile kerkib selge meedialõhe: eakad väärtustavad käegakatsutavaid artefakte, nagu trükitud fotod ja kirjad, samas kui nooremad sugulased toetuvad kiiretele visuaalsetele digikanalitele, mida paljud vanemaealised tajuvad segaste või kurnavatena. Olemasolevad suhtluslahendused kipuvad eelistama kas pereliikmeid või eakaid ega suuda sageli ühildada vahetust ja materiaalsust ega toetada eakaid aktiivsete pereloo jutustajatena.

Selle lõhe uurimiseks ühendab magistritöö teoreetilise ja poliitikaanalüüsi, turu- ja konkurentsikaardistuse ning kvalitatiivse välitöö kontseptsioonisuunalise disainiarendusega. Empiiriline materjal hõlmab poolstruktureeritud intervjuusid iseseisvalt elavate eakate ja geograafiliselt eraldatud pereliikmetega, kontekstuaalseid vaatlusi ning Eesti vananemis- ja perepoliitikat käsitlevate dokumentide analüüsi. Teemaatilise analüüsi kaudu tuvastab töö korduvad pinged, mis puudutavad emotsionaalset eemaldumist, süütundest ajendatud suhtlust, digitaalset tõrjutust ja käegakatsutava meedia eelistamist, ning tõlgib need disaininõueteks, põhimõteteks ja võimalusaladeks.

Töö tulemuseks on FAMILY HEARTBEAT, peresuhtluse kontseptsioon, mis kasutab olemasolevat tahvelarvutit eakale sobiva koduse ekraanina ning seob selle pereliikmete mobiili- ja veebirakendusega. Pereliikmete jagatud igapäevased fotod, lühivideod ja helisõnumid teisendatakse kaheks väljundiks: rahulikeks igapäevasteks "heartbeats"-vaadeteks eaka tahvilil ning kord nädalas postiga saabuvaks trükitud pereleheks. Eakale suunatud liides rõhutab radikaalset lihtsust, suuri ja loetavaid visuaale ning ühe puudutusega häälvastuseid; lisaks on võimalik kasutada dementsussõbralikku režiimi, mis toetab meenutamist ja emotsionaalset eneseväljendust. Pere poolel aitavad lihtne jagamine, automaatne kureerimine, õrnad meeldetuletused ja eaka vastuste esiletõstmine vähendada suhtluse hõõrdumist ning anda eakale tagasi suurem nähtavus ühises pere loos.

Magistritöö panus on kolmetine. Esiteks pakub see kontseptuaalse raamistiku, mis seob sotsiaalse nähtamatuse, emotsionaalse kohalolu, hübriidmeedia ja digitaalse tõrjutuse hilisea peresuhtluse võtmeteemadeks. Teiseks annab töö empiirilist sissevaadet sellesse, kuidas Eesti pered kogevad distantssi, süütunnet ja meedialõhet hilisemas elueas. Kolmandaks esitab töö tõenduspõhise disainiettepaneku, mis näitab, kuidas suhtluslahendused võivad muuta pelga ühenduse tajutavaks kohaloluks. Kuigi FAMILY HEARTBEAT jääb kontseptuaalseks ja stsenaariumipõhiseks ettepanekuks, osutab töö sellele, kuidas inimkeskne disain võib luua realistlikke teid teenusteni, mis toetavad kodus vananemist, tehes eakad mitte ainult kättesaadavaks, vaid ka nähtavaks ja emotsionaalselt kohalolevaks oma perekonna igapäevaelus.

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## **PREFACE**

This thesis arises from the author's deep interest in social challenges related to ageing, family disconnection, and the emotional isolation experienced by older adults living independently from their geographically distant families. The topic evolved within the joint study programme Design and Future Technologies at Tallinn University of Technology and the Estonian Academy of Arts, with all research, analysis, and design development conducted independently during the academic year 2025–2026.

The choice of topic stems from a universal truth: ageing touches everyone, and as families increasingly live apart, children moving to cities or abroad for work and education, the emotional bonds that sustain us in later life become fragile. This gained personal urgency through the experience of the author's partner's grandmother, who lived independently in France while the author and partner resided in Denmark, and even her other relatives in France lived geographically distant from her. Her situation revealed not just physical separation but emotional invisibility. Being peripheral to family narratives despite deep emotional ties across international borders.

Rather than focusing solely on aesthetics or functionality, this thesis confronts a pressing social issue, family distance, that undermines emotional well-being, self-worth, and belonging in later life. It explores how human-centered design can bridge this gap through communication arrangements that combine digital sharing with calm, tangible and elderly-friendly forms of access, addressing "silent" problems like the erosion of relational presence across continents.

Situated within Estonia's rapidly ageing society, where emigration and urbanization create unprecedented family separation, the thesis shows how design-led inquiry can translate empirical insight into a situated and practically relevant proposal.

The author extends gratitude to thesis supervisors Martin Pärn and Kätlin Kangur, whose guidance shaped this work from broad social inquiry to focused design innovation. Deep thanks go to the elderly participants and family members who shared their stories of connection and disconnection, making this research meaningful. Appreciation is also due to friends, fellow students, and the Design and Future Technologies community for their encouragement throughout this journey.

## **LIST OF ABBREVIATIONS**

**EU – European Union**

**FRA – European Union Agency for Fundamental Rights**

**HCI – Human–Computer Interaction**

**JUSTDIGI –Estonian Senior Digital Skills Program**

**RQ – Research Question**

**SHARE – Survey of Health, Ageing and Retirement in Europe**

# **1 INTRODUCTION**

## **1.1 Ageing population and loneliness among elderly in Estonia.**

Estonia is experiencing rapid population ageing, a demographic shift with significant implications for social structures, care systems and family life. The proportion of people aged 65 and over is projected to rise substantially by 2040, driven by declining birth rates, increasing life expectancy and the outward migration of younger generations (Statistics Estonia, 2025). As a result, growing numbers of older adults live in contexts marked by geographic distance from family members, shrinking local support networks and uneven access to everyday social contact.

This demographic transformation is closely linked to concerns about loneliness and social isolation in later life. In Estonia, loneliness affects a considerable share of older adults and is associated with poorer emotional well-being, reduced quality of life and increasing vulnerability in everyday living (Arenguseire Keskus, 2022). However, loneliness is not reducible to physical solitude alone. As later sections of this thesis argue in greater detail, older adults may remain formally connected to family or community while still experiencing a profound lack of emotional presence, recognition and reciprocity (Oró Piqueras, 2005; Day, Gould, & Hazelby, 2020)

In this context, ageing must be understood not only as a demographic process but also as a relational one. Questions of belonging, visibility and meaningful connection become increasingly important as older adults navigate changing family structures, migration and the digitalization of communication. The Estonian case therefore provides an important setting for examining how design might respond to loneliness not merely as a health or care issue, but as a problem of social and emotional disconnection.

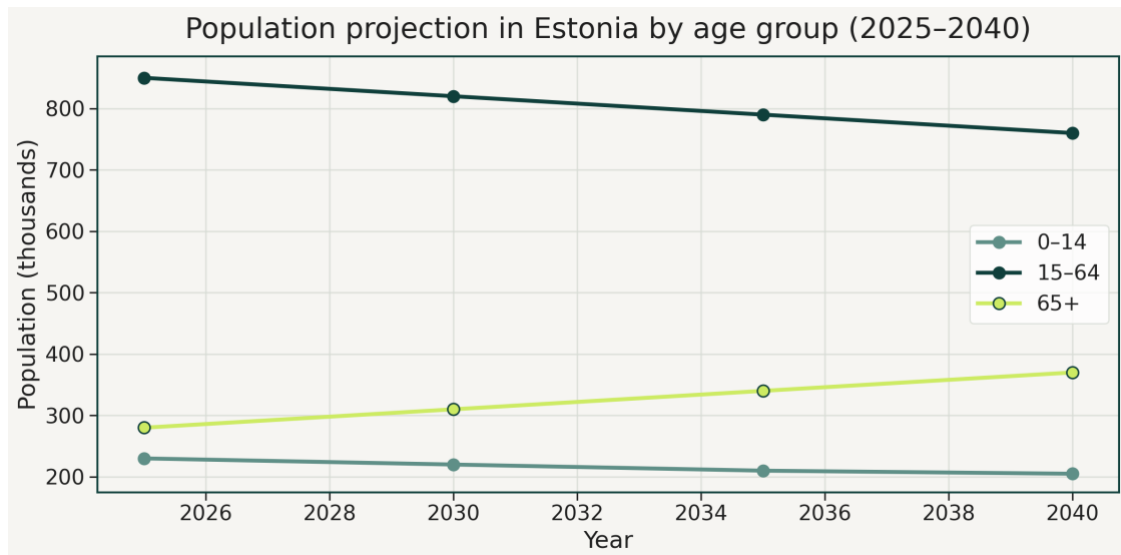


Figure 1.1 Population projection in Estonia by age group (2025–2040). Source: Statistics Estonia.

## 1.2 Geographic distance in family relationships

A central challenge in contemporary Estonian family life is geographic distance between generations. Younger adults increasingly relocate for work or education to bigger cities such as Tallinn, Tartu or even abroad, creating growing physical and emotional distance between older parents and their adult children. Comparative analysis based on SHARE data indicates that increasing geographic distance is associated with substantially reduced face-to-face contact between adult children and elderly parents, even where emotional bonds remain intact (Fihel, Kalbarczyk, & Nicińska, 2019). Similar patterns have been documented in Nordic research, where distance reshapes both the practical

organization of care and the emotional texture of family relationships (Malmberg & Pettersson, 2007; Pettersson, 2011).

As distance increases, family communication often shifts in character. Informal and spontaneous everyday interaction may gradually be replaced by scheduled calls, practical check-ins or contact tied to specific concerns. In such cases, communication can remain regular while losing much of its emotional depth. Older parents may feel present only at the margins of family life, while adult children struggle to balance care, responsibility and time pressure across distance (Pettersson, 2011).

In Estonia, these dynamics are intensified by migration and regional inequality. Patterns of urban concentration, rural depopulation and transnational mobility mean that many families must sustain intergenerational relationships across long geographic distances (Statistics Estonia, 2025; Arenguseire Keskus, 2022). This makes long-distance family communication not only a private matter, but also a broader social and design challenge.

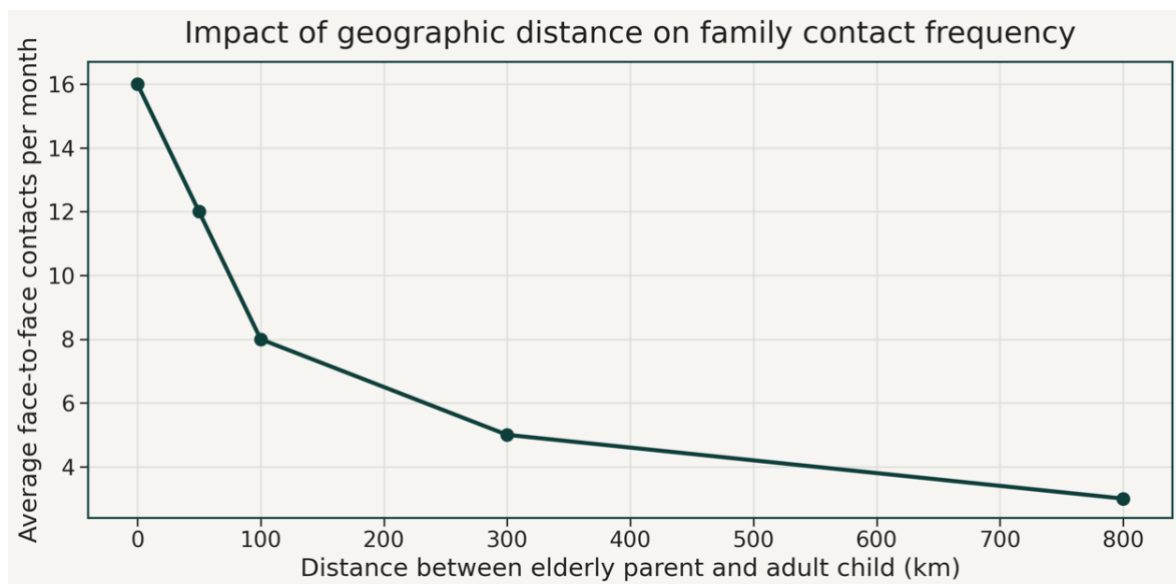


Figure 1.2 Impact of geographic distance on family contact frequency. Adapted from Fihel et al. (2019).

### **1.3 Emotional and health consequences of family disconnection**

The consequences of family disconnection in later life extend beyond temporary sadness or inconvenience. A large body of research links chronic loneliness and social isolation to serious physical and psychological health risks. Meta-analyses have associated prolonged loneliness with higher risk of cardiovascular disease, stroke and dementia, suggesting that its health effects are substantial and cumulative over time (Holt-Lunstad et al., 2015). Other studies show that social isolation in older age is associated with poorer mental health, reduced physical functioning and increased use of health services (Courtin & Knapp, 2017). Further research has highlighted effects on immune functioning, sleep quality and coping capacity (Püllüm & Çevik Akyıl, 2017; Newman-Norlund et al., 2022).

At the same time, the emotional consequences of family disconnection cannot be captured by clinical indicators alone. Older adults may experience a diminished sense of self-worth, emotional fatigue and the feeling that they are becoming peripheral to the lives of those who matter most to them. As discussed later in the theoretical framework, this experience can be understood through the concept of social invisibility, in which older people remain formally included yet feel overlooked within family narratives and everyday relational life (Oró Piqueras, 2005; Day, Gould, & Hazelby, 2020).

These concerns are especially relevant in Estonia, where demographic ageing intersects with migration, regional depopulation and uneven access to informal support. In this setting, family disconnection is not merely an interpersonal issue but part of a broader pattern of vulnerability in later life (Arenguseire Keskus, 2022). It therefore warrants attention not only from health and social policy, but also from design research concerned with how emotional presence and everyday connection might be better supported.

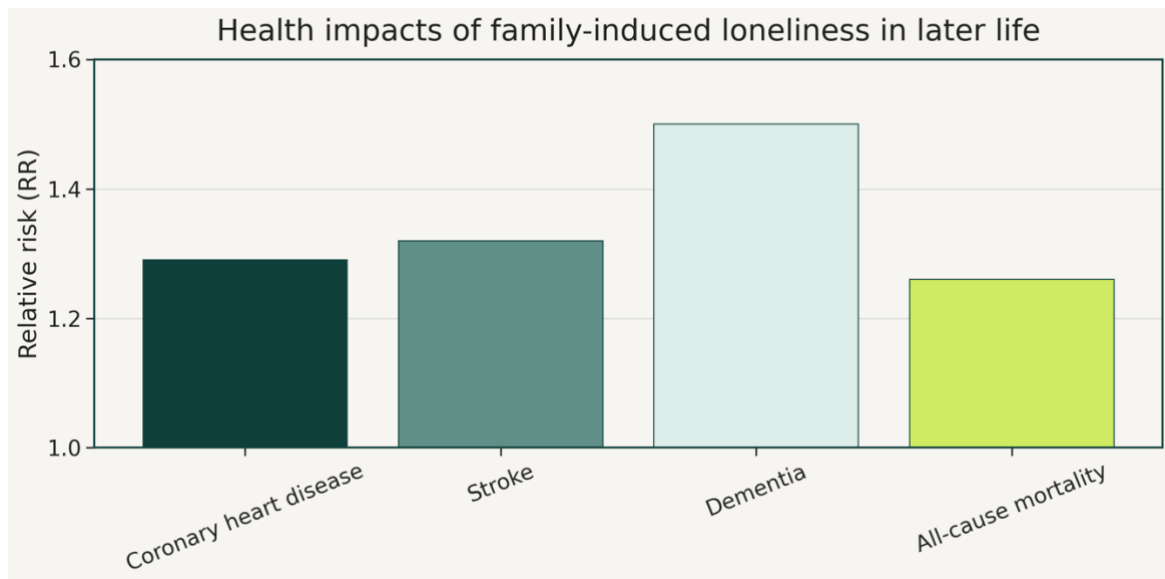


Figure 1.3 Health impacts of family-induced loneliness in later life. Compiled from Holt-Lunstad et al. (2015).

## 1.4 Digital barriers in long-distance family communication

Although Estonia is often described as a highly digitalized society, the benefits of digital infrastructure are not distributed evenly across generations. Older adults continue to face substantial barriers in accessing and using digital services and communication platforms, particularly when systems rely on complex interfaces, frequent updates and assumptions of prior digital confidence. National data indicate that a significant

proportion of older Estonians lack basic digital skills or experience digital engagement as difficult and stressful (JustDigi, 2025). Research on digital exclusion among older adults further shows that low confidence, insufficient support and rapidly changing platforms contribute to a persistent “grey digital divide” even in technologically advanced contexts (Mubarak & Suomi, 2022).

