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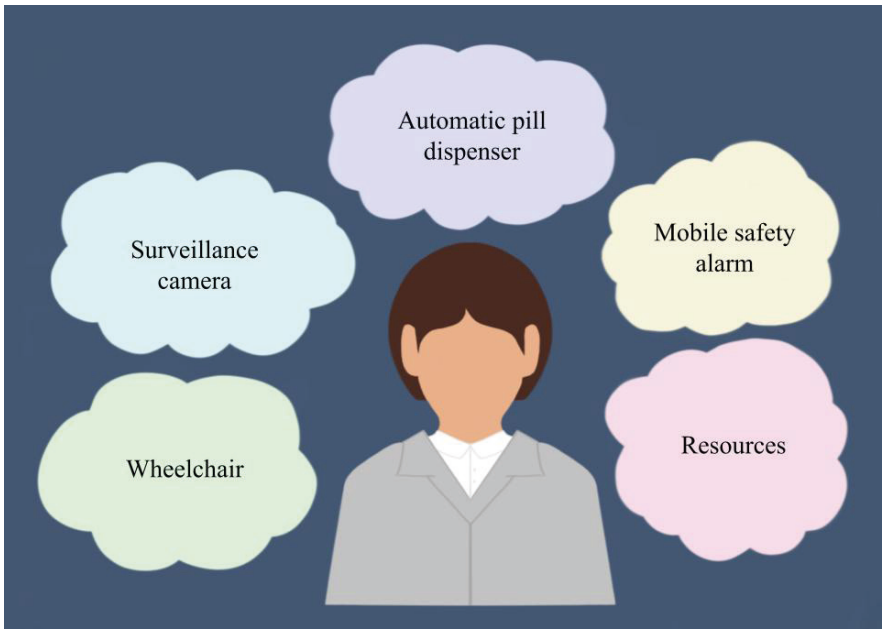
Assistive technology and welfare technology explorations

Aspects of perception, utilisation and decision-making

Katarina Baudin



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ASSISTIVE TECHNOLOGY AND WELFARE TECHNOLOGY EXPLORATIONS

ASPECTS OF PERCEPTION, UTILISATION AND DECISION-MAKING

Katarina Baudin

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School of Health, Care and Social Welfare

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Akademisk avhandling

Som för avläggande av filosofie doktorsexamen i vårdvetenskap vid Akademin för hälsa, vård och välfärd kommer att offentligen försvaras fredagen den 28 maj, 2021, 9.15 i sal C1007, Mälardalens högskola, Eskilstuna.

Fakultetsopponent; Professor Maria Haak, Kristianstad Högskola, Lunds Universitet

Akademin för hälsa, vård och välfärd

Abstract

Aims: The overall aim of this thesis was to explore decision makers' and professionals' perceptions, utilisation, and decision-making about assistive technology (AT) and welfare technology (WT) within the interprofessional field of care for older adults. ***Methods***: A literature review was conducted, including nine peer-reviewed scientific articles (I), analysed with a qualitative descriptive method. A web-based questionnaire, answered by 393 officials and health care providers in municipal eldercare (II and III), was analysed using content analysis of the open-ended answers (II) and descriptive and inferential statistics of the closed-ended answers (III). A semi-structured interview with 24 decision makers was also conducted and analysed with thematic reflexive analysis. ***Results***: The studies revealed a lack of evidence-based decision models to support assistive and welfare technology decisions, partly due to the context being complex and multifaceted. The technology was perceived as progressive and cutting-edge, while organizational structure and culture were perceived as regressive and resistant to change. The results revealed personnel working with WT were generally very positive toward new technology, although there were age, gender, participation, and professional differences. Study IV results revealed that supportive aspects, technology aspects, patient aspects, and knowledge aspects influence AT-organizations' decision-making. Although AT/WT has been portrayed to have the potential to solve the challenges of an aging population, the decision-making regarding AT/WT is complex and evolving. Increased communication between government, regions, and municipalities to support the development of guidelines would enhance the goal of a person-centred care. ***Conclusion***: This thesis contributes to knowledge of decision-making models, focusing on GATE´s model (Khasnabis et al., 2015) applicable in AT/WT.
Further development and deepen knowledge in the area of AT/WT appears as needed due to results showing that there is a lack of structured knowledge about the decision-making processes and evaluations of effects of AT/WT.

Keywords: assistive technology, welfare technology, older adults, health care providers, content analysis, cross-sectional, thematic analysis, interdisciplinary health care professionals, decision-making, managers, utilisation, perception

"When a flower does not bloom, you fix the environment in which it grows, not the flower."
- Alexander den Heijer

Abstract

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List of papers

This thesis is based on following papers, which are referred to in the text by their Roman numerals.