These barriers directly affect family communication. While younger family members often rely on messaging apps, social media, image-sharing platforms and video calls as part of their ordinary routines, many older adults find such tools overwhelming, confusing or tiring. Difficulties may include small fonts, unclear icons, fragmented communication across multiple apps and fear of making mistakes. As a result, communication practices that feel effortless for younger users may remain inaccessible or emotionally costly for older relatives.

A further challenge lies in media mismatch. Younger relatives tend to prefer fast and low-friction digital sharing, whereas many older adults value slower, more tangible forms of communication such as printed photographs, letters and physical artefacts that can be revisited over time (Mubarak & Suomi, 2022; Courtin & Knapp, 2017). Existing communication tools often privilege one side of this divide: digital-first platforms fit family routines but exclude some elderly users, while traditional print-based communication offers tangibility but lacks immediacy and reciprocity. This mismatch suggests the need for alternative communication arrangements capable of bridging digital convenience and tangible emotional resonance.

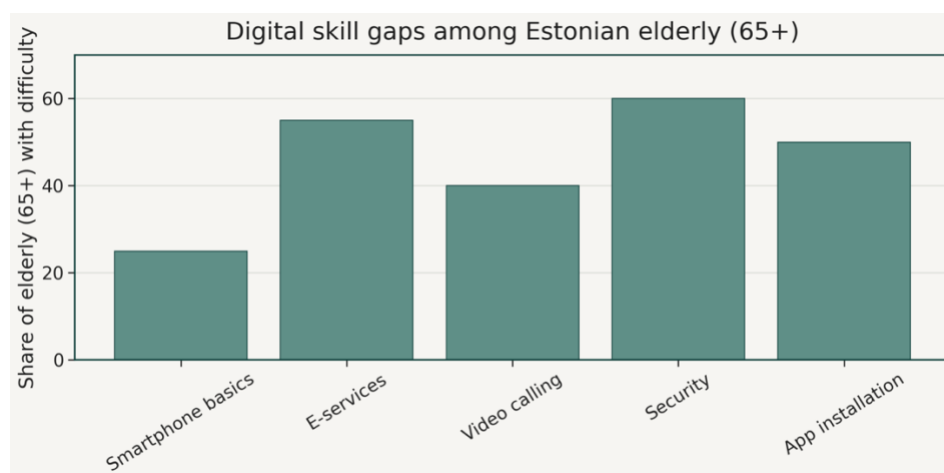


Figure 1.4 Digital skill gaps among Estonian elderly (65+). Source: JustDigi (2025).

## **1.5 Estonian family structures and the need for reconnection**

Estonian families are undergoing gradual but profound change. Smaller household sizes, delayed parenthood and increased rates of migration mean that intergenerational support that once took place within shared or nearby households is now often stretched across cities, regions and even national borders. As Statistics Estonia and foresight reports note, a growing share of older adults live alone or as couples in depopulating rural areas, while their adult children concentrate in urban centers or abroad. In practice, this weakens the density of everyday contact and the informal care networks that many elderly people previously relied on.

At the same time, demographic ageing and labour shortages are placing pressure on formal care systems. Policy documents warn that without new approaches, both institutional care and home-based services will struggle to meet demand, particularly for those with limited financial resources or living far from major service hubs. Ageing in place is promoted as a central strategy, yet emotional and relational aspects of ageing in place receive less attention than housing, benefits or medical support. This creates a risk that older adults may remain physically at home, but feel increasingly peripheral to family and community life.

Against this backdrop, long-distance family relationships become both more fragile and more important. When adult children live far away, the everyday practices through which care and belonging are expressed must be mediated by communication technologies and constrained by work schedules, time zones and digital habits. As the previous sections have shown, these mediated arrangements are shaped by digital skill gaps and media preferences that do not always align across generations. The result is a situation in which elderly parents may be formally “in touch” with family but still experience social invisibility, while younger relatives struggle to balance concern, guilt and overload.

For design research, this context underscores the need for solutions that do not treat family communication as a private afterthought, but as part of the broader infrastructure that enables ageing in place with dignity. Rather than simply increasing the volume of contact, there is a need for communication arrangements that help restore elderly people's visibility in family narratives and make emotional presence feel more continuous across distance. The conceptual framework introduced in Section 2.6 builds directly on this insight, situating the thesis at the intersection of social invisibility, emotional presence, media materiality and communication preferences, and digital exclusion in Estonia's ageing, highly digitalized society.

## **1.6 Aim of the thesis and research questions**

Against this background, this thesis explores how human-centered design can strengthen long-distance family relationships for independently living elderly people in Estonia. The study combines contextual analysis, empirical inquiry and concept-oriented design development in order to examine how design might respond to loneliness, social invisibility and mediated family disconnection in later life. Rather than treating loneliness only as a condition to be described, the thesis asks how communication design might support forms of connection that make older adults feel more visible, included and emotionally present within everyday family life.

The primary aim of the thesis is to develop a family communication proposal that combines digital sharing with tangible, elderly-friendly formats in order to foster emotional presence across geographic distance. More specifically, the study investigates how communication systems might better align with the realities of geographically dispersed families while also responding to older adults' preferences for simplicity, legibility and meaningful, revisit-able forms of contact.

This aim is examined through the following research questions:

- **RQ1:** How do independently living elderly and their geographically distant family members experience emotional disconnection and social invisibility in daily life?
- **RQ2:** What digital and tangible barriers hinder meaningful family communication, and how do preferences for physical media emerge?

These questions guide the thesis from the contextual framing presented in this introduction, through the theoretical discussion in Chapter 2 and the methodological approach in Chapter 3, to the empirical findings and design development in later chapters. In this way, the study seeks to contribute both to understanding how family disconnection is experienced in Estonia's ageing society and to showing how that understanding can be translated into a situated and discussable design intervention.

## **2 LITERATURE REVIEW & THEORETICAL FRAMEWORK**

### **2.1 Social invisibility and emotional isolation in later life**

Loneliness in later life has been widely recognized as a multidimensional phenomenon encompassing emotional, social and existential dimensions (Perlman & Peplau, 1981; Weiss, 1973). Beyond the mere absence of social contact, scholars have emphasized the importance of perceived quality, reciprocity and emotional fulfilment in relationships, showing that older adults may be surrounded by others and still feel profoundly alone when their relational needs are not met (De Jong Gierveld & Van Tilburg, 2006). In ageing societies, this mismatch between visible contact and felt connection becomes increasingly salient as family structures, work patterns and residential geographies continue to change (National Academies of Sciences, Engineering, and Medicine, 2020).

Within this broader discussion, the notion of social invisibility offers a particularly relevant lens for the present thesis. Social invisibility refers to situations in which individuals feel overlooked, peripheral or taken for granted within their social worlds even when they remain formally included (Oró Piqueras, 2005; Day, Gould, & Hazelby, 2020). For older adults, this may emerge when their everyday experiences, stories and contributions are no longer reflected in family narratives or wider public discourse. Rather than being recognized as active subjects, they risk becoming background figures in the lives of younger generations. In the context of long-distance family relationships, this may mean receiving photographs and updates from children and grandchildren while rarely seeing one's own life mirrored back in those communicative flows.

Research further suggests that social invisibility has important consequences for identity, agency and well-being. Day, Gould and Hazelby (2020) describe how older adults may internalize a sense of redundancy when they feel that their presence no longer matters to others, leading to withdrawal, reduced confidence and diminished agency. Oró Piqueras (2005) similarly argues that cultural narratives of ageing often reinforce this marginality by positioning older adults as burdens or passive recipients of care rather than as relational centers of family life. In this thesis, social invisibility is

therefore not treated as a secondary descriptor of loneliness, but as a central conceptual thread for understanding how elderly participants describe their place within geographically dispersed families and for guiding design decisions that seek to return narrative agency to them.

## **2.2 Family communication and emotional presence at a distance**

Family communication plays a central role in sustaining continuity, belonging and emotional security across the life course. Classic work on family systems emphasizes that relationships are maintained not only through major events, but also through small and repeated everyday exchanges that reaffirm mutual care and relational continuity (Imber-Black, 1998; Nussbaum & Coupland, 2004). When family members live apart, however, such exchanges become increasingly mediated by technology and constrained by time, creating new patterns of presence and absence. Research on transnational families, for example, shows how phone calls, messaging and remittances become practical and symbolic means of managing forms of “being there” despite physical separation (Baldassar, 2008; Wilding, 2006).

A growing body of work examines the concept of emotional presence in mediated family communication. Rather than equating connection with contact frequency alone, this literature focuses on how communication feels: whether it conveys warmth, attention and mutual recognition, or remains primarily functional (Licoppe, 2004; Madianou & Miller, 2012). Licoppe (2004) describes “connected presence” as a relational mode in which frequent, low-intensity exchanges, such as short messages, images and casual check-ins, maintain a background awareness of each other’s lives. Yet for older adults who depend on others to initiate and structure these exchanges, connected presence

can easily become uneven, shifting into a one-sided form of observation in which they see more than they are seen.

Intergenerational communication research highlights additional tensions that shape long-distance family relationships. Adult children often juggle work, caregiving for their own children and digital overload, which can produce what has been described as guilt-driven communication: sporadic, duty-oriented contact motivated more by obligation than by spontaneous relational desire (Lüscher, 2002; Silverstein & Bengtson, 1997). Older parents, meanwhile, may avoid expressing their own struggles or needs so as not to burden their children, creating a double silence in which both sides withhold emotionally significant experiences (Morr Serewicz & Canary, 2008). In geographically dispersed Estonian families, these dynamics intersect with structural factors such as migration, regional inequalities and digital divides, complicating efforts to maintain emotionally rich ties across distance.

For this thesis, emotional presence is treated as a key design objective. The issue is not simply how to increase the volume or frequency of communication, but how to support mediated interaction in ways that make elderly family members feel recognized, included and woven into everyday family life. This requires attention not only to what is shared, but also to who is represented, how communication flows, and through which media relationships are sustained.

## **2.3 Hybrid print-digital media and ageing**

Media studies and design research have increasingly explored how older adults engage with different communication formats, revealing a persistent attachment to tangible media such as printed photographs, letters and physical artefacts (Hagen, 2018; Neves

et al., 2019). These materials enable slow and reflective engagement: they can be touched, displayed in the home, revisited alone or with visitors, and incorporated into everyday domestic routines (Lindley, 2015). For elderly people, such materiality supports not only memory but also a sense of relational permanence, reinforcing the feeling that one's place in the family is inscribed in visible and enduring forms.

At the same time, younger family members increasingly organize communication through fast, visual digital platforms that privilege immediacy, volume and ease of sharing. This has led to growing interest in hybrid media systems that combine digital input with physical output in order to bridge generational preferences. Services such as Famileo and Neveo allow family members to submit digital contributions, including photographs and short messages, which are then transformed into printed newspapers or photo books for elderly relatives (Neveo, n.d.; Famileo, n.d.). Studies of such services report strong engagement among older recipients, largely because the format is emotionally resonant, tangible and accessible without demanding advanced digital skills (Neves et al., 2017).

However, existing hybrid services also reveal important limitations. Content is often delivered with a considerable delay, for example on a monthly basis, and communication tends to remain largely one-way, positioning older adults primarily as recipients rather than active contributors (Neves et al., 2017). From a design perspective, this suggests that hybrid media should not simply wrap digital content in a nostalgic material form, but should instead reconfigure roles, temporalities and agency within family communication. For the present thesis, hybrid print-digital media therefore represents a promising starting point, but one that requires further development along at least three dimensions: temporal rhythm, shifting from occasional delivery to more continuous presence; directionality, moving from one-way to bidirectional communication; and representation, ensuring that the elderly person's own life and voice are included rather than marginalized.

## **2.4 Technology adoption and digital exclusion among elderly**

Technology adoption among older adults has been widely studied in human-computer interaction (HCI), gerontology and communication research. Factors that support adoption include perceived usefulness, ease of use, social support and alignment with existing routines, while barriers include fear, low self-efficacy, physical and cognitive limitations, and negative prior experiences (Czaja et al., 2006; Mitzner et al., 2010). In digital-first societies such as Estonia, these broader patterns are intensified by the speed and scale of digital transformation, as services that were optional a decade ago have increasingly become default.

Local studies of Estonian elderly confirm that digital skills and confidence decline sharply after the age of 65, with many older adults relying on relatives, librarians or social workers to mediate access to e-services (JustDigi, 2025; Kalmus et al., 2019). The combination of complex interfaces, small fonts, multi-step authentication and fragmented support can create what some authors describe as a form of administrative and cognitive burden (Herd & Moynihan, 2018; Daigneault, 2024). For individuals already managing health issues, fatigue or reduced confidence, such burdens can shift digital engagement from hesitant participation to complete withdrawal from digital channels.

At the same time, research consistently shows that older adults are not inherently opposed to technology. When tools are carefully tailored to their needs, for example through large high-contrast interfaces, clear feedback, limited navigation depth and opportunities for gradual learning, many elderly users do adopt and even enjoy digital communication (Mubarak & Suomi, 2022; Neves et al., 2019). The problem therefore lies less in technology itself than in the complexity, pace and assumptions embedded in mainstream platforms, which are typically designed for younger and continuously connected users. This thesis builds on that insight by proposing a communication arrangement in which digital infrastructure remains available on the family side, while the elderly-facing interface is made as calm, legible and forgiving as possible, treating digital exclusion as a designable outcome rather than as a fixed trait of ageing.

## **2.5 The Estonian ageing and family policy context**

National and European policy documents underline that population ageing, migration and changing family structures pose major challenges for the sustainability of care systems and social cohesion (Arenguseire Keskus, 2022; European Commission, 2021). In Estonia, foresight studies on the future of long-term care suggest that, without significant intervention, demand for care will exceed available formal and informal resources, particularly in rural areas and among lower-income groups (Arenguseire Keskus, 2022). These reports emphasize the importance of ageing-in-place strategies, community-based support and digital innovation, but they tend to focus more on service delivery, housing and workforce issues than on the everyday emotional experience of ageing.

At the family level, policy frameworks recognize the important role of relatives in providing informal care, yet offer limited tools for sustaining emotional connection across distance. As emigration and internal migration continue to separate generations geographically, the maintenance of meaningful family ties becomes simultaneously more difficult and more important (Statistics Estonia, 2025; Arenguseire Keskus, 2022). The European Union Agency for Fundamental Rights further notes that loneliness and social isolation in later life are unevenly distributed, disproportionately affecting those who live alone, in remote areas or with limited resources (FRA, 2020). In Estonia, these risk factors intersect with the digital divide outlined in Section 2.4, creating layered vulnerabilities for elderly people who may be distant from family, services and digital infrastructures at the same time.

For design research, this policy context provides both constraints and opportunities. On one hand, any proposed solution must remain realistic within existing institutional and infrastructural conditions. On the other hand, there is clear strategic interest in solutions that can reduce loneliness, support ageing in place and leverage Estonia's digital strengths without deepening inequality. The present thesis therefore positions a family communication service as a modest but concrete contribution within this wider landscape, complementing rather than replacing formal care and policy initiatives by strengthening the emotional layer of support.

## 2.6 Conceptual framework and research gap

Drawing together the preceding sections, this thesis adopts a conceptual framework built around four interconnected lenses: social invisibility, emotional presence, media materiality and communication preferences, and digital exclusion. Social invisibility highlights how older adults may feel overlooked or peripheral even when formal contact with family members continues, pointing to questions of recognition and narrative agency rather than contact frequency alone. Emotional presence shifts attention from whether communication takes place to how it feels, emphasizing warmth, mutual attention and a sense of being woven into others' everyday lives. Media materiality and communication preferences highlight how different forms of communication vary in pace, accessibility, tangibility and revisitable value for older adults. Finally, research on digital exclusion and technology adoption among elderly people underscores the importance of simplicity, predictability and support in any communication system that aspires to be genuinely inclusive in highly digitalized societies such as Estonia.

Although each of these domains has been examined in prior work, they have largely developed along parallel tracks. Studies of loneliness, social isolation and social invisibility in later life have provided rich psychological, sociological and policy-oriented accounts of how older adults experience marginality within families and communities, but they have less often been connected to concrete communication design propositions. Research on mediated family communication and emotional presence has shown how everyday exchanges help sustain a sense of "being there" across distance, yet typically focuses on younger or mixed-age populations without attending in depth to the specific constraints and preferences of elderly users. Work on media materiality and communication preferences demonstrates that printed and other revisit-able forms of communication can hold particular meaning for older recipients, but these insights are rarely brought into sustained dialogue with questions of long-distance family relationships in specific national and policy contexts. In parallel, literature on digital exclusion among elderly people documents structural and experiential barriers to using mainstream digital tools, while remaining only loosely connected to questions of emotional connection and narrative participation within family life.

On this basis, the present thesis identifies a research gap at the intersection of these strands. There is a lack of studies that explicitly link social invisibility in later-life family relationships with the design of communication arrangements that are sensitive to elderly users' capacities, preferences and policy context. Existing services rarely

consider how older adults might move from being primarily recipients of information to being recognised contributors within ongoing family narratives, while also accommodating differences in accessibility, media preference and everyday communication rhythm. Likewise, much of the innovation discourse around digital ageing emphasizes safety, monitoring and service efficiency, while giving comparatively less attention to the emotional and relational dimensions of ageing in place in highly digitalized societies such as Estonia.

The conceptual framework developed here therefore positions this thesis within a space where questions of visibility, emotional presence, media materiality and communication preferences, and digital exclusion converge. It motivates an empirical focus on independently living elderly people and their geographically distant family members, and it informs the formulation of the research questions presented in Section 1.6. The following chapter builds on this framework to outline the qualitative and design-oriented methodology through which these questions are investigated, and through which communication design is treated as a means of engaging with, rather than merely describing, the challenges of long-distance family relationships in later life.

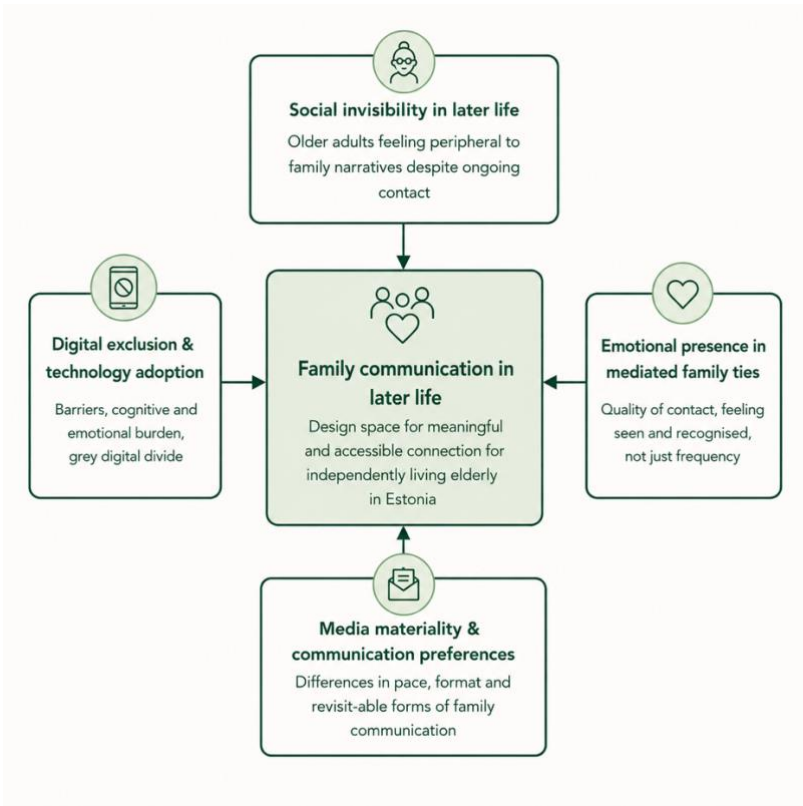


Figure 2.1 Conceptual framework of later-life family communication in Estonia.

### 3 METHODOLOGY

#### 3.1 Research approach: Qualitative and design-oriented inquiry

This thesis adopts a qualitative and design-oriented research approach that combines empirical inquiry with concept development in order to investigate how long-distance family communication is experienced and how it might be improved for independently living elderly people in Estonia. Rather than separating analysis from design, the study treats design development as a way of synthesizing and responding to the empirical and theoretical material generated through the research process. In the present study, the emerging outcome is a family communication proposal developed through engagement with elderly participants, geographically distant family members, policy material and existing services.

This approach aligns with human-centered and inclusive design traditions, which emphasize lived experience, contextual constraints and the development of actionable knowledge that can inform practice and future interventions. Rather than treating older adults as passive end-users, the study positions them as knowledgeable participants whose everyday experiences help define what counts as a meaningful design direction. In this sense, the methodological approach functions as a bridge between the theoretical framework introduced in Chapter 2, the empirical findings presented in Chapter 4 and the concept development articulated in later chapters.

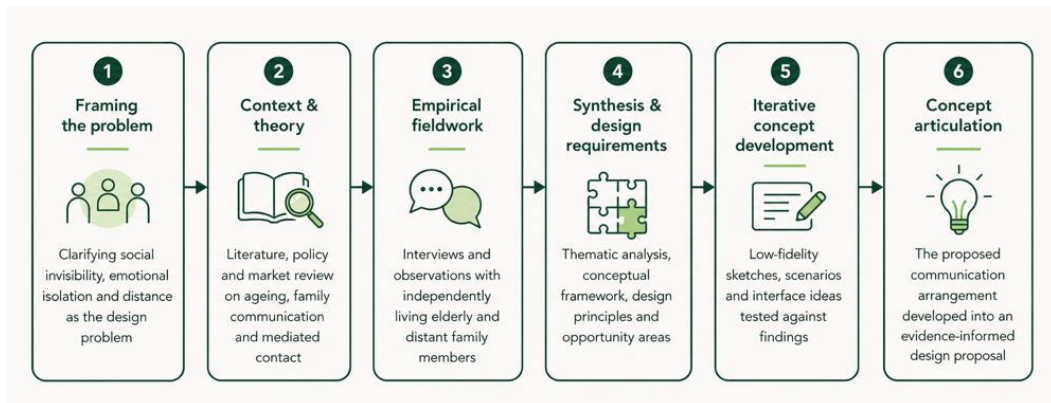


Figure 3.1 Research process from problem framing to concept development

## **3.2 Case context and participant selection**

The empirical focus of the study is on independently living elderly people in Estonia who have geographically distant family members, alongside a smaller group of those family members. This case context was selected because it concentrates several of the structural conditions outlined in earlier chapters, including population ageing, regional depopulation, migration and digital transformation (Statistics Estonia, 2025; Arenguseire Keskus, 2022). By focusing on older adults living in their own homes rather than in institutional care, the thesis addresses a stage of later life in which emotional connection may play a sustaining and preventative role in supporting ageing in place.

Participants were recruited through community centers and informal networks in both urban and rural areas. Eligibility criteria for elderly participants included being aged 65 or over, living in ordinary housing either alone or with a partner, and having at least one adult child or close relative living in another city or country. A complementary group of adult children, generally in early or middle adulthood and living at least several hours away, was included in order to capture how time pressure, guilt and distance shape the family side of communication (Fihel, Kalbarczyk, & Nicińska, 2019; Pettersson, 2011).

The sampling strategy was purposive and qualitative. The aim was not statistical representativeness, but the generation of a sufficiently varied yet coherent set of cases through which recurring patterns in emotional disconnection, media preference and communication practice could be identified (Denzin & Lincoln, 2018). Variation was sought in relation to region, gender, housing situation and family configuration, while the sample remained grounded in the Estonian social and cultural context.

### 3.3 Data Collection methods

To understand the problem space from multiple angles, the study employed a multi-method qualitative design combining documentary analysis, interviews, contextual observation and design-oriented exploration. This methodological combination made it possible to connect structural conditions with personal experiences and emerging design opportunities.

The main forms of data collection were as follows:

- **Document and policy analysis:** National statistics, foresight reports and policy documents concerning ageing, long-term care, loneliness and digital skills in Estonia were reviewed in order to establish the broader structural context of the study (e.g. Statistics Estonia, 2025; Arenguseire Keskus, 2022; FRA, 2020; JustDigi, 2025).
- **Semi-structured interviews:** In-depth interviews were conducted with independently living elderly participants and geographically distant family members. The interviews explored communication routines, emotional experiences of distance, feelings of visibility or invisibility, media preferences and attitudes toward digital tools.
- **Contextual observation and visual audit:** With participants' consent, observations were made regarding the presence and use of communication artefacts in the home, such as printed photographs, letters, notes, calendars and digital devices. These observations helped situate participants' narratives within the material realities of everyday domestic life.
- **Design sketching and conversational prompts:** As analysis progressed, early sketches, diagrams and storyboards of possible communication arrangements were developed and used informally in later conversations and peer discussions. This helped clarify emerging ideas, test their relevance against participant feedback and support the transition from empirical insight to concept development.

Together, these methods generated a layered dataset linking macro-level demographic and infrastructural conditions with micro-level emotional experiences and communication practices. They also supported the translation of empirical insight into design-oriented reasoning without reducing the study to either pure description or purely speculative concept generation.

### **3.4 Market and competitive analysis of family communication tools**

A dedicated market and competitive analysis was conducted to position the thesis within the existing landscape of family communication solutions and to identify the limitations that remain insufficiently addressed by current services. Rather than treating the proposed concept as emerging in isolation, this analysis examined how different products and communication formats already support, structure or constrain long-distance family contact involving older adults. The purpose was to identify where usability, emotional presence, tangibility and reciprocity are currently distributed unevenly across user groups.

The analysis considered three broad categories of existing solutions. The first category included digital-first tools such as messaging applications, social media platforms and video-calling services that are widely used by younger family members because they fit seamlessly into everyday routines and enable rapid, low-friction sharing. However, these tools often assume continuous connectivity, digital confidence and tolerance for fragmented interfaces, which can make them difficult or tiring for many elderly users. The second category included elderly-oriented devices and simplified communication tablets, which reduce interface complexity and improve legibility but often depend on dedicated hardware, closed ecosystems or additional setup effort by family members. The third category included hybrid print-digital services such as Famileo and Neveo, which transform digital contributions into printed artefacts for elderly recipients and

therefore respond more directly to preferences for tangible and revisit-able communication.

To make the comparison analytically useful, the review focused on six criteria: family-side convenience, elderly-side usability, tangible output, reciprocity, temporal rhythm and setup burden. Across these dimensions, a recurring pattern became visible. Digital-first platforms performed strongly in convenience and immediacy but weakly in elderly accessibility and tangibility. Elderly-oriented devices improved accessibility but often shifted logistical and financial burden onto families. Hybrid print services offered emotional resonance and material permanence, yet typically relied on slower delivery cycles and largely one-way communication, leaving elderly users positioned more as recipients than as active contributors.

This comparison indicates that the key market gap is not simply the absence of communication tools, but the absence of solutions that reconcile the needs of both sides within one coherent communication ecology. Existing services tend to optimize either for the routines of younger relatives or for the accessibility needs of older adults, while rarely supporting immediacy, tangibility and bidirectional participation at the same time. The competitive analysis therefore informed the later design requirements by clarifying that a more balanced communication arrangement would need to combine low-friction family sharing with calm elderly-facing interaction and visible channels for the older person's own contribution.

| Solution category                                                                                                 | Typical examples                                 | Strengths                                                                | Main limitations                                                                        |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  Digital-first platforms       | WhatsApp, Messenger, video-calling tools         | Fast sharing, familiar to families, supports frequent updates            | Often fragmented, cognitively demanding, weak in tangibility and elderly usability      |
|  Elderly-oriented devices      | Simplified tablets, senior communication devices | Better legibility, reduced interface complexity, calmer interaction      | Requires dedicated setup, may create extra cost, often depends on closed systems        |
|  Hybrid print-digital services | Famileo, Neveo                                   | Tangible and revisit-able output, emotionally resonant for elderly users | Often slower, largely one-way, limited elderly contribution in ongoing family narrative |

Figure 3.2 Summarizes the main strengths and limitations of existing solution categories relevant to long-distance family communication with elderly users.

### **3.5 Data analysis**

The empirical material was analyzed using reflexive thematic analysis, a flexible qualitative method suited to identifying patterns of meaning across rich and varied data (Braun & Clarke, 2006; Braun & Clarke, 2021). The analysis proceeded iteratively rather than linearly, moving back and forth between interviews, observations, documentary material and emerging design reflections.

The process began with familiarization, during which transcripts, fieldnotes and observation notes were read repeatedly and annotated with initial impressions, recurring tensions and notable expressions used by participants. This was followed by inductive coding, in which segments of data were coded in relation to emotional states, communication practices, media preferences, barriers and recurring relational dynamics. Examples included codes related to guilt, burden avoidance, spectator feeling, tangible permanence, digital friction and selective sharing.

Codes were then grouped into broader provisional themes, which were reviewed and refined across the dataset. Themes such as social invisibility, guilt-driven communication, digital abandonment and preferences for hybrid communication gradually emerged through comparison across participants and data types. These themes were subsequently interpreted in relation to the theoretical lenses developed in Chapter 2 and translated into design opportunities and constraints. In this way, analysis in the thesis served both interpretive and generative functions: it was used not only to describe participants' experiences, but also to shape the conceptual development of the proposed design solution.

Visual synthesis tools, including empathy maps, journey maps and opportunity diagrams, were used throughout the analysis to support coherence between empirical findings and later design decisions. These tools did not replace thematic analysis, but complemented it by helping organize insights in ways that were actionable for design development.

### **3.6 Ethical considerations**

The study follows ethical principles relevant to research involving older adults and emotionally sensitive topics such as loneliness, family strain and social invisibility (Helgesson, 2005; National Academies of Sciences, Engineering, and Medicine, 2020). Given that participants were invited to discuss intimate aspects of family life, particular attention was paid to consent, confidentiality, emotional safety and proportionality of research burden.

Participants received a clear explanation of the study's purpose, methods and their rights, including the right to decline questions or withdraw from participation at any point. Consent was obtained prior to interviews and observations, either verbally or in writing depending on the context. Pseudonyms are used in the thesis, and identifying details such as names, exact locations and specific family events were altered or omitted in order to preserve anonymity.

Because interviews touched on potentially difficult emotions, the researcher remained attentive to participants' comfort and affective responses during the sessions. Breaks, pauses and topic shifts were offered where needed, and no high-effort technological testing was imposed on participants. The study sought to minimize burden by adapting the pace and setting of interactions to participants' routines and capacities, ensuring that the research process itself did not intensify vulnerability or dependence.

### **3.7 Researcher positionality and reflexivity**

The study acknowledges that the researcher's positionality shaped the framing of the research problem, the interpretation of empirical material and the development of the design concept. As a design student working within the Estonian context and engaging personally with questions of ageing, distance and care, the researcher did not occupy a position of neutrality external to the topic. Instead, the thesis adopts a reflexive stance, treating subjectivity as something to be critically examined rather than concealed (Finlay, 2002; Braun & Clarke, 2021).

Reflexivity was supported through several practices. These included reflective note-taking after interviews and design decisions, ongoing discussion with supervisors and peers, and repeated returns to the data in order to test whether interpretive claims remained grounded in participants' accounts. This was especially important in avoiding overly romantic assumptions about tangible media or overly solution-oriented interpretations unsupported by the material.

By making the role of the researcher explicit, the thesis strengthens methodological transparency and clarifies how the final concept emerged not as a neutral technical answer, but as a situated design proposition shaped through dialogue between theory, data and reflective interpretation.

### **3.8 Methodological limitations**

Several limitations of the methodological approach should be acknowledged. First, the study is based on a qualitative and purposive sample, which means that the findings are not statistically generalizable to all elderly people in Estonia or to all family configurations. The value of the research lies instead in the depth, coherence and interpretive richness of the patterns it identifies.

Second, the empirical material is cross-sectional and largely self-reported. Interviews and observations capture experiences at particular moments and through participants' own accounts, which may foreground some aspects while minimizing others. Longitudinal studies, diary-based methods or in-situ prototype deployments would be needed in order to understand how communication practices and feelings of invisibility evolve over time.

Third, the outcome of the thesis is a conceptual and design-level contribution rather than a fully implemented and evaluated system. Although the proposed concept is grounded in empirical insight, policy context and market analysis, its real-world feasibility, long-term adoption and broader social effects would require further technical development and field testing. Finally, the research is inevitably shaped by the institutional context of a design-oriented master's programme and by the researcher's own positionality. The thesis therefore does not claim to offer a definitive solution to loneliness in later life, but rather a situated and evidence-informed proposition that can be further discussed, critiqued and developed.

## **4 FINDINGS**

### **4.1 Elderly experiences of social invisibility and emotional disconnection**

Interviews with independently living elderly participants revealed a recurring sense of social invisibility despite continued formal independence and at least occasional contact with family members. Several participants described themselves as being connected in principle, yet only weakly included in the everyday flow of family life. One participant summarized this feeling by saying, "Sometimes I feel they are all busy with their own lives," while another described her position more quietly as being "left to one side."

These expressions suggest that emotional disconnection was not experienced primarily as total abandonment, but as a gradual loss of relational centrality. Even where weekly or bi-weekly calls were maintained, participants often described these exchanges as brief, practical and oriented toward health, logistics or reassurance rather than reciprocal sharing. In several interviews, earlier phases of life were remembered through images of spontaneous visits, shared meals and everyday closeness, whereas present-day communication was portrayed as more scheduled, compressed and selective.