I. Baudin, K. Sundström, A., Mullersdorf, M., Gustafsson, C. (2020). The policies of Provision of Assistive and Welfare technology – A literature review. *Societies* 2020, *10* (1), 22 doi.org/10.3390/soc10010022

II. Frennert, S., Baudin, K. (2019). The concept of welfare technology in Swedish municipal eldercare. *Disability and Rehabilitation* (2019) doi:10.1080/09638288.2019.1661035

III. Baudin K, Gustafsson C, Frennert S. (2020). Views of Swedish Elder Care Personnel on Ongoing Digital Transformation: Cross-Sectional Study. *Journal of Medical Internet Research* 22(6) doi: 10.2196/15450

IV. Baudin, K., Sundström, A., Borg, J., Gustafsson, C. (2021). Decision-making is in the making! Managing decisions within Assistive and Welfare technology organisations. *International journal of Environmental Research and Public Health* 18(4028) doi: 10.3390/ijerph18084028

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To Alexander, Estelle and Nicolas –

you are my everything!

Contents

Abbreviations:

AT	Assistive Technology
CRPD	Convention of Rights for persons with Disability
EBM	Evidence based medicine
GATE	Global Cooperation on Assistive Technology
GPS	Global Positioning System
ICF	International Classification of Functioning Disability and Health
MOHO	Model of Human Occupation
OT	Occupational therapist
PT	Physiotherapist
RN	Registered nurses
SCOT	Social construction of technology
UN	United Nations
WT	Welfare technology
WHO	World Health Organization

Introduction

This thesis focused on exploring and generating knowledge about assistive technology (AT) and welfare technology (WT) (hereafter called AT/WT) on healthcare professionals at the municipal, regional, and organisational levels, from a multitude of perspectives. The explorations involve perspectives from international scientific research, decision makers, officials, and health care professionals' views of their experiences, usage and work. The thesis is also intended to understand the local context of AT/WT within municipal and regional organisations, what aspects, barriers and facilitators the context constitutes, and how they affect the outcomes of the AT/WT provision.
The structure of the thesis follows a compilation structure. Four manuscripts are compiled at the end of the thesis. The four manuscripts are introduced and contextualised, starting with a background on the health and welfare area, the concepts of AT/WT and AT provision, and decision-making within the area of AT/WT. The theoretical frameworks and related concepts that were used in this thesis are thereafter described. The aims of the thesis and methods are presented, with data collection and analysis described, and then the thesis continues with a chapter of findings, a discussion of the main findings, methodological considerations, and some future aspects and implications.

The thesis from a health and welfare perspective

This thesis was conducted within the areas of health and welfare and the field of the care sciences, in which the concepts of health and welfare are described as combined and intertwined. These concepts are described below.

Health

Health can be described as '*a dynamic state of complete physical, mental, spiritual and social well-being and not merely the absence of disease or infirmity*' (WHO, 1998). Health is also described as a human right (WHO, 2009) and as being involved in or participating in life situations (WHO, 2001). Patients and clients are seen as individuals with unique values, skills, problems, needs, and a broad cultural heritage. The concept of health is a multidimensional concept that mirrors humans' actual and total life situations and considers health as individual. When an older adult's health declines, it can impact negatively on daily life; however, they may still realise the life project (Dahlberg & Segesten, 2010), where the health care provider-patient relationships are considered to have health-enhancing potentials (Strandås & Bondas, 2018; Uhrenfeldt et al., 2018; Arman et al., 2015). The health declines imply changed strategies and reinterpretation of the situation to handle the effects of sickness. This implies that even when an individual's capacity diminishes, that person may still be able to do things that matter to them if they live in a supportive, enabling environment. This thesis will hold a consistent position regarding older adults' healthy ageing and satisfactory level of health pursuant to the WHO view (WHO, 2004), where daily day experiences consist of meaningful activities, with participation and support for these experiences of satisfactory health (Beard & Bloom, 2015). Research shows that despite the higher risk for functional impairments and chronic diseases that come with increasing age, older adults often consider their general health to be good (National Board of Health and Welfare, 2012; 2017). Furthermore, good living conditions and support with AT/WT can contribute to an increased quality of life for older adults.