Importantly, many participants were hesitant to name their experience directly as loneliness. Instead, they spoke in indirect or softened terms, balancing gratitude for still having children or grandchildren with descriptions of absence, quietness and marginality. This ambivalence is analytically significant because it shows that emotional disconnection can coexist with continued family attachment and intermittent contact. In this sense, the findings suggest that what is at stake is not only whether communication exists, but whether older adults feel meaningfully present within the narrative life of the family.

## **4.2 Family perspectives: guilt, time pressure, and digital habits**

Interviews with geographically distant family members revealed a complementary but differently structured experience of disconnection, shaped above all by time pressure, guilt and digital saturation. Participants often described strong concern for their elderly parents alongside an ongoing feeling that they were not communicating enough. In several cases, contact was described as happening after too much time had passed, after hearing worrying news, or around birthdays and other significant moments rather than through continuous everyday sharing.

This pattern is captured clearly in the material through the notion of “guilt-driven communication.” Rather than emerging spontaneously, contact was often triggered by delayed responsibility or a sense that one should check in. Family members explained that work, childcare, commuting and life across several locations compressed communication into narrow time windows, which meant that each interaction had to carry reassurance, practical updates and emotional care all at once.

Participants also drew a strong contrast between how they communicated with peers and how they communicated with elderly relatives. Messaging apps, social media feeds and image-sharing channels were described as natural parts of everyday communication with friends, partners and children, yet older parents were often seen as “not really on those channels,” even when family life itself was increasingly documented there. The problem was therefore not simply unwillingness to share, but a mismatch between existing family communication habits and the communicative conditions under which older adults could realistically feel included.

## **4.3 Preferences for tangible and revisitable communication**

Across the elderly participants, there was a strong and consistent preference for tangible media such as printed photographs, greeting cards, letters and other physical artefacts linked to family life. Participants described these objects not merely as keepsakes but as everyday carriers of connection, often kept in visible places around the home where they could be noticed, returned to and occasionally shown to others. One interviewee explained that while it was “nice to see pictures on the phone too,” they still preferred “real photographs” that could be held and kept nearby.

A recurring theme in the material was the importance of visibility and ease of return. Several participants suggested that printed photos or cards felt more present in everyday life because they did not require searching or interaction with a device. As one elderly person put it, “I have a photo of my grandchild on a shelf. I don’t need to search for it or press any buttons. I walk by, see it, and it gives me a good feeling.” By contrast, photos sent through messaging applications were appreciated but often described as fleeting or difficult to retrieve once new messages arrived. One interviewee summarized this clearly: “Someone sends another message, and then I can’t find the picture anymore. Sometimes I worry that I might accidentally delete something important.” These accounts indicate that what mattered was not only the emotional content of the message, but also the assurance that it would remain accessible without effort.

Participants also highlighted how tangible media supported social sharing and a sense of domestic continuity. Cards on the refrigerator or letters in a drawer were described as objects that could be revisited and used to tell stories to others. One interviewee noted that when a neighbour visited, it was easy to say, “Look, my grandchild sent me this card,” because the object was already there in the room, whereas showing something on a phone required searching through menus and message threads. Such descriptions suggest that physical artefacts help keep family connections woven into everyday spaces and interactions, rather than confined inside a device.

Family members, meanwhile, described their own communication practices as organized around fast and flexible digital channels that fitted busy schedules and geographic distance. Several noted that although sending printed photographs or small packages felt meaningful, doing so regularly required extra planning and therefore often dropped

out of everyday routine. This tension was also reflected in the interview material, where one participant acknowledged that relatives “send pictures on their phones because it’s easier,” but added that “sometimes it would be nice if they printed out a photo too. Then it stays with me here in my home.” Importantly, older adults did not position themselves as opposed to digital contact. As one interviewee clarified, “I’m happy when they send things. But I enjoy it more when the message or photo doesn’t disappear into a screen and stays visible to me.” Taken together, these accounts point not to a rejection of digital communication, but to a preference for communication arrangements in which family members can share content digitally while elderly users receive it in calm, tangible and revisitable forms.

| Aspect            | Elderly (65+)        | Family Members (25–45) |
|-------------------|----------------------|------------------------|
| Preferred Medium  | Paper (87%)          | Digital (100%)         |
| Desired Frequency | Daily presence       | Instant sharing        |
| Content Type      | Photos + short notes | Photos + 10s videos    |
| Emotional Value   | Tangibility          | Spontaneity            |
| Tech Comfort      | Zero learning        | Full smartphone        |

Figure 4.1 Comparison of communication preferences between elderly and family members.

#### 4.4 Barriers in existing communication tools

Both elderly participants and family members identified multiple barriers in existing communication tools that limited the development of emotionally meaningful long-distance contact. On the elderly side, the most frequently mentioned difficulties included small text, unclear icons, multi-step navigation, forgotten passwords and uncertainty about what different functions actually did. One interviewee described this very directly,

noting that “sometimes the text is too small, or the icons are confusing” and that “there are so many buttons” they were not always sure what each one did.

Importantly, these barriers were not experienced simply as isolated design flaws. Participants often connected interface complexity with a sense of risk, anxiety and dependence. As one elderly person explained, the problem was not only usability in a technical sense, but the fear of pressing “the wrong thing” and accidentally deleting something or changing something important. Another part of the same interview captured this emotional dimension particularly clearly: “What if I break something? Then I have to ask someone for help again, and I don’t always want to depend on others.” Such statements suggest that digital barriers in later life are closely tied to confidence, autonomy and the wish not to become a burden to family members.

This emotional uncertainty often led participants to avoid unfamiliar functions altogether. One interviewee explained that if something was not immediately understandable, they would usually “leave it alone unless someone is sitting next to me to help,” adding that “sometimes I miss out on things because of that.” The significance of this pattern lies in the fact that exclusion did not arise only because technology was unavailable, but because the effort and risk involved in using it made participation feel unsafe or discouraging. Over time, this could reduce confidence further and reinforce a sense that family communication was taking place through systems not designed for them.

Family members described a different but related set of obstacles. Although many routinely took photographs and short videos during everyday life, sharing those materials specifically with one elderly relative often required extra selection, additional steps and sometimes a different communication channel from the ones already used with the rest of the family. As the interviewee reflected, this was understandable because relatives were already busy and “might need to choose pictures, send them separately, or use different apps. That takes time.” The problem was therefore less a lack of care than the friction involved in transforming ordinary family media into accessible intergenerational communication.

Existing products aimed at elderly communication were also perceived as only partial solutions. Simplified devices could improve accessibility, yet they often introduced other burdens such as special hardware, subscription costs or additional setup work. As one participant observed, “some are easier to use, but then you need special devices or subscriptions. Sometimes setting everything up becomes another problem.” Printed

services, meanwhile, were appreciated for their tangible qualities, but were also seen as slower and largely one-directional. One interviewee summarized this tension by noting that printed photos were valuable because they could be held and kept at home, “but they can be slow, and usually communication only goes one way.” Taken together, the findings suggest that current tools tend to fit either the family side or the elderly side, but rarely reconcile both within one communication arrangement that feels simple, mutual and sustainable over time.

## **4.5 Cross-cutting patterns and design challenges**

Taken together, the findings reveal several cross-cutting patterns that define the design problem addressed in this thesis. First, elderly participants often occupied the role of spectators rather than protagonists within family communication. They saw selected glimpses of others’ lives, but their own everyday experiences were less frequently represented, reflected or circulated back into the family narrative. This asymmetry contributed directly to feelings of invisibility and reduced relational significance.

Second, the findings reveal a persistent tension between speed and permanence. Family members valued fast, low-effort and digitally integrated sharing, whereas elderly participants valued slower, materially stable and revisit-able forms of communication. Existing tools largely reinforced this divide rather than mediating it. Third, the material points to the importance of simplicity and predictability: for many older participants, even minor interface complexity could lead to uncertainty, loss of confidence and eventual abandonment, while calm, stable and low-choice systems were described as far more approachable.

A further pattern concerns the interaction between guilt and burden avoidance. Adult children worried that they were not doing enough, while elderly parents often avoided expressing needs or emotions in order not to create additional pressure. This produced a relational double bind in which both sides cared deeply yet both also held back. Finally, the findings show that loneliness in this context is rarely caused by a single factor. Geographic distance, digital exclusion, health concerns and shrinking local support networks often intersected, creating layered vulnerability for certain older adults. These

patterns together suggest that the design challenge is not merely to increase contact frequency, but to create communication arrangements that redistribute narrative agency, reduce friction, and balance digital immediacy with tangible emotional continuity.

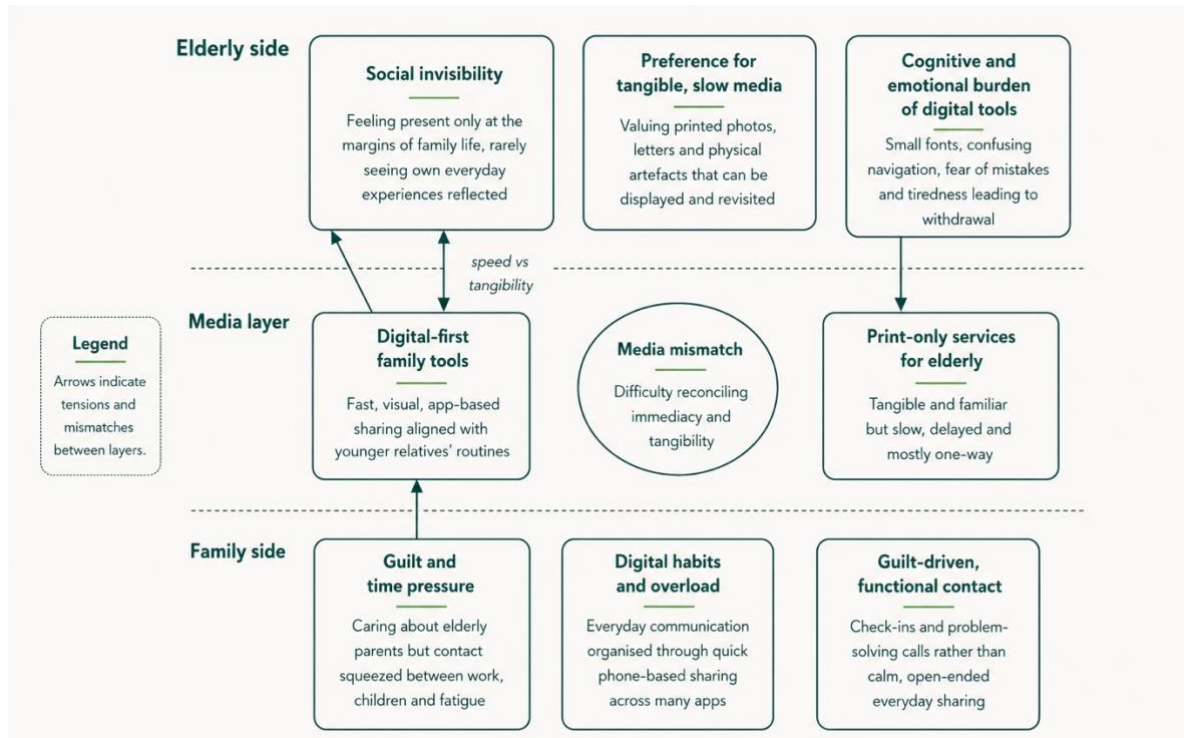


Figure 4.2 Key patterns and tensions in long-distance family communication.

*The figure summarizes cross-cutting patterns identified in the empirical material: tensions between elderly needs, media infrastructures and family routines that together shape experiences of social invisibility, emotional distance and design opportunities for later-life family communication*

## **5 DESIGN FRAMEWORK & APPROACH**

### **5.1 From findings to design requirements**

The findings presented in Chapter 4 reveal a set of interrelated tensions that any meaningful intervention in long-distance family communication must address. Elderly participants often experience themselves as spectators rather than protagonists in family life, while geographically distant relatives struggle with time pressure, guilt and digital overload. At the same time, existing communication tools tend to split between two extremes: fast but exclusionary digital platforms on one side, and tangible but slow or one-directional formats on the other.

Taken together, these tensions translate into a series of design requirements for a proposed family communication arrangement that aims to support emotional presence rather than merely increase contact frequency. First, the concept must counteract social invisibility by ensuring that elderly users are not positioned solely as recipients of family updates, but also as visible contributors to the shared family narrative. Second, the solution must accommodate the existing digital routines of younger family members while offering elderly users a calm, predictable and error-forgiving experience. Third, it must reconcile immediacy with permanence by combining regular digital glimpses of family life with tangible artefacts that can be revisited and displayed in the home. Finally, the concept must remain realistic in relation to time, effort, digital skills and cost, avoiding new burdens for either side.

Building on these findings, Table 5.1 summarizes how the main empirical patterns identified in Chapter 4 are translated into design requirements, principles and example design elements. This table functions as a conceptual bridge between the analytical findings and the design proposal that follows in Chapter 6.

| Finding (Ch. 4)                                                                                                                                      | Design requirement                                                                                                                  | Design principle                                          | Example design element                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Elderly participants feel socially invisible and peripheral to family life despite ongoing contact.                                                  | The system must actively reflect the elderly person back into the family narrative, not only show others' lives.                    | Redistribute narrative agency towards the elderly.        | Tablet screen that highlights elderly responses; newspaper sections dedicated to the elderly's photos, quotes and reactions.  |
| Adult children experience guilt, time pressure and digital overload, which leads to sporadic, duty-driven communication.                             | Family contributions must fit into existing routines with minimal extra effort and no complex planning.                             | Lower the activation energy for everyday sharing.         | One-tap sharing from existing photo streams; light prompts suggesting "send a quick heartbeat" rather than heavy check-lists. |
| Elderly prefer tangible artefacts (printed photos, letters) and slow, revisitable media, while families organize life through fast digital channels. | The system must bridge tangible and digital channels without requiring elderly users to adopt complex digital tools.                | Combine digital immediacy with tangible permanence.       | Weekly printed family newspaper generated from digital contributions; tablet view that mirrors the paper's structure.         |
| Digital interfaces often feel confusing, small and risky for elderly users, leading to avoidance and dependence on others.                           | Elderly-side interaction must be extremely simple, forgiving and legible, with no "wrong" paths.                                    | Design for calm, legible and error-forgiving interaction. | Home screen with only a few large tiles; one-tap voice reply; clear, persistent labels; no hidden menus or notifications.     |
| Some elderly participants hold back their own feelings "not to worry the children", reinforcing one-way communication.                               | The system should support lightweight emotional expression from the elderly that does not feel burdensome or technically demanding. | Enable safe, low-effort self-expression.                  | Pre-structured voice reply options (e.g. "Thank you", "This made my day"); simple prompts inviting short stories or memories. |
| Families and policymakers are interested in solutions that can work both in private homes and in supported settings.                                 | The concept must be technically and organizationally scalable beyond single households.                                             | Design for modularity and institutional compatibility.    | Backend that can handle multiple households; configurable roles for family members, care staff and service providers.         |

Figure 5.1 Translation of empirical findings into design requirements, principles and example features.

*These requirements form an intermediate design framework between the analytic work of Chapters 1–4 and the detailed concept articulation in Chapter 6.*

## **5.2 Design principles for later-life family communication**

Building on the findings in Chapter 4 and the conceptual framework outlined in Chapter 2, this thesis formulates a set of design principles for later-life family communication. These principles are intended to guide the development of communication arrangements that respond to elderly users' needs and constraints while fitting realistically into the everyday routines of geographically distant family members. Rather than prescribing a single technical configuration, the principles describe the qualities that any proposed communication arrangement should strive to embody.

First, the empirical material highlights the importance of radical simplicity on the elderly side. Interfaces aimed at older adults need to minimize steps, choices and cognitive load, favouring large, stable and forgiving interaction patterns over feature-rich complexity. This includes not only visual clarity, but also predictable behaviours that reduce anxiety about making mistakes. For participants with limited digital confidence, such simplicity is not merely a usability preference but a condition for sustained engagement.

Second, the findings point to a need for calm, legible presence in the home. For elderly participants, communication media are most supportive when they can be integrated into ordinary domestic rhythms, offering slow and comprehensible updates rather than demanding constant attention. Design should therefore foreground readable visuals, gentle temporal rhythms and forms of presence that feel like quiet background companionship rather than an additional source of noise. In this sense, the communication arrangement should function less as an attention-seeking device and more as a stable domestic presence that can be encountered without stress.

A third principle concerns immediacy and tangibility. Younger relatives tend to communicate through fast digital channels, while older adults value tangible artefacts that can be revisited over time. Communication arrangements should therefore support low-friction family sharing while ensuring that elderly users encounter the resulting content in stable, material or otherwise easily revisitable forms that fit their everyday practices. The aim is not to privilege one medium over another, but to reconcile different communicative habits within a shared structure of exchange.

Fourth, the framework emphasizes elderly-centred narrative agency. In many existing arrangements, older adults risk becoming primarily recipients or observers of family life.