Welfare

The core values of the welfare state and of its health policies include concepts such as healthy ageing (WHO, 2002), empowerment, social inclusion, active citizens, and participation (Newman & Tonkens, 2011). The demands for health care and social care are expected to increase, as the ageing population will increasingly depend on help and support in their everyday lives. The United Nations' (2016) Convention on the Rights for Persons with Disability (CRPD) describes their motivating principle as '*full and effective participation and inclusion in society*' (art. 3c). This is also described as the political right to enjoy all areas of human life, and the view that participation is a right has influenced policies for the disabled and rehabilitation policies (Eide et al., 2017). The arrangements and social policies of the welfare state are important determinants of health and inequalities in health (Eide et al., 2017; Beckfield et al., 2015). How society's decision makers handle these challenges will have consequences for public expenditure and affect the welfare of ageing people (EU, 2014; Government Offices of Sweden, 2013). The Swedish welfare system promotes universal rights and social equality, and AT/WT is believed to be a step further in digital transformation for sustainable equality and universal rights for citizens in the face of increasing demands and limited resources for welfare services (Raphael, 2014). Even though the population has a legal right to participate in society, older adults are a vulnerable group because of their dependency on healthcare and social care. The society is changing rapidly and has moved into the age of digital technology, and the means and the arenas for participation and inclusion are changing. One crucial factor to be considered is technological innovation, as this has already changed the accessibility to health services, interaction, and information with this, both in general and for older adults in particular.

People live longer lives as a result of better health, which is also observed in Sweden. Declining birth rates together with falling death rates result in the ageing of the population: the proportion of older adults, a heterogeneous group of people of 60+ years of age, is expected to increase from today's 17% to 23% by the year 2030. Many of these older adults are expected to continue to live in their own residences, also known as 'ageing in place' (National Board of Health and Welfare, 2020b). How decision makers handle the challenges of an ageing population, with its greater demands on welfare and healthcare services, will have consequences for public expenditure and influence the quality of life of ageing people (European Union [EU], 2014; Government Offices of Sweden, 2013).

The Swedish context

The healthcare system in Sweden is well established and part of the welfare system. The system is taxation-based and locally administrated, with every citizen having equal access to services. AT is considered an integral part of health care, and it is financed, distributed, and prescribed through the national health system (National Board of Health and Welfare, 2017). However, the public resources available for eldercare have decreased proportionately to the increased number of older adults in the population (Szebehel et al., 2017). The delivery of healthcare services at home is limited to those with extensive healthcare needs, and the increasing population of older people means that many more people with healthcare needs are living at home and needing care around the clock (Thorslund, 2011). The municipalities in Sweden have the responsibility of providing health care for all individuals in need of such care, including residential and home-based care for older adults (Szebehely & Trydegård, 2012). This responsibility was established in the Social Policy Reform (sv. Ädelreformen) executed in 1992, which meant that home care was transferred from regional councils to

municipalities (Trydegård & Thorslund, 2001), and the reform gave older adults the right to influence their own care, delivered within the patients' residences; 'ageing in place' (Thorslund, 2011). The Swedish regions and municipalities are regulated by the Social Services Act (SoL; SFS, 2001) and the Health and Medical Services Act (HSL; SFS, 2017). In 2019, home care was provided to almost 401,000 persons over 65 years of age (National Board of Health and Welfare, 2020a). The majority of older adults receiving home care have extensive needs for health and social care (National Board of Health and Welfare, 2020b) and are often of an advanced age (Lagergren, 2013). The basic philosophy upon which the Swedish welfare system is based is that all people have a right to full participation in society. The rights to participate in care, rehabilitation, and the provision of AT are regulated by law (Swedish Code of Statutes [SFS] 2014: 821). For older adults and people with disabilities, this right is explicitly confirmed in a national policy that states that individuals with disabilities should be offered equal resources and have the same obligations as anyone in society, regardless of where they live. A policy based on the concepts of integration, full participation, and equality (Ministry of Health and Social Affairs, 2000) has guided the way in which Sweden has built its AT provision systems (Lilja et al., 2003; Sund et al., 2013; Larsson Ranada & Lidström, 2017).

The interprofessional field of care

The context in which this thesis research was conducted, at the health care professional, municipal, regional, and organisational levels in the area of AT/WT provision, is complex. This reflects the growing complexity of healthcare problems, which makes interprofessional collaboration increasingly important (D'amour et al., 2005). The interprofessional field of care is the collaboration of interprofessional work involving different healthcare professions who regularly come together to solve problems or

provide services. It is essential to ensure qualified care, and teamwork is the main context in which collaborative person-centred care is provided. Some authors have defined interprofessional work as duties with the required competences, such as communication, autonomy, coordination, responsibility, cooperation and assertiveness (Norsen et al., 1995).

The concepts of AT/WT

The concepts of assistive technology (AT) and welfare technology (WT) are used in this thesis; however, the meaning of these concepts differs in different parts of the world (Cullen, 2012). The terms will therefore be defined and clarified with regard to the products that each term covers, starting with WT and thereafter AT.

Welfare technology (WT)

The concept of WT is a fundamental concept in this thesis; it is a Nordic concept and only a decade old, implying promises of change and innovation (Corneliussen & Dyb, 2017). Other commonly used and related terms to WT are ‘ambient assisted living technologies’, ‘smart home technology’, ‘telemedicine’, ‘telecare’, ‘telehealth’ and ‘e-health.’ Although these terms all cover different forms of digital care, there is considerable overlap among them (Aaen, 2019; Boogerd et al., 2015; Cozza, 2018; Cozza et al., 2019; Frennert & Östlund, 2018; Greenhalgh et al., 2012). The term is an inclusive concept involving investment, implementation, and usage, both within and among organisations (Aaen, 2019; Stokke et al., 2019). Furthermore, WT includes the integrated work of numerous actors, such as health care providers, patients, relatives, politicians, and IT developers (Cozza, 2018; Peek et al., 2016). Above this, it refers to societal and technological aspects

within healthcare and social care (Aaen, 2019), such as design, usability, the value of older adults, and ethics.

In Sweden, the National Board of Health and Welfare defines WT as '*digital technology that can help individuals having or that are at risk of having a functioning disability to maintain or increase their activity, participation, safety, and independence*' (National Board of Health and Welfare, 2019). WT can be used by care providers and relatives and can be bought on the consumer market or distributed as granted assistance or AT. Examples of WT are digital safety alarms and information and communication technologies (ICT), such as videophones, monitoring cameras, and global positioning systems (GPS) for sending alarms and tracking users (National Board of Health and Welfare, 2019). This thesis uses the concept of WT as understood in the definition by the National Board of Health and Welfare (2019). A major goal of Sweden's social services is the health of older adults (National Board of Health and Welfare, 2017), in which WT is expected to be one of the solutions for improving safety and participation (National Board of Health and Welfare, 2020b).

Examples of WT that are provided by municipal care include social security alarms that can be used to call for emergency help, e-home services that replace or supplement physical visits with digital contacts, advanced toilets with flush and drying functions, key-free home services that replace physical keys with digital key management systems, individual rehabilitation training with game consoles in the home, camera surveillance during the night, and automatic pill dispenser for taking prescriptions, which, can be linked to the alarm system (Sjoberg et al., 2014). Hoffman (2013) argued that the introduction and use of WT for ageing depends to a more significant extent than most other technology areas on the involvement of several different actors. Politicians, public sector employees, private entrepreneurs, care

professionals, older people, relatives, lawyers, etc. all embody different interests and conceive of ageing in different ways (Hoffman, 2013). The Swedish government regards WT as necessary for meeting the demands of future home care and health care (Wickström, 2017). The number of in-house patients is expected to be reduced, with care transferred from hospitals and care facilities to primary care and home-service care. The responsibility for health is to be redirected to the patients, with a focus on participation, empowerment, and independence regarding their own health care (Trydegård & Thorslund, 2001). This prediction for the future is supported by studies showing the consequences of failing to use WT, as exemplified by increased welfare costs and a lower quality of care for the individual care receiver (Hoffman, 2013; Axelsson et al., 2010; Frohm, 2015).

Assistive technology (AT)

AT is an umbrella term that includes many products, systems and services. AT aims to provide support to people with impairments and disabilities in their everyday lives and for their social participation. WHO offers a broad and global definition of both AT and assistive products: "*Assistive technology is the application of organised knowledge and skills related to assistive products, including systems and services. Assistive technology is a subset of health technology. Assistive products: Any external product (including devices, equipment, instruments, or software), especially produced or generally available, the primary purpose of which is to maintain or improve an individual's functioning and independence, and thereby promote their well-being. Assistive products are also used to prevent impairments and secondary health conditions* (WHO, 2016, p. 1).
These definitions of AT imply that technology covers both commercially available products, such as mainstream technologies, and products specially made to compensate for an impairment. In Sweden, there are no legal

definitions of AT. However, there are descriptions and definitions of AT from different perspectives. In the National Board of Health and Welfare's terminology bank, the AT for daily living is: individually procured product with the purpose to keep or maintain activity, participation and independency through by compensation for an impairment (National Board of Health and Welfare, 2016). Whether a product should be viewed as AT or not is here in this thesis, defined by the purpose of its use—that is, whether it meets a need related to a disability. As indicated above, various national and international definitions of assistive technology and assistive products have been offered. In this thesis, however, the term covers AT provided not only to overcome functional limitations but also to overcome barriers that hinder the individual's participation in valued activities. This thesis has chosen to use the umbrella term 'assistive technology' (AT), as it is more commonly used in the AT research literature.