The design of family communication systems should therefore make it straightforward for them to respond, express preferences and see their own experiences reflected in ongoing family narratives, even when their contributions are brief or primarily audio-based. Supporting communication in later life means not only making family content visible to elderly users, but also making elderly users visible within the family's evolving story.

Finally, the principles are anchored in ethical care and equity. Communication concepts must be attentive to digital exclusion, avoiding designs that deepen existing divides or normalize guilt-driven surveillance of elderly people. Instead, they should support ageing in place in ways that are experienced as fair, respectful and voluntary by all parties. This requires attention not only to interface accessibility, but also to how responsibility, burden and emotional labour are distributed across the wider communication arrangement.

Together, these five principles define the design focus for the communication arrangement developed in the following sections. They translate the thesis’s conceptual framework and empirical findings into a set of practical orientations for design, clarifying how emotional presence, simplicity, tangibility, agency and equity should be balanced in later-life family communication. Figure 5.2 summarizes this design focus and illustrates how the principles cluster around the overarching aim of supporting felt emotional presence across distance.



Figure 5.2 Design principles for later-life family communication.

*The figure summarizes the core design principles that translate the thesis’s conceptual framework and empirical findings into guidance for later-life family communication. Together, these principles shape how the proposed communication arrangement balances simplicity, calm presence, tangibility, narrative agency and ethical care.*

## 5.3 Stakeholder ecosystem and interaction model

The design principles outlined above inevitably play out within a broader ecosystem of stakeholders, infrastructures and everyday routines rather than in a simple one-to-one relationship between an elderly person and a single family member. Long-distance family communication is shaped not only by individual preferences, but also by how responsibility, effort and visibility are distributed across different actors and channels. This section maps the main stakeholder groups and sketches an interaction model for a hybrid family communication arrangement that responds to the findings in Chapter 4 and the design focus described in Section 5.2.

At the center of this ecosystem is the independently living elderly person, whose experience of social invisibility, emotional presence and digital exclusion defines the primary design constraints. For them, the system needs to provide calm, legible presence in the home and radically simple ways of engaging with family communication. Surrounding the elderly user are geographically distant family members, who typically coordinate their own communication through fast digital channels while managing significant time pressure and emotional load. In the interaction model, these relatives contribute small, low-effort updates that can be transformed into forms more suitable for elderly users without requiring them to adopt the same tools or habits.

Beyond the immediate family, additional stakeholders influence how such a communication arrangement can function over time. These may include local carers or neighbours who occasionally support the elderly person with devices or practical tasks, postal or delivery services that handle physical materials, and service providers or municipalities responsible for digital infrastructure and ageing-in-place initiatives. While these actors are less visible in everyday communication, they affect reliability, accessibility and equity. For example, uneven broadband coverage, postal delays or paid subscription models can all shape who is able to benefit from hybrid communication services and on what terms.

The interaction model therefore considers not only who sends and receives messages, but also where cognitive and logistical effort is placed. In line with the ethical care and equity principle, the aim is to shift complexity away from elderly users and toward the background of the system, where it can be handled by more digitally confident family members or by automated processes. Elderly participants should primarily encounter stable, predictable interactions that allow them to respond in ways that feel natural to

them, such as brief voice messages or simple selections, while still being represented as active contributors rather than passive recipients.

Figure 5.3 summarizes this stakeholder ecosystem and interaction model. It positions the elderly person and distant family members at the core, shows how their exchanges are mediated through digital and tangible communication channels, and indicates the supporting roles of carers, service providers and public programmes. The figure does not prescribe a specific technical implementation, but serves as a structural template for the proposed communication arrangement that is detailed in Chapter 6.

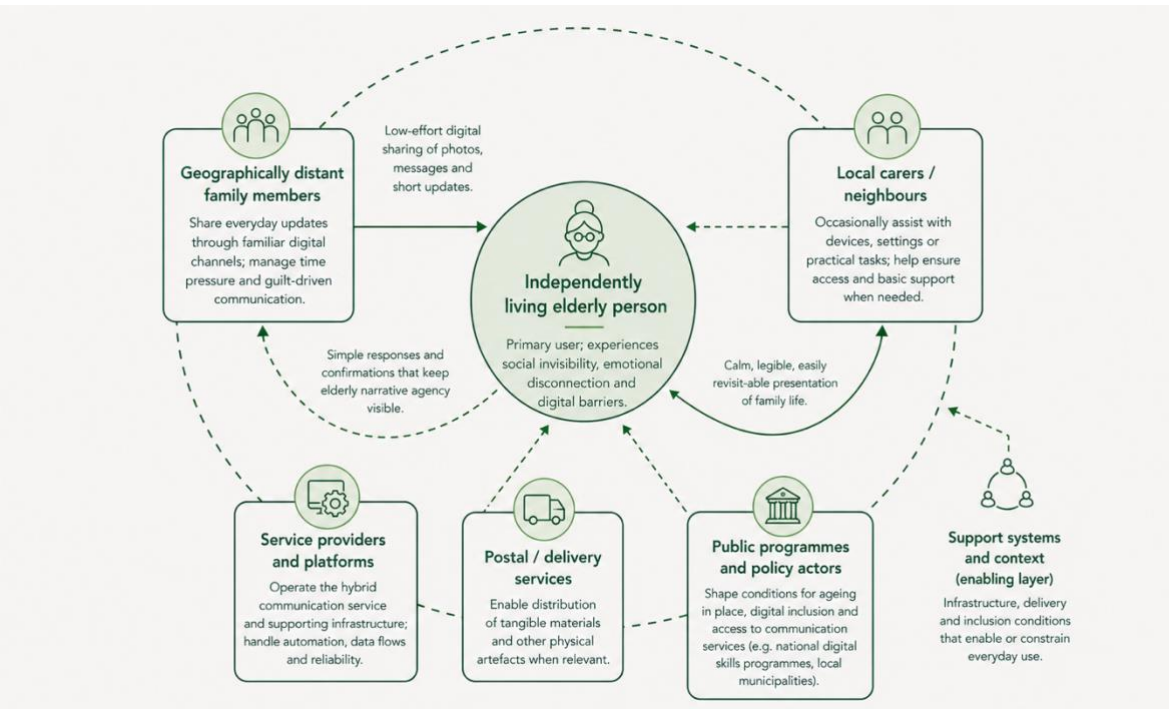


Figure 5.3 Stakeholder ecosystem and interaction model for the proposed communication arrangement.

## 5.4 Design opportunity areas

The synthesis of findings and ecosystem mapping points to several key opportunity areas where design intervention can meaningfully address the problems identified in earlier chapters. One such opportunity lies in supporting everyday glimpses without overload. Family members already produce a large amount of ordinary visual and textual content in daily life, but very little of it reaches elderly relatives in accessible and meaningful form. A design opportunity therefore exists in creating mechanisms through which small moments can be shared with minimal effort while remaining calm and digestible on the receiving side.

A second opportunity concerns curated tangible artefacts that place the elderly user at the center rather than at the margins of the family narrative. Printed newspapers, photo-based summaries or other physical outputs can do more than deliver content; they can materially affirm that the older person's voice, memories and reactions remain part of ongoing family life. A third opportunity lies in confidence-preserving interaction patterns, especially for elderly users with low digital confidence or emerging cognitive difficulties. Here, the task is not simply to reduce complexity, but to create interactions in which exploration feels safe and mistakes do not result in embarrassment, confusion or abandonment.

Further opportunities emerge on the family side. Because many younger relatives experience contact through a lens of guilt and time scarcity, there is value in guilt-reducing touchpoints that lower the emotional threshold of communication and normalize small acts of presence. Another opportunity lies in redistributing narrative agency, so that elderly users are not positioned merely as recipients of updates but are also able to respond, react and appear within the shared family flow in visible ways. Finally, the proposed communication arrangement opens a broader opportunity for bridging domestic and institutional contexts, making it potentially relevant not only for private homes but also for supported housing, community centers or care-related settings. This expands the relevance of the proposal beyond individual households and aligns it with wider societal discussions about ageing in place and relational care.

Together, these opportunity areas prepare the ground for the evidence-informed service blueprint presented in the following section.

## **5.5 Evidence-informed blueprint for concept articulation**

Based on the principles and opportunities outlined above, this thesis proposes an evidence-informed blueprint for concept articulation. The blueprint is not a fully specified technical design but a structured description of how a future communication arrangement should behave and how it should feel to different stakeholders, grounded in empirical findings and theoretical insights.

At a high level, the blueprint consists of three interdependent layers. The first is a family-side layer, in which multiple relatives can easily contribute photos, short texts and audio snippets into a shared stream using existing devices and familiar interaction patterns. The second is an elderly-side layer, where this stream is transformed into calm, legible and emotionally resonant experiences through a simplified digital display and periodically produced tangible artefacts. The third is a curatorial and service layer, which governs rhythm, balance, representation and practical delivery, ensuring that the communication flow neither overwhelms nor leaves long empty periods.

A central function of this blueprint is to reconcile asymmetrical needs without reproducing asymmetrical value. Family members require low-friction participation that fits within dense digital routines, whereas elderly users need stability, clarity and forgiving interaction. At the same time, the arrangement must ensure that older adults are not merely positioned as recipients of content, but are visibly integrated into the shared family narrative through lightweight forms of reply, expression and recognition.

The blueprint also includes governance and support structures that underpin trust and long-term sustainability. These include clear roles for setup, troubleshooting, content moderation where necessary, and adaptation over time to changing cognitive, sensory or relational needs. In this sense, the proposal is understood not only as an interface system, but as a socio-technical arrangement involving people, practices, media formats and service infrastructures.

This blueprint serves as a bridge between the analytic work of Chapters 1–4 and the more concrete design proposal developed in Chapter 6. Rather than presenting a generic technology solution, it translates the thesis findings into a structured conceptual foundation for a communication service designed to support emotional presence, narrative inclusion and relational continuity across distance.

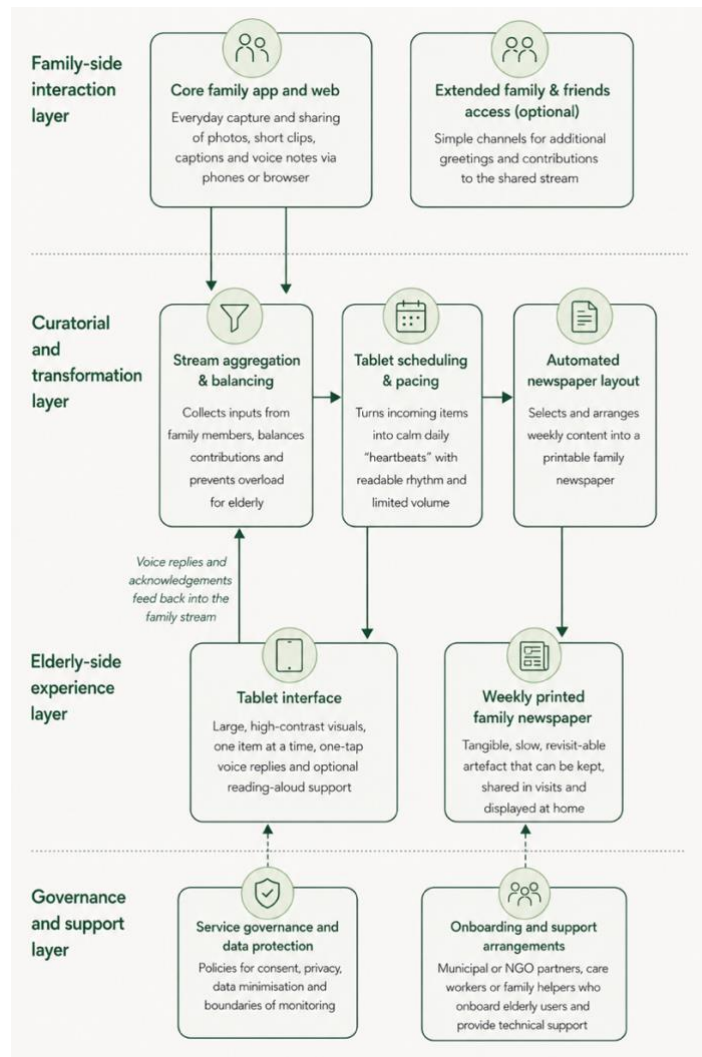


Figure 5.4 Evidence-informed blueprint for concept articulation.

*The blueprint distinguishes between family-side interaction, the curatorial and transformation logic, the elderly-side experience and the governance and support structures that hold the service together. It shows how everyday digital inputs can be translated into calm domestic updates, periodic tangible outputs and simple reply channels, while preserving attention to ethical care and data protection.*

## **6 DESIGN PROPOSAL: FAMILY HEARTBEAT**

### **6.1 Concept overview: from scattered updates to daily heartbeats**

Building on the evidence-informed blueprint outlined in Chapter 5, the proposed concept is articulated here as FAMILY HEARTBEAT, a hybrid family communication service for geographically separated families. The concept is designed to respond directly to the tensions identified in Chapter 4: elderly people's experience of social invisibility, family members' guilt-driven and time-pressured communication patterns, the mismatch between digital and tangible media, and the barriers created by complex communication tools. Rather than treating these issues separately, FAMILY HEARTBEAT brings them together within a single service ecology that aims to support emotional presence, narrative inclusion and relational continuity across distance.

At its core, the concept transforms scattered family updates into a more rhythmic and meaningful communication flow. Instead of relying only on occasional calls, isolated messages or infrequent visits, the service creates two complementary outputs from everyday family sharing: calm, daily digital heartbeats delivered through a simplified tablet experience, and a weekly printed family newspaper that brings selected moments into a tangible, revisitable form. In this way, the concept addresses the dual requirement identified earlier in the thesis: communication must be both immediate enough to create a background sense of ongoing life and stable enough to support reflection, memory and display in the home.

The concept deliberately avoids introducing a highly technical or medicalized solution. On the family side, it works through familiar mobile and web-based sharing practices, while on the elderly side it repurposes an existing tablet into a dedicated home display shaped by radical simplicity, legibility and low-pressure participation. Crucially, FAMILY HEARTBEAT is not designed as a one-way feed from younger relatives to older recipients. It is structured as a bidirectional communication environment in which elderly users can respond through voice, simple choices and selected images, thereby becoming visible participants in the family narrative rather than passive recipients of care or information.

Seen in relation to the framework established in Chapter 5, FAMILY HEARTBEAT can therefore be understood as a concrete instantiation of the thesis's design principles. It operationalizes elderly-centered narrative agency through visible reply channels, hybrid immediacy and tangibility through tablet and print outputs, radical simplicity on the elderly side through calm interaction design, and frictionless integration on the family side through lightweight contribution flows. The sections that follow describe how this concept is structured across interfaces, features and user journeys.

In parallel with the functional concept, a coherent visual identity was developed to support a calm, trustworthy and legible character across all touchpoints; its core elements are presented in Appendix 1 and applied in the elderly and family interfaces described in Sections 6.2 and 6.3.

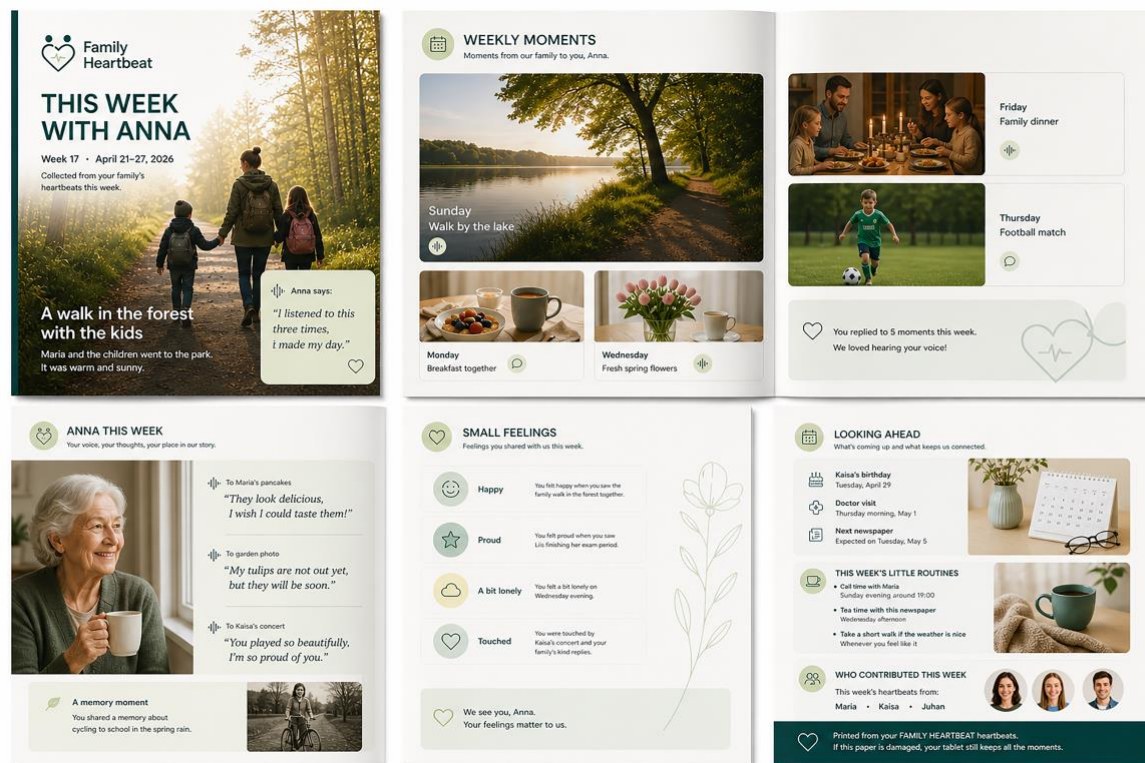


Figure 6.1 Family Heartbeat weekly newspaper prototype "This Week with Anna".