Common examples of AT include wheelchairs, prosthetic and orthotic devices, white canes, software for magnification, hearing aids, speech synthesisers, communication boards, robotics, exoskeletons, and a range of smart devices that are also considered assistive technologies. For older adults, the new technology delivers high expectations for improvements in their everyday lives, and this group of the population already uses and values AT. Research shows a range of improved outcomes for older adults, such as participation, satisfaction, quality of life, well-being, and inclusion (Löfqvist et al., 2005), while secondary outcomes include cost-effectiveness (minimising social costs and cost offset) and decreased support costs through lower admissions (Mann et al., 2004; Layton & Steel, 2019; Layton & Irlam, 2018). Since older adults spend most of their time at home (Iwarsson et al., 2007), home care must support and accommodate activities and participation for older adults remaining in their ordinary housing (Haak et al., 2007). The

living conditions of older adults can be facilitated by the use of AT/WT, which increases their independence and ability to age in place.

The borders between the concepts of AT and WT are blurred, and the same products could be considered AT in one region and WT in another in Sweden. There is an ongoing discussion of the different terms, since there are differences in the provision of AT and WT, but no consensus has been reached yet. Since the concepts partly overlap, in this thesis, they are addressed as AT/WT in Study I and Study IV. In Studies II and III, only WT are addressed because the aim of the studies was to focus on WT in the context of municipal eldercare.

Assistive technology provision

The service delivery process for AT has gained some important interest, as the provision of AT is critical for the independence and participation of individuals with disabilities in society (Larsson Ranada & Lidström, 2019). AT provision is a term that entails everything that is needed to ensure that a person with a disability who might benefit from AT actually obtains it and that the most appropriate AT solution is obtained for that individual (de Witte et al., 2018). A key element is the service delivery process, that is, the process through which an individual obtains an AT solution that meets his or her needs.

At the global level, the WHO organised a key stakeholder meeting in Geneva in July 2014, at which they established an initiative to realise the obligations of CRPD to increasing access to AT (CRPD, article 32; Global Cooperation on Assistive Technology [GATE]). The GATE initiative included representatives from user groups, academia, international organisations, donor agencies and professional organisations. The main goal

of GATE is *'to improve access to high-quality, affordable assistive products globally. To achieve this, the GATE initiative is focusing on five interlinked areas (5P): people, policy, products, provision, and personnel.'* Based on this initiative, Khasnabis et al. (2015) developed the model used in this thesis to understand and describe decision-making processes and health policies related to the field of AT/WT. The model includes the eight domains of the GATE model: policy, assessment, procurement, technology, environment, usability, sustainability, and rights.

In Sweden, the regions and municipalities have local guidelines for AT provision, AT service and delivery, and for decisions regarding which product should be defined as AT and prescribed for a particular patient (Swedish Handicap Institute, 2012). Considerations of financial resources are added to these guidelines for the decision-making process concerning AT/WT. The regions and municipalities have substantial autonomy and a long tradition of this process.

The municipalities and the regions provide AT and WT either on prescription or as granted assistance (National Board of Health and Welfare, 2017). The system is decentralised, and the regions and municipalities are responsible for providing AT/WT to people with impairments and disabilities. The provision is based on individual needs, and it is important to consider the user's interests and needs foremost; however, the interests and needs of significant others are also important. This is regardless of the person's economic status, where the person lives, or their age (Ministry of Health and Social Affairs, 2000). The actors involved in the process are those who prescribe AT/WT in the context in which this thesis was conducted and are mostly occupational therapists (OTs), physiotherapists (PTs), or registered nurses (RNs). They do so in their daily work, and most prescriptions are carried out in primary care or municipal settings as part of

the rehabilitation services. WT can be prescribed both as an AT and as granted assistance, depending on the product or the solution and in which region or municipality the older adult resides. Each region and municipality has the responsibility of choosing what to provide and the associated costs and fees (Swedish Handicap Institute, 2012; Sobis et al., 2013; Kylberg et al., 2015). The decision-making process within the regions and municipalities is carried out in different ways and depends on various factors. For example, the autonomy of the local authorities in Sweden has led to many differences among municipalities in terms of their development of care resources and service provision systems.

Digital transformation

Within our society, there is a digital transformation of services; this also applies within the area of healthcare and social care, where technology has influenced care, caring skills and treatment, as well as health policies (Barnard, 2002; Korhonen et al., 2014). The concept of technology has several meanings and is complex; it includes devices, computers and applications, artifacts, and even technical services and solutions (Bijker, 2006). There are several theories about the role of human-technology interaction in society, and the social construction of technology (SCOT) (Pinch & Bijker, 1987) theory posits that technology is shaped and created by human actions, which means that society composes technology. Technological determinism, the opposite of SCOT, acknowledges that technology is a governing force in society, that it determines human actions, and that it is more or less imminent and out of control (Pinch & Bijker, 1987). This thesis takes the position that technology is socially constructed. Furthermore, it does not deny that technology is a powerful ingredient in modern technological society. Instead, it endorses the view that its strengths

do not stem from the technology itself. The focus is rather on how technology is used and what meaning is given to it in our society and culture (Sörensen, 2005).