## **6.2 Elderly interface design: calm, legible and participatory**

The elderly-facing side of FAMILY HEARTBEAT is designed as a simplified tablet interface that can remain present in the home as a calm domestic object rather than an intrusive digital device. This responds directly to the findings that many older adults feel excluded by mainstream interfaces because of small text, confusing navigation, unpredictable changes and fear of making mistakes. The interface therefore prioritizes large visuals, stable layouts, high contrast, clear labels and a minimal number of actions, ensuring that interaction feels safe, legible and low-pressure even for users with limited digital confidence.

The home screen presents one piece of content at a time, such as a family photo, a short captioned update or a voice message linked to an image. Rather than encouraging rapid browsing, the system adopts a slow and readable rhythm in which new items appear as daily heartbeats and can be revisited without urgency. Core functions include Today's Heartbeat, which foregrounds the most recent update; Listen Again, which replays a voice note or reads text aloud; Reply with My Voice, which allows the user to send a simple spoken response; and My Newspapers, which stores earlier weekly issues in a clear, browsable archive. These functions translate the design principle of radical simplicity into specific interaction patterns grounded in the barriers and preferences identified in Chapter 4.

At the same time, the elderly interface is not only simplified but also participatory. A central aim of the concept is to counter the "spectator feeling" described in the findings, where older adults observe family life without seeing their own experiences reflected back. For this reason, the interface includes low-effort reply channels that make emotional expression possible without demanding technical fluency. One-tap voice replies, simple acknowledgements and occasional prompted sharing make it easier for elderly users to contribute in ways that feel meaningful but not burdensome. In this sense, the tablet is designed not merely as a display surface but as an interface for relational presence.

This side of the system also acknowledges that ageing is heterogeneous and that users' capacities may shift over time. Settings such as font size, contrast, volume and reading support can be adjusted by family members or trusted helpers, but the everyday user experience remains uncluttered and stable. The result is an elderly interface that aims to reduce cognitive and emotional burden while preserving the older person's visibility, voice and sense of agency within ongoing family communication.

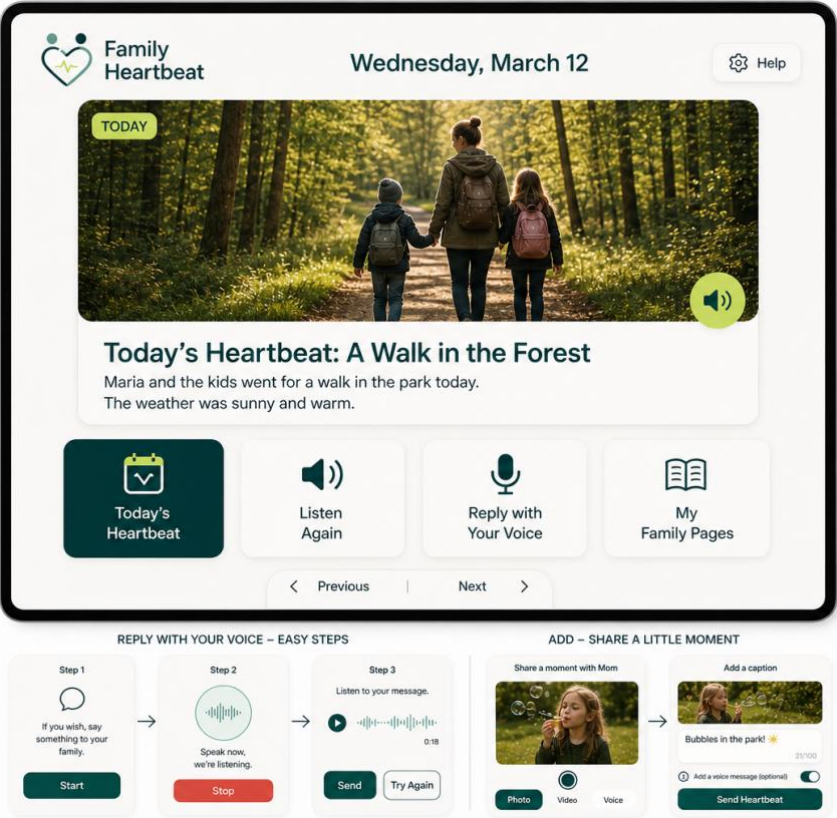


Figure 6.2 Default home screen of the elderly-facing interface, presenting recent family updates in a calm, legible layout.

Additional screen views of the elderly interface, including further home states and reply flows, are provided in Appendix 2.

## **6.3 Family interface design: frictionless sharing and curated care**

The family-facing side of FAMILY HEARTBEAT is designed around the realities described by adult children and other relatives in the empirical material: concern for elderly parents exists, but communication is often fragmented by work, childcare, fatigue and digital overload. Instead of expecting family members to adopt a highly deliberate or time-intensive caregiving tool, the concept seeks to lower the activation energy of contact by integrating into habits they already have. This means that sharing a small family moment should feel close to ordinary phone use rather than like a separate emotional task requiring planning, curation and sustained attention.

The family interface therefore centers on fast contribution flows. Users can capture or select a photo, add a short caption or voice note, and send it into the shared family stream with minimal effort. The system then assists with curatorial work that would otherwise create friction, such as balancing contributions across family members, selecting suitable items for the weekly print artefact and highlighting responses from the elderly user. Gentle prompts help maintain rhythm without turning communication into obligation, especially after long silences or around meaningful dates. This approach responds directly to the problem of guilt-driven communication by making small acts of presence easier and more routine.

A second important function of the family interface is to make the elderly person's contributions visible and valued. Rather than treating replies as background feedback, the app surfaces them clearly. For example through labels such as Today from Mom or Grandpa's voice, so that the older person appears as a contributor to shared family life. This design move reflects the broader argument of the thesis: emotionally meaningful communication depends not only on sending content to elderly relatives, but on making room for their perspective within the family narrative. By doing so, the family interface supports not only efficient sharing but also the redistribution of narrative agency described in Chapters 4 and 5.

The family-side experience may also include a lightweight coordination layer for siblings or extended relatives. A shared Care Circle view can show recent contributions, upcoming print timing and simple indications of elderly engagement without relying on gamified metrics or pressure-inducing dashboards. This maintains alignment among contributors while respecting the thesis’s emphasis on emotional calibration, low burden and scaffolding rather than surveillance.

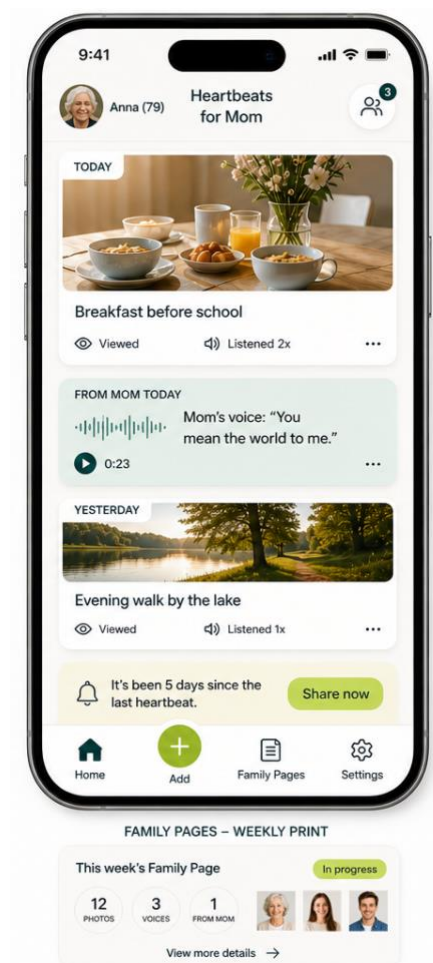


Figure 6.3 Main family dashboard, showing recent contributions, upcoming print cycles and a concise overview of the elderly relative’s engagement.

Extended screen views of the family interface, including detailed dashboards and contribution flows, can be found in Appendix 3.

## 6.4 Dementia-sensitive features and memory support

While the previous sections describe the core FAMILY HEARTBEAT experience for elderly and family users, the concept must also respond to a more vulnerable subgroup within the target population: older adults living with mild cognitive impairment or early-stage dementia. Extending the principles of radical simplicity, calm interaction and emotional presence introduced in Sections 6.2 and 6.3, this section outlines how dementia-sensitive features can be integrated directly into the mainstream elderly interface. Rather than separating these users into a parallel or clinical system, the design aims to support memory, recognition and expression within the same family communication environment, thereby helping them remain visible in everyday family life.

In this context, FAMILY HEARTBEAT incorporates dementia-sensitive support not as a diagnostic tool or monitoring system, but as an extension of its relational design logic. The goal is not to test recall or manage decline, but to sustain recognition, familiarity and emotional participation through simplified, supportive interactions. This orientation is consistent with the thesis's broader argument that older adults should remain present as relational subjects within family life rather than becoming primarily objects of care, concern or supervision.

A dedicated Memory Moments mode offers one way of realizing this principle. Here, the tablet periodically presents large, familiar visual cards that combine archival family photos, names and short prompts linked to emotionally meaningful events or relationships. Instead of asking the user to remember correctly, the system invites low-stakes reminiscence and expression, for example by offering a voice response option or a small set of feeling-based selections such as happy, proud or nostalgic. These interactions are repeatable, forgiving and non-evaluative, ensuring that the user is not confronted with failure or correction.

On the family side, responses generated through these moments are returned as contextualized fragments of communication, such as a selected feeling or a short recorded message. This allows relatives to encounter the older person's inner world not only through caregiving updates, but through emotionally resonant traces of memory

and recognition. In this way, dementia-sensitive features are integrated into the wider concept as a continuation of the same core aim: reducing loneliness and social invisibility by preserving channels for expression, acknowledgment and presence even when cognitive abilities fluctuate.

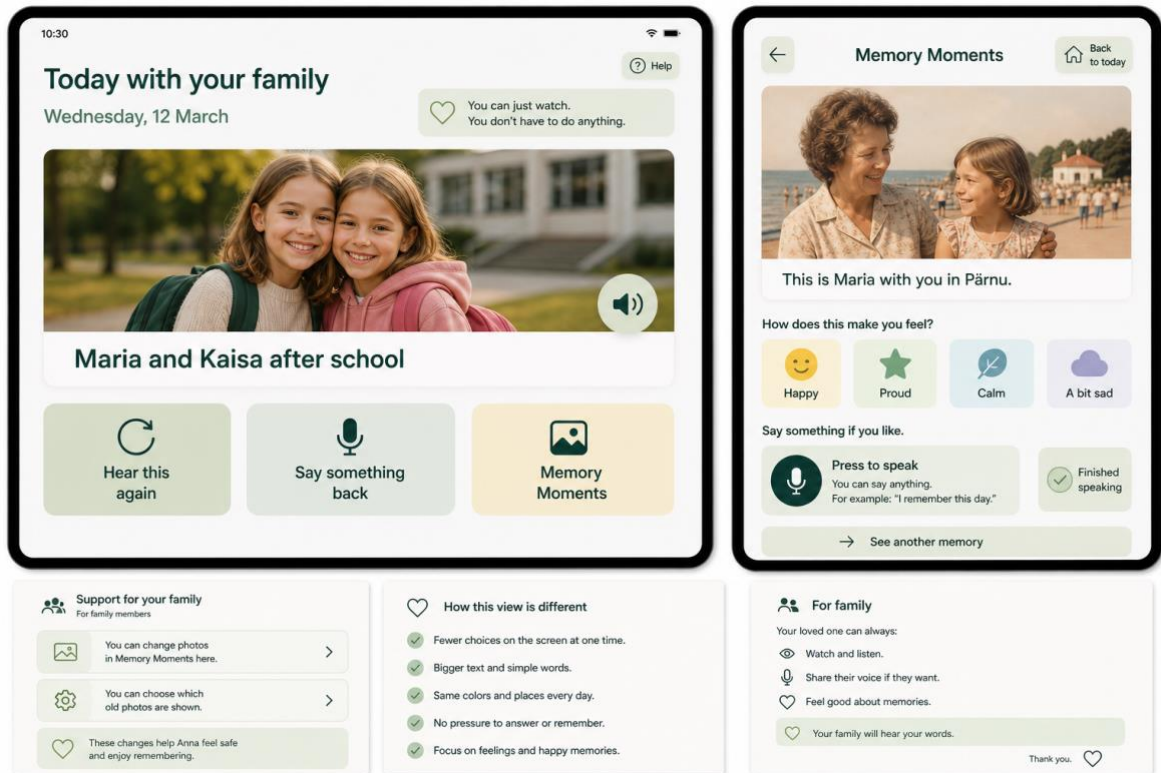


Figure 6.4 Memory Moments mode supporting dementia-sensitive reminiscence.

## 6.5 Personas and user journeys

To make the proposed system more concrete and to demonstrate how the design framework translates into everyday life, this section presents a small set of composite personas and a simplified weekly user journey. These are not fictional additions detached from the research, but interpretive tools derived from the themes, tensions

and opportunity areas developed across Chapters 3–5. They help show how FAMILY HEARTBEAT might operate across different family structures, digital abilities and support needs while maintaining coherence with the thesis’s central design principles.

### 6.5.1 Personas

To make the proposed system more concrete and to show how it responds to the empirical findings, this section presents simplified personas and illustrative user journeys for the main stakeholder groups. The personas are derived from interview material and contextual observation, but are intentionally composite rather than one-to-one representations of individual participants. They serve as narrative tools for testing whether the design aligns with the emotional, practical and technological realities described in Chapters 4 and 5.

**Anna (79, Pärnu)** represents an independently living older adult with low digital confidence but strong attachment to printed family materials and everyday routines. She values letters, photographs and visible reminders of family presence, yet often feels like she is watching others’ lives from the margins rather than participating in them. In Anna’s scenario, FAMILY HEARTBEAT becomes a calm kitchen-table device that brings in small daily family moments without demanding technical competence, while the weekly printed newspaper gives her something tangible to revisit and share with visitors. Her role within the system is not limited to receiving content: her spoken replies and selected reactions also flow back into the family stream, helping her feel more present in family life.

**Maria (34, Helsinki)** represents a geographically distant adult child balancing employment, parenting and transnational family obligations. She cares deeply about her mother but often experiences communication through guilt and delay, contacting her more reactively than she would like. In Maria’s scenario, the family app reduces the threshold of communication by allowing ordinary moments: a child’s drawing, a short commute photo, a brief voice note to be sent with almost no extra effort. The result is

not only more frequent contact, but a lighter and less burdened rhythm of emotional presence.

**Jaan (82, rural South Estonia)** represents an elderly user with early-stage dementia whose family connection depends partly on support from a daughter and a nearby helper. In his scenario, Memory Moments and simplified interaction pathways create opportunities for recognition and response even when language or recall varies from day to day. The system does not require him to master a general-purpose communication tool; instead, it offers a structured environment in which emotionally meaningful participation remains possible. His persona illustrates how the concept can remain inclusive without fragmenting into a separate clinical solution.

Taken together, these personas show that the system is designed not for one ideal user but for a range of relational and cognitive conditions. They also reinforce the framework developed earlier: different users encounter the concept through different needs, but the same principles: narrative agency, hybrid media, simplicity, low friction and emotional calibration remain active across all cases.

### **6.5.2 Weekly FAMILY HEARTBEAT journey**

A weekly journey helps to illustrate how FAMILY HEARTBEAT weaves together the everyday actions of elderly users, core family members and the background service into a coherent rhythm. Rather than relying on single, high-stakes calls, the concept distributes small moments of connection across the week and across actors. Figure 6.2 visualizes this rhythm over seven days, showing how daily heartbeats on the tablet and the weekly printed family newspaper emerge from ordinary family sharing practices.

On Day 1, the initiative typically starts on the family side. One or more core family members share a quick photo or short clip from their everyday life via the app – for example, a moment from work, a grandchild’s activity or a view from a walk. The FAMILY HEARTBEAT service aggregates these contributions and schedules them into the upcoming sequence of calm daily heartbeats, avoiding an immediate burst of

notifications for the elderly person. When the elderly user glances at the tablet later that day, they see a single, clearly framed photo with a short caption, presented as that day's heartbeat.