In many Western societies, including Sweden, health strategies have changed, and people expect to take greater responsibility and care for their own health with technology (Faulkner, 2009). This change of strategies in health care implies that both citizens and health care providers use more health technology in their caring. Nevertheless, the main purpose of health technology, such as AT/WT as a support in older adults' everyday lives was described by Wey (2004) as to "*enable and empower the person and to help bring the world around them back within their grasp"* (Wey 2004, p. 203). Furthermore, it's purpose is to improve their self-esteem, sense of agency, and social confidence. Some researchers (e.g., Cash, 2003; Scherer, 2002) even pose that there is a risk that the technology could disable older adults if their goals, capabilities, desires, and social context are not taken into consideration.

Challenges to the adoption and implementation of technology

Internationally, research has declared that the AT/WT sector has been neglected, perhaps because of its broad scope within healthcare and social care (Barlow, 2017). Alternatively, despite its delivery of many health advantages, AT/WT remains a low priority for national governments compared to the drug industry (Pannenborg, 2010). Another factor is the belief that the context and environment in which AT/WT is adopted is unlike that of any other sector or industry. The healthcare sector is fragmented and complex, involving interactions between many organisations, systems, and institutions (Barlow, 2017; Khan et. Al, 2018). The development process for AT/WT is less structured and regulated than that of the pharmaceutical

sectors. Furthermore, the new AT/WT technology can be more time consuming and costly due to scientific and engineering regulatory processes (Barlow, 2017). Similar findings regarding challenges from the personnel perspective have also been found in the Swedish context. Healthcare professionals express duality in their perceptions of using technology in elderly care (Sävenstedt et al., 2006). Nonetheless, the implementation of AT/WT in Sweden is of considerable interest because of the high quality of healthcare provided (Anell et al., 2012).

For health care providers in healthcare and social care, organisational boundaries, such as time-controlled tasks and a lack of resources, can lead to task-oriented and formalised practices that can endanger the individualised care of patients (Austin, 2011; Tønnessen et al., 2011). Similar tendencies relating to the organisation of services, care challenges, and patients living at home are mentioned in other health care studies (Karlsson et al., 2014; Selberg, 2013; Turpin et al., 2012; Wälivaara, Sävenstedt & Axelsson, 2013; Wilkes et al., 2008). Other researchers; Larisch et al. (2016) highlighted one of these barriers to adoption and implementation and stated that '*it is difficult to change a paradigm from within the paradigm...If someone is a part of health care, it can be challenging to see what the new health care looks like. I think people are genuinely surprised over how far behind health care is'* (Larisch et al., 2016, p. 1230). This is in accordance with results from Kamp and Hansen (2019) and Nilsen et al. (2016), who indicated that personnel's resistance to the new health technologies in healthcare and social care complicates the implementation processes. Their results also suggest that these complications can lead to consequences regarding older adults' or patients' needs for and participation in AT/WT.
Other factors that can affect AT/WT are the so-called 'anti-innovation culture' and the belief that the organisational culture undervalues innovation, as can be seen in the National Health Service in the UK (Barlow, 2017), and

there is little expectation that personnel will engage in new technologies. Healthcare staff are stressed and face high demands in their daily work with patients, which allows them no extra time to implement innovations (Barlow, 2017; Barlow & Hendy, 2009). Another barrier is the degree of 'innovation fatigue' that sets in (Barlow, 2017). This is consistent with conclusions from the study on the *Productive Ward: Releasing Time to Care*' programme (Van de Broek et al., 2013). The findings of this study verified that healthcare organisations (e.g., in a Dutch hospital) must confront multiple logics, which include a care logic and a business-like logic: At the beginning of the implementation process, the nurses were enthusiastic. They saw the programme as an opportunity to make a difference in their ward, to gain more patient time, and to offer a better quality of care. However, the programme's goal was to increase efficiency, and the managers emphasised arguments concerning the enhancement of efficiency rather than improved patient care (Van de Broek et al., 2013).

Decision-making and AT/WT

This thesis research has been conducted at the organisational, regional, municipal, and healthcare professional level within the area of AT/WT. The healthcare sector in many countries, including Sweden, has been subjected to organisational reforms and regulations *(*Greve et al., 2016; Christensen & Lægreid, 2001; Wollscheid et al., 2013). Due to these reforms and regulations, managerial decision-making within healthcare and social care is considered demanding and challenging. The demands lie in the changes brought by the digitalisation of services, more effective and cost-efficient care models, and self-care promoting personalised healthcare (Caulfild & Donnely, 2013). Besides these changes, there are demographic changes that drive variations in the age, illnesses, function, and living conditions of

home-care patients, and the trends are a growing ageing group with multi-morbidity and increasingly complex needs.

These reforms and regulations have led to rationalisation of the health care sector (i.e., hospital and homecare) and to older adults being discharged to their residences sooner (Markel-Reid et al., 2006). This, in combination with a growing and changing population and a welfare policy, encourages older adults to age in place (Trydegård & Thorslund, 2001).

As the implementation of efficient policies is pushed to the lowest level of the healthcare system, home care areas are under great pressure to ensure effective service and to manage service allocation within decided frameworks *(*Vabø, 2009). Managers are therefore expected to make effective and conscious decisions when procuring AT/WT into their organisations. To ensure this, it is important to base the interventions on research evidence (Holm, 2000; Taylor, 2004). Evidence-based practice can support health care providers in evaluating and treating clients adequately and improving clients' outcomes and health care services (Kent et al., 2009). Within the healthcare context, managers' job description in home care consists of a threefold responsibility: to the older adults, the staff, and the budget (Lindberg et al., 2012). Some authors describe this responsibility for caring in leadership as a focus on the economy with a constant lack of time due to multiple demands (Lindberg, Persson & Bondas, 2012). As Skirbekk et al. (2017) and Solbakken et al. (2018) argued, first-line managers often have a balanced economy as their main priority.

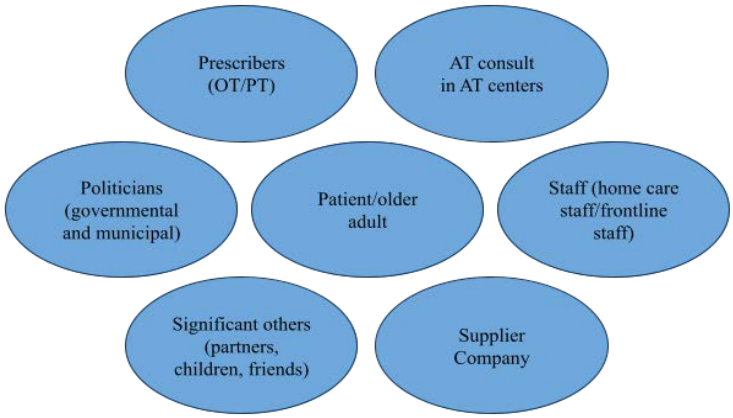

Figure 1. Stakeholders involved in the decisions to procure new AT or WT into the regions and municipalities (inspired by Freeman's model of stakeholder theory).

As mentioned before, the context of where this research has been conducted is considered as complex. Figure 1 shows the stakeholders who have a 'voice' during the procurement process of AT/WT. The stakeholder theory (Freeman, 1994) is based on principles well suited to help managers deal with complex environments, which are characterised by rapid changes and uncertainties, but also a high level of interdependency among health care providers. The theory is built on practical applications to develop trusting relationships, long-term thinking, personal/data integrity and co-operations with their major stakeholders, leading to higher levels of efficiency, innovations, and values (c.f., Freeman, 1994). Nevertheless, the health care providers are obligated by the law to provide compassionate and person-centred care; less than 40% of the municipal health care providers reported not having enough time for social contact, safeguarding the patients' needs and companionship (Uhrenfeldt & Hall, 2015), and not being able to fulfil

these responsibilities might cause guilt, frustration, stress and a loss of pride in giving good care (Ertner, 2019; Fläckman et al., 2015).

Theoretical frameworks

To understand the complexity of perception, utilisation, and decision-making within the AT/WT context, this thesis uses some interconnected theories and concepts presented below.

When people interact with or use AT/WT, it appear within the context of time and space, which may be with or without other humans, with other physical objects, and intermittently within a system in which other technologies are included. To illuminate this, the underlying theoretical framework for this thesis consists of person-centred care as applied within the care science and occupational therapy—the model of human occupation (MOHO) (Kielhofner, 2012). Below, the theory and different concepts used in the thesis are elaborated.

Person-centredness

An important concept in this thesis is person-centredness, which highlights the importance of viewing older adults using AT/WT as a crucial part of the health care process.

To provide person-centred care, the healthcare system should modify the care and the care environment to suit the needs of older adults. The older adult should be involved and given the opportunity to make decisions in all aspects of her/his own care. The person's experience is the starting point in the quest to understand symptoms and behaviour (Ekman, 2014). Person-centredness places the person at the centre of care, thus moving away from fragmented, medically dominated care and instead focusing on caring relationships and holistic, collaborative care (Ekman, 2011). As Edvardsson declared, *person-centred care should be seen as holistic, flexible, creative,*

personal and unique, consequently not reductionist, standardised, detached and task-based, unless the person wants it to be (Edvardsson, 2008, p. 66).