On Days 2 and 3, this pattern continues at a low intensity. The elderly person sees new heartbeats appear in the familiar home view and can, if they wish, listen again to earlier updates. When they feel moved to respond, they can send a short voice message using the one-tap reply flow described in Section 6.2. On the family side, relatives occasionally see prompts or highlights of these replies in their dashboard and may answer with another small update. The service layer quietly manages timing and order, ensuring that the tablet experience remains slow and legible even if several family members contribute in parallel.

By Days 4 and 5, a small collection of updates has accumulated. Core family members may add a few moments they explicitly want to see in that week's printed newspaper, such as a significant event or photo they know will matter to the elderly person. The FAMILY HEARTBEAT service selects representative content from the week, taking into account both family contributions and the elderly person's replies, and generates a draft layout for the newspaper. From the family interface, relatives can glance at a digital preview of this layout and make light adjustments if needed, without engaging in manual design work.

On Day 6, the focus shifts more strongly to materialisation. The service finalises the weekly layout and sends it to the print provider, while also updating the family dashboard with the expected delivery status. For the elderly user, the tablet continues to show calm daily heartbeats drawn from the existing pool of content, maintaining continuity without requiring any additional action. This separation between digital preparation and tangible output reduces pressure on both sides while still moving the week towards a concrete, shareable artefact.

On Day 7, the printed family newspaper arrives at the elderly person's home. They can revisit the week's moments at their own pace, keep the paper in a visible place and occasionally show it to visitors, turning mediated updates into part of the material fabric

of everyday life. Core family members receive a notification that the newspaper has been delivered, providing reassurance that their earlier contributions have resulted in something tangible. Across the week, the combined actions of elderly users, family members and the service have transformed scattered digital updates into a steady rhythm of emotional presence that is both immediately accessible on the tablet and durably anchored in print.

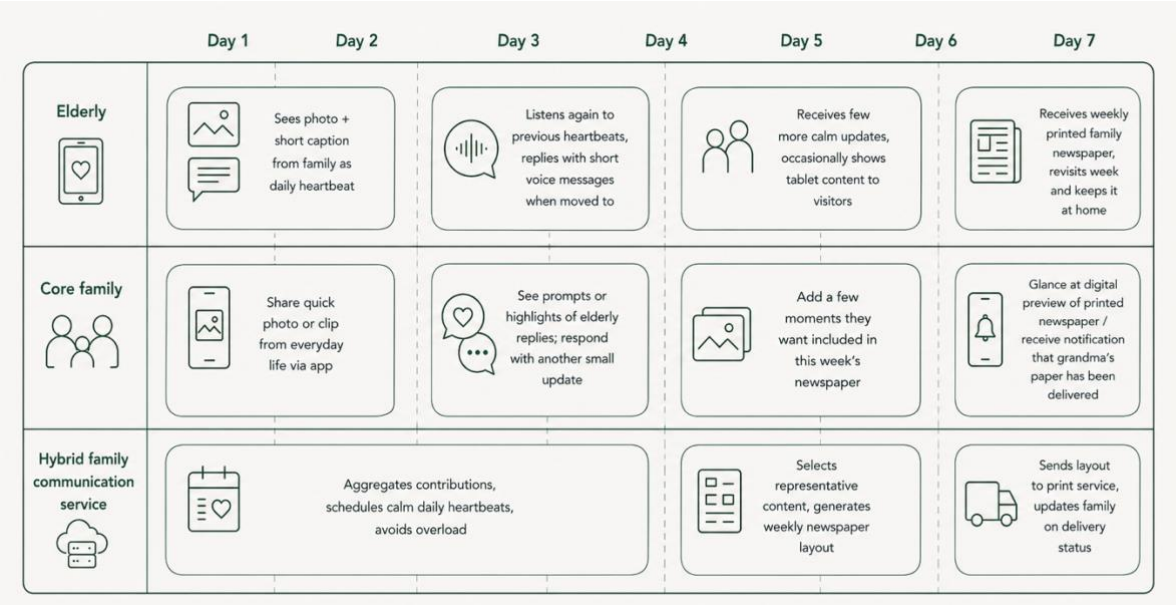


Figure 6.5 Weekly FAMILY HEARTBEAT journey across elderly, family and service.

*The weekly journey diagram illustrates how everyday contributions from family members, the system’s pacing and elderly experiences unfold over a typical week, culminating in the printed family newspaper. It shows how small, distributed actions add up to a sense of continuous emotional presence.*

## **7 DISCUSSION**

### **7.1 Addressing the research questions**

This thesis set out to explore how human-centered design could strengthen long-distance family relationships for independently living elderly people in Estonia by addressing social invisibility, emotional disconnection and media mismatch. The findings and the resulting design proposal together show that the issue is not simply a lack of contact, but a deeper problem of how presence, visibility and participation are distributed within geographically separated families. In this sense, the discussion returns to the research questions by showing how empirical insight, theoretical framing and design development inform one another.

The first research question asked how independently living elderly people and their geographically distant family members experience emotional disconnection and social invisibility in daily life. The findings suggest that many elderly participants are not entirely disconnected in a technical sense, yet still feel peripheral to family life because communication tends to be functional, occasional and asymmetrical. Their role often becomes that of a spectator rather than a participant: they receive selected updates, but their own everyday routines, thoughts and emotions remain weakly represented in the shared family narrative. On the family side, communication is shaped by affection but also by guilt, time pressure and digital fatigue, resulting in reactive rather than continuous emotional presence. Together, these patterns support the argument that social invisibility is a useful interpretive lens for understanding later-life loneliness in the context of distance, because it highlights not only whether contact exists, but whose life becomes visible within it.

The second research question examined what digital and tangible barriers hinder meaningful family communication, and how preferences for physical media emerge. Here, the study revealed a clear mismatch between generations: elderly participants often preferred printed photos, letters and other stable artefacts that could be touched, revisited and displayed, while younger relatives relied on fast, fragmented and highly visual digital channels that fit their everyday routines but frequently excluded older users. At the same time, the issue was not technology in itself, but the complexity, unpredictability and cognitive effort built into mainstream tools. Existing market solutions partly address this divide, but they tend either to privilege the family side

through digital-first interaction or the elderly side through slower, one-way print services. The study therefore answers RQ2 by showing that communication barriers arise from a structural gap between digital immediacy and tangible permanence, compounded by usability challenges, low confidence and role asymmetry.

Building on these two research questions, the thesis then translated the empirical findings into design principles, opportunity areas and a concrete proposal. Rather than treating design development as a separate third research question, the proposal functions here as a synthesis of the issues identified through RQ1 and RQ2. It responds to emotional disconnection by supporting more continuous forms of mediated presence, to media mismatch by combining digital input with tangible and revisit-able outputs, and to narrative asymmetry by making room for the older person's own contribution. In this way, the proposal is not presented as an abstract technological answer, but as an evidence-informed response to the lived conditions described by participants and interpreted through the conceptual framework of the thesis.

## **7.2 Implications for design practice**

One of the clearest implications of this thesis for design practice is that long-distance family communication in later life should not be evaluated primarily through frequency or technical availability. A family may exchange calls, messages or occasional updates and still leave the older person feeling unseen in everyday relational terms. The findings suggest that emotionally meaningful communication depends on whether the elderly person is represented, acknowledged and able to contribute within the ongoing flow of family life. This shifts the design focus from "how to increase contact" toward how to support emotional presence, narrative inclusion and mutual recognition across distance.

A second implication concerns the importance of designing communication ecologies rather than isolated interfaces. Existing tools tend to optimize for a single side of the relationship: either speed and convenience for busy family members or simplicity and

tangibility for elderly recipients. The thesis suggests that a more effective direction lies in deliberately hybrid systems that operate across different temporalities and media forms. In this view, digital content is valuable because it supports continuity and low-friction sharing, while print is valuable because it stabilizes that content, gives it domestic presence and makes it easier to revisit without technical effort. Hybrid media should therefore be treated not as an aesthetic embellishment, but as a strategic way of reconciling mismatched communication habits.

A third implication is that accessibility in this context must be understood as relational and emotional as well as technical. For elderly users, accessible design includes legibility, low cognitive load, forgiving interaction and confidence-preserving flows, but it also includes the feeling that one's participation matters. For family members, accessibility means that contributing should not require a second full-time job of curation, coordination and emotional management. This means asymmetry is not a flaw but a necessity: one side may need automation, prompts and aggregation, while the other needs calmness, stability and very limited decision points. Designing well for cross-generational communication therefore requires acknowledging unequal capacities without reproducing unequal value.

## **7.3 Implications for ageing and care policy in Estonia**

The thesis also has implications beyond design practice, especially for discussions around ageing, care and digital inclusion in Estonia. The findings suggest that emotional disconnection from family should not be treated only as a private matter, because it is closely tied to structural conditions such as migration, ageing in place, shrinking informal care networks and unequal digital participation. In policy terms, this means that emotional presence could be recognized as part of the broader support environment that helps older adults maintain wellbeing, belonging and motivation in everyday life.

Current policy frameworks tend to prioritize service access, physical care and administrative digitalization, but the study indicates that the emotional layer of family communication is also consequential.

A second policy implication is that digital inclusion strategies should not stop at formal access to e-services. An older person may be technically connected to the digital state and still remain excluded from the family's most meaningful communication practices. This suggests a need for a broader understanding of inclusion, one that considers whether older adults can participate in everyday mediated family life in ways that feel safe, legible and emotionally rewarding. Hybrid services like FAMILY HEARTBEAT point toward an alternative model in which digital infrastructure is used, but not imposed in its mainstream form, and where familiar physical artefacts remain part of the communication ecology.

The concept also implies a possible role for municipalities, libraries, community centers, social workers and civil society organizations in supporting hybrid family communication. These actors could help with onboarding, initial device setup, troubleshooting and low-threshold guidance, especially for elderly users in rural areas or with limited digital confidence. Rather than replacing family responsibility, such support would strengthen the conditions under which family contact can remain meaningful across distance. In that sense, the thesis positions hybrid communication services as a complement to ageing-in-place strategies and community support systems, not as a substitute for them.

## **7.4 Scaling from prototype concept to mainstream service**

Although FAMILY HEARTBEAT is presented as a conceptual and scenario-based proposal, the discussion also points to practical questions about how such a system might move toward implementation. A plausible early pathway would be small pilot deployments using repurposed tablets in households where family contact already exists but is constrained by media mismatch, usability barriers or guilt-driven rhythms. Such pilots would allow observation of whether the proposed weekly and daily rhythms are workable in real life, how much setup support is needed and how families negotiate contribution responsibilities over time. They would also help clarify whether the printed component is experienced as valuable enough to justify the logistical effort it requires.

Scaling the concept would likely depend less on a standalone app logic and more on a coordinated service ecosystem. The value of the proposal lies in the orchestration of multiple elements: family-side contribution, elderly-side display, curatorial logic, printing, delivery and ongoing support. This makes partnership models particularly relevant, involving print providers, municipalities, postal or delivery services, community organizations and potentially care-related actors. In other words, scaling should be understood as socio-technical integration rather than simple user growth.

At the same time, mainstreaming such a service raises questions of affordability and sustainability. A purely commercial subscription model may exclude those elderly users who are already most vulnerable because of income, geography or weak support networks, while a fully public model may be difficult to justify without evidence of psychosocial benefit. Hybrid funding models, including pilots, subsidies or partnerships with civil society organizations, may therefore be more realistic in the near term. This suggests that future development should attend not only to interface design but also to service design, governance and cost structure from the outset.

## 7.5 Equity considerations and risks

The proposed concept also brings important equity and ethical questions into view. First, a family-based communication service is inherently uneven in whom it can benefit most easily. Not all elderly people have geographically distant but emotionally available relatives, and not all families possess the time, devices, stability or motivation to contribute consistently. For that reason, FAMILY HEARTBEAT should be understood as one possible intervention within a broader anti-loneliness landscape, not as a universal answer to later-life isolation.

Second, there are risks related to privacy, consent and subtle coercion. Elderly users may not always fully understand how their responses, voice notes or images circulate, especially where cognitive decline is present or setup is handled by others. Likewise, family-facing visibility features could unintentionally generate guilt, obligation or a sense of surveillance if they are implemented too aggressively. These concerns reinforce the importance of privacy-by-design, clear consent mechanisms and the avoidance of gamified participation metrics. The concept should support care without transforming communication into monitoring.

A further equity concern relates to access and infrastructural dependency. Even though the concept reduces digital burden for elderly users, it still depends on functioning postal systems, available devices, electricity, family-side connectivity and some form of support for setup and maintenance. Rural location, low income, disability or weak family networks may therefore shape who can benefit and how reliably. This means that any future deployment should include attention to subsidies, community partnerships and fallback support structures so that the service does not reproduce the same exclusions it seeks to reduce.

## 7.6 Limitations and future research directions

Several limitations shape the scope of this thesis and define how its findings and design outcomes should be interpreted. First, the empirical base is qualitative, relatively small and purposively selected, focusing on independently living elderly people in Estonia and their geographically distant family members. This provides contextual depth and rich insight into patterns of social invisibility, media preference and communication strain, but it does not capture the full diversity of family structures, socioeconomic conditions, regional inequalities or levels of digital exclusion across the wider population. The findings should therefore be read as analytically meaningful rather than statistically generalizable.

A second limitation concerns temporality and method. The study is cross-sectional and relies mainly on interviews, contextual observation, document analysis and scenario-based concept development. As a result, it cannot show how communication routines, family participation, emotional responses or feelings of visibility might evolve over extended periods of real use. It also cannot fully anticipate novelty effects, declining engagement, device abandonment, shifts in family responsibility or tensions between digital rhythm and printed delivery over time. These questions would require longitudinal field trials in real households and comparison with families' existing communication practices.

A third limitation is that FAMILY HEARTBEAT remains a conceptual and design-level contribution rather than a fully implemented and evaluated intervention. Although the concept is grounded in empirical findings, theoretical framing, policy context and market analysis, its technical feasibility, service sustainability and measurable effects on loneliness or relational wellbeing have not yet been validated in practice. This is especially relevant in relation to the printed component, onboarding processes, data governance and the coordination demands placed on families or partner organizations. The proposal should therefore be understood as an evidence-informed design direction rather than a proven service model.

The dementia-sensitive elements of the concept also require particular caution. While the proposed Memory Moments mode and related features are informed by literature and adjacent design approaches, they have not been co-designed or tested directly with people living with dementia, their relatives and care professionals. Questions of consent, emotional safety, interpretation of responses and appropriate family mediation remain especially important here. Future research should therefore include participatory co-design with people living with dementia and their support networks, ensuring that such features remain relationally supportive rather than patronizing, confusing or unintentionally extractive.

Taken together, these limitations point toward several future research directions. The first is longitudinal household piloting, where families use a working version of the concept over weeks or months so that rhythms of sharing, reply behaviour, print value and emotional impact can be examined in practice. The second is participatory refinement of dementia-sensitive features, onboarding flows and consent mechanisms with elderly users of varying abilities and confidence levels. The third is systems-level research into how municipalities, libraries, community organizations, senior support services and potential commercial partners could help integrate hybrid family communication into broader ageing-in-place strategies in Estonia. These next steps would help move the thesis contribution from a strong conceptual proposition toward a more robust, ethical and scalable service ecology.

## 8 CONCLUSION

This thesis has argued that loneliness in later life should be understood not only as a problem of insufficient contact, but as a problem of visibility, recognition and emotional presence within geographically separated families. Focusing on independently living elderly people in Estonia and their distant family members, the study showed that emotional disconnection often emerges not from complete absence of communication, but from communication that becomes functional, fragmented and uneven in whose life it represents. In this sense, the thesis reframed later-life loneliness through the concept of social invisibility and used that perspective to guide both analysis and design development.

The research demonstrated that the communication gap between elderly people and their families is shaped by several interrelated tensions. Elderly participants often preferred tangible and revisitable media such as printed photos and letters, while younger relatives relied on fast, digital and low-friction sharing practices that fitted their everyday routines but frequently excluded older adults. At the same time, family communication was often constrained by guilt, time pressure, digital fatigue and the broader conditions of migration, ageing and shrinking informal care networks in Estonia. These findings support the thesis's argument that emotional presence is not guaranteed by technical connectivity alone and must instead be actively designed through rhythm, accessibility, representation and material form.

In response to these tensions, the thesis developed FAMILY HEARTBEAT as an evidence-informed hybrid concept designed to bridge them. On the family side, the concept supports low-friction sharing through familiar mobile and web interfaces, allowing everyday photos, short clips and voice notes to be sent with minimal additional effort. On the elderly side, these contributions are transformed into calm daily heartbeats on a simplified tablet and a weekly printed family newspaper that can be reread, displayed and shared with visitors. By also enabling one-tap voice replies and dementia-sensitive Memory Moments, the concept seeks not only to increase communication volume but to redistribute narrative agency back toward the older person, making them visible as an active participant in family storytelling rather than a passive recipient of updates.

The thesis makes three main contributions. First, it proposes an integrated conceptual framing that brings together social invisibility, emotional presence, hybrid media and digital exclusion as interconnected dimensions of later-life family communication. Second, it provides situated empirical insight into how independently living elderly people and geographically distant family members in Estonia experience distance, guilt, media mismatch and the erosion of everyday relational presence. Third, it offers a concrete design proposition through FAMILY HEARTBEAT, showing how these combined insights can be translated into a hybrid communication concept grounded in the realities of both family routines and elderly users' needs.

At the same time, the thesis recognizes its limitations. The empirical material is qualitative and small in scale, and the concept remains at a scenario-based stage rather than a fully implemented and evaluated service. Its long-term effectiveness, ethical robustness and scalability therefore remain questions for future research, especially through longitudinal field trials, participatory co-design with people living with dementia and collaboration with municipalities, service providers and community organizations. Even so, the work shows that designing against loneliness in later life requires more than making communication technically available: it requires designing for recognition, rhythm, tangibility and inclusion within the ongoing fabric of family life.

For Estonia, and for other ageing and highly digitalized societies, this thesis argues that emotional connection should be treated as a meaningful design and policy concern rather than a purely private matter. Hybrid services such as FAMILY HEARTBEAT suggest one possible pathway for turning technical connectivity into felt presence by aligning with families' existing digital habits while respecting older adults' preferences for slower and more tangible forms of communication. Ultimately, the thesis shows that designing against loneliness in later life means designing not only for access and safety, but also for recognition, inclusion and emotional presence in everyday family life.

## 9 SUMMARY

Population ageing, migration and regional depopulation are reshaping family life in Estonia, leaving many independently living elderly physically and emotionally distant from their closest relatives. While formal contact often continues through phone calls and occasional visits, the qualitative interviews in this thesis show that older adults frequently experience social invisibility – feeling like background figures in their families' narratives – while geographically distant family members struggle with guilt, time pressure and digital overload. A clear media gap emerges: elderly participants value tangible artefacts such as printed photos and letters, whereas younger relatives rely on fast, visual digital channels that many older users find confusing or exhausting. Existing communication tools tend to privilege either families (digital-first apps) or elderly recipients (print-only services) and seldom reconcile immediacy with tangibility or support elderly people as active narrators of family life.

The thesis set out three main objectives: to understand how independently living elderly in Estonia currently experience loneliness, social invisibility and distant family relationships; to explore inclusive opportunities for supporting emotional presence across distance; and to design a hybrid communication concept that offers elderly users individualized, accessible support. To address these aims, the work combines literature and policy review, market and competitive analysis, and qualitative fieldwork with design-oriented concept development. Empirical material includes semi-structured interviews with independently living elderly and geographically separated family members, contextual observations, and analysis of Estonian ageing and family policy documents. Thematic analysis of this material is used to derive design requirements, principles and opportunity areas for hybrid family communication.

The findings highlight three intertwined problem clusters. First, emotional presence in late-life family relationships is fragile: elderly parents often describe themselves as observers rather than protagonists in their children's and grandchildren's lives, receiving sporadic functional check-ins rather than being woven into everyday stories. Second, there is a pronounced mismatch between generational media preferences: older adults prefer slow, tangible and revisitable forms of communication, while younger relatives rely on fast, fragmented digital channels that can overwhelm or exclude elderly users.

Third, many existing tools place high cognitive and emotional demands on elderly users, requiring complex navigation, constant vigilance and adaptation to changing interfaces, thereby reinforcing feelings of incompetence and digital exclusion. Together, these patterns show that “being reachable” via technology is not the same as feeling relationally present and seen.

Building on these insights, the thesis develops a hybrid family communication concept that repurposes an existing tablet as a senior-friendly home display connected to a mobile and web application used by family members. Everyday photos, short video clips and voice notes shared by relatives are transformed into two coordinated outputs: calm daily “heartbeats” on the elderly person’s tablet and a weekly printed family newspaper delivered by post. On the elderly side, the interface emphasizes radical simplicity, large and legible visuals and one-tap voice replies, with an optional dementia-sensitive mode that supports reminiscence and emotional expression. On the family side, one-tap sharing, automated layout, gentle prompts and prominent display of elderly responses reduce friction in everyday care and help redistribute narrative agency back to elderly participants as visible storytellers.

The thesis argues that this concept translates abstract concerns about loneliness, digital exclusion and demographic change into a situated, evidence-informed design proposition. Conceptually, the work proposes an integrated framework linking social invisibility, emotional presence, hybrid media and digital exclusion in later-life family relationships. Empirically, it contributes insight into how Estonian families negotiate distance, guilt and media preferences, and how these negotiations shape everyday experiences of connection and disconnection among independently living elderly. From a design perspective, the thesis shows that hybrid print–digital services can reconfigure existing devices and routines into calmer, more inclusive channels that turn mere connectivity into felt presence.

From the author’s perspective, the thesis successfully meets its initial objectives by combining theoretical and policy analysis, qualitative fieldwork and design experimentation into a coherent, practice-oriented outcome. At the same time, several limitations remain. The empirical base is qualitative and small in scale; the proposed system is articulated at the level of concept and scenarios rather than as a fully

implemented and evaluated service. Important questions – such as long-term adoption in real households, integration into municipal or care-provider infrastructures, accessibility for people with more advanced dementia, and economic sustainability at scale – fall beyond the current scope and require future work. Addressing these open issues through longitudinal field trials, participatory co-design with people living with dementia and their relatives, and collaboration with policy-makers would be essential steps toward turning the concept into a robust contribution to ageing-in-place strategies in Estonia and comparable digital societies.

## 10 KOKKUVÕTE

Rahvastiku vananemine, ränne ja piirkondlik rahvastiku vähenemine muudavad perestruktuure Eestis, jättes paljud iseseisvalt elavad eakad oma lähedastest nii füüsiliselt kui emotsionaalselt kaugemale. Kuigi formaalne kontakt telefonikõnede ja aegajalt toimuvate külastuste näol sageli säilib, näitavad magistritöös läbiviidud kvalitatiivsed intervjuud, et eakad kogevad sageli sotsiaalset nähtamatust — tunnet, et nad on oma pere loos pigem taustategelased —, samal ajal kui geograafiliselt eraldatud pereliikmed maadlevad süütunde, ajasurve ja digiväsimusega. Esile kerkib selge meedialõhe: eakad väärtustavad käegakatsutavaid artefakte, nagu trükitud fotod ja kirjad, samas kui nooremad sugulased toetuvad kiiretele visuaalsetele digikanalitele, mida paljud vanemaealised tajuvad segaste või kurnavatena. Olemasolevad suhtluslahendused kipuvad eelistama kas pereliikmeid või eakaid ega suuda sageli ühildada vahetust ja materiaalsust ega toetada eakaid aktiivsete pereloo jutustajatena.

Magistritöö eesmärk oli uurida, kuidas iseseisvalt elavad eakad ja nende geograafiliselt eraldatud pereliikmed kogevad emotsionaalset eemaldumist ja sotsiaalset nähtamatust, millised digitaalsed ja materiaalsed tõkked takistavad tähenduslikku peresuhtlust ning kuidas disain võiks nendele probleemidele vastata. Nende eesmärkide saavutamiseks ühendab töö kirjanduse ja poliitikadokumentide analüüsi, turu- ja konkurentsikaardistuse ning kvalitatiivse välitöö disainisuunalise kontseptsiooniarendusega. Empiiriline materjal hõlmab poolstruktureeritud intervjuusid iseseisvalt elavate eakate ja geograafiliselt eraldatud pereliikmetega, kontekstuaalseid vaatlusi ning Eesti vananemis- ja perepoliitikat käsitlevate dokumentide analüüsi. Temaatilise analüüsi abil tuletatakse sellest materjalist disaininõuded, põhimõtted ja võimalusalad, mis loovad aluse hilisemale disainiettepanekule.

Tulemused tõid esile kolm omavahel seotud probleemiklastrit. Esiteks ilmnes, et emotsionaalne kohalolu hiliseas perekondlikes suhetes on habras: eakad kirjeldavad end sageli pigem pealtvaatajate kui osalistena oma laste ja lastelaste elus. Kuigi side võib formaalselt püsida, jääb see sageli funktsionaalseks, lühikeseks ja ebaühtlaseks selles, kelle elu tegelikult nähtavaks tehakse. Teiseks ilmnes tugev meedialõhe põlvkondade vahel: eakad eelistavad aeglasemaid, käegakatsutavaid ja uuesti vaadatavaid suhtlusvorme, samas kui nooremad pereliikmed kasutavad kiireid ja killustunud digikanaleid, mis sobivad nende igapäevarutiinidega, kuid ei vasta alati eakate võimetele ega eelistustele. Kolmandaks näitas materjal, et paljud olemasolevad

suhtlusvahendid seavad eakatele kõrged kognitiivsed ja emotsionaalsed nõudmised, nõudes keerukat navigeerimist, pidevat kohanemist ja tehnilist enesekindlust.

Nendele tulemustele tuginedes arendab magistritöö välja FAMILY HEARTBEATi — peresuhtluse disainiettepaneku, mis ühendab pereliikmete tuttavad digitaalsed jagamisviisid eakatele sobivate rahulike ja materiaalselt kohalolevate väljunditega. Kontseptsioon kasutab olemasolevat tahvelarvutit eakale sobiva koduse ekraanina ning seob selle pere mobiili- ja veebirakendusega. Pereliikmete jagatud fotod, lühivideod ja helisõnumid teisendatakse kaheks koordineeritud väljundiks: rahulikeks igapäevasteks „heartbeats“ vaadeteks tahvilil ning kord nädalas ilmuvaks trükitud pereleheks. Eakale suunatud liides rõhutab radikaalset lihtsust, suuri ja loetavaid visuaale ning ühe puudutusega häälvastuseid; lisaks on võimalik laiendada süsteemi dementsussõbralike funktsioonidega, mis toetavad meenutamist ja emotsionaalset eneseväljendust. Pere poolel aitavad lihtne jagamine, automaatne kureerimine, õrnad meeldetuletused ja eaka vastuste esiletõstmine vähendada suhtluse hõõrdumist ning anda eakale tagasi suurem nähtavus ühises pere loos.

Magistritöö panus on kolmetine. Esiteks pakub see kontseptuaalse raamistiku, mis seob sotsiaalse nähtamatuse, emotsionaalse kohalolu, hübriidmeedia ja digitaalse tõrjutuse hilisea peresuhtluse võtmeteemadeks. Teiseks annab töö empiirilist sissevaadet sellesse, kuidas Eesti pered kogevad distantssi, süütunnet, meedialõhet ja igapäevase läheduse nõrgenemist. Kolmandaks esitab töö tõenduspõhise disainiettepaneku, mis näitab, kuidas neid teadmisi saab tõlkida situatsioonitundlikuks ja arutletavaks suhtluslahenduseks.

Samas jäävad tööle ka piirangud. Empiiriline alus on kvalitatiivne ja väikesemahuline ning pakutud süsteem on esitatud kontseptsiooni ja stsenaariumide tasandil, mitte täielikult teostatud ja testitud teenusena. Seetõttu jäävad lahtiseks küsimused pikaajalise kasutuse, teenuse majandusliku kestlikkuse, omavalitsuste või hooldusteenustega lõimimise ning dementsusega inimeste kasutuskogemuse kohta. Edasine uurimistöö võiks hõlmata pikemaajalisi väliteste päris peredes, kaasdisaini dementsusega inimeste ja nende lähedastega ning koostööd kohalike omavalitsuste, kogukonnaorganisatsioonide ja teenusepakkujatega. Sellised sammud aitaksid viia töö kontseptuaalsest ettepanekust tugevama ja praktilisemalt rakendatava teenuse suunas.

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## **APPENDICES**

Appendix 1. Elderly interface design – screen views

Appendix 2. Family interface design – screen views

1. Elderly home / Today's heartbeat

Default: calm state

2. Audio heartbeat state

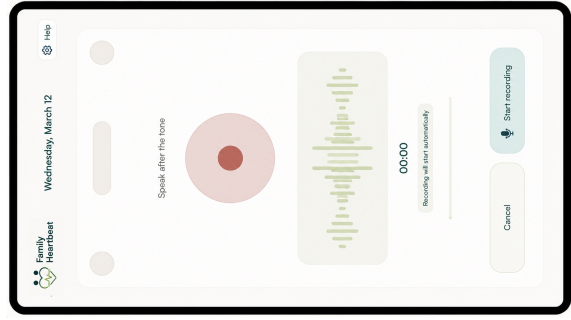
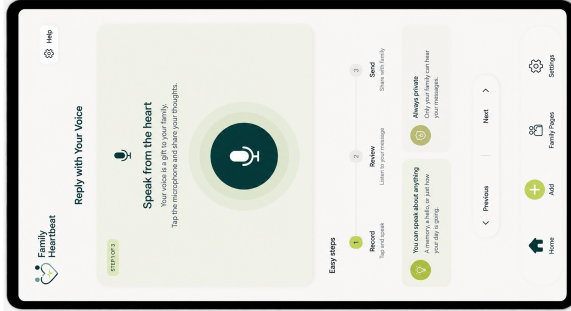
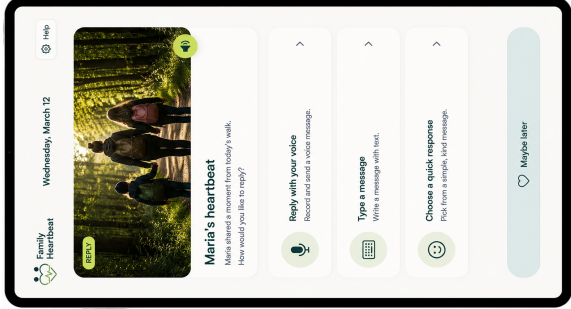
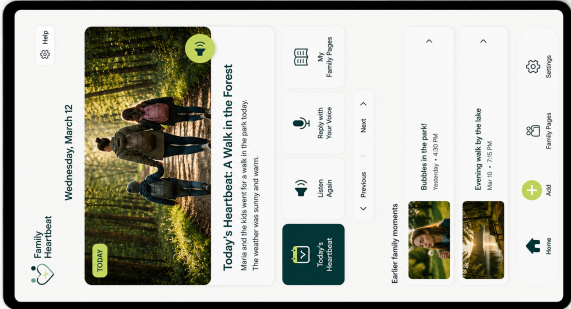
Listening- focused content

3. Reply start

Choose simple response mode

4. Reply recording

Voice reply capture



5. Reply review / send

Confirm before sending

6. My family pages archive

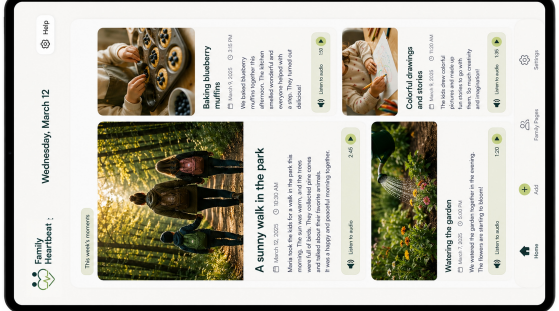
Browse previous weekly issues

7. Opened weekly family page

Full issue reading view

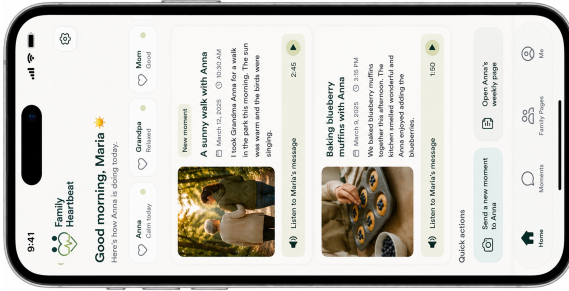
8. Opened weekly family page - zoomed detail state

Reading / zoomed detail state



1. Family home feed

See elderly heartbeat and status



2. Capture photo / video

Start new share



3. Compose and select recipients

Add caption, choose elderly



4. Weekly page review

See upcoming print layout



5. Elderly responses view

Listen to replies



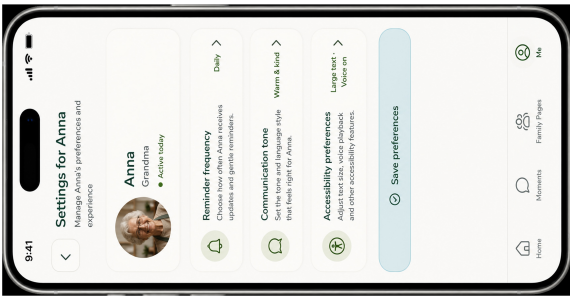
6. Nudges / Gentle reminders

Prompt to share



7. Settings for elderly profile

Frequency, tone, access



8. Household view / Multi-elderly

Switch between relatives