MOHO

The theoretical foundations of the thesis are grounded in the client-centred approach, as described in the occupational therapy model MOHO (Kielhofner, 2012). This model stresses a holistic view of the older adult, which means that attention is paid not only to their medical needs but also to the person's whole situation *(*Kielhofner, 2012). The MOHO is a conceptual practice model based on a dynamic systems theory and explains how a person's performance capacities, habituation (roles, patterns, and habits), and volition (motivation) interact with environmental conditions and influence the capacity to manage AT/WT. MOHO can be referred to as a way to organise and understand how to use occupations (e.g., activities) into practice to improve people's health by understanding how and why meaningful activities are motivated, patterned, and performed (Kielhofner, 2008).

Furthermore, the MOHO is based on an open systems theory, which states that a human is a self-organising system in interaction with the environment, where humans interact with their environment through occupations and receive input and output. Input is defined as when an individual attends to information of interest or relevance within their environment and then acts upon it with an output, or occupation. By interacting with the environment, a person receives feedback (input), which creates change over time. The key to the MOHO is to understand that all components within it are dynamic. When any part of it changes (skills, values, roles, habits, routines, environment), for example, when an older adult's health declines, the entire dynamic may

shift in either a healthy or unhealthy way for the individual (Taylor, 2017; Kielhofner, 2012).

There are other concepts similar to person-centred, such as client-centred and patient-centred, which are used interchangeably within healthcare practice and research. Thus, the person-centred approach used in this thesis is based on client-centredness (Taylor, 2017), as well as on person-centredness, as described by Ekman et al. (2011) and Leplege et al. (2007).

Evidence-based care

Important concepts used in this thesis are evidence-based care, participation, and the theory of diffusion of innovation. Evidence-based care means that patients' unique expectations and preconditions are integrated with the best available evidence. This is a critical area of competence used by care providers. A definition from Sacket and his team is widely applied: '*Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research* (Sacket et al., 2002, p. 2).

Participation

Moreover, the concept of participation, as described by Kielhofner (2012), is emphasised in this thesis. Maintaining health and quality of life with the support of AT/WT requires the older adult´s participation in everyday life. Participation is a concept that is widely applied both within the field of occupational therapy and in other areas. The concept of participation is included in the international classification of functioning, disability and

health (ICF) and the model of human occupation (Vessby & Kjellman, 2010). The meaning is that the health of older adults involves their participation and engagement in daily activities (both cultural and social) as desired and needed. Different levels of performance, the interaction of components (for example, the environment and volition), and change processes are all factors that may alter participation in activities throughout life. Participation in meaningful activities is an overall description of what people are engaged in, and participation can be experienced without active performance. In the third edition of MOHO (Kielhofner 2002), the concept of participation is defined as '*engagement in work, play, or activities of daily living that are part of one's sociocultural context and that are desired and/or necessary to one's well-being. Engagement involves not only performance but also subjective experience*' (p. 115).

Theory of diffusion

The literature suggests several theories and models for the technology implementation process, one of which is Rogers' widely used theory of diffusion (Rogers, 2003). This theory suggests that innovation can be described by attributes, which are seen as the relative advantages, compatibility, complexity, trialability, and observability of the innovation (Rogers, 2003). Relative advantages associate to the degree to which an innovation is perceived as better than the current practice, while compatibility is the degree to which innovation is perceived as consistent with current experiences, needs and values. Complexity refers to the perceived hindrance in recognition and utilisation of the innovation. Trialability refers to the opportunity of experimenting with the innovation on a limited basis. Innovations that can be tested at the beginning, will generally be adopted more rapidly. Lastly, the observability deals with the visibility of

the innovations to others. Rogers concludes that the more visible the results, the more likely the innovation will be adopted *(*Rogers, 2003).

Rationale

Older adults are a large heterogeneous group; they have different areas of declining health, which might include chronic and multiple diseases and disabilities. They are dependent on welfare services and are vulnerable to marginalisation and exclusion. It is essential to support their safety, participation, activity, and independence in a rapidly changing society, especially in relation to technological development and deployment. Enjoying meaningful activities can contribute to healthy ageing through interactions with others and through the experiences and skills that are obtained. With support from AT/WT use and health care providers, they can benefit from positive outcomes and maintain their quality of life in their everyday lives.

Adopting and implementing AT/WT into the healthcare system is a complex process, although the need to implement it is crucial. The main task of healthcare and social care is to provide care for the patients while considering constraints such as limited resources. It is therefore important to explore how those working with AT/WT (on a health care professional, municipal, regional, and organisational level) perceive it, how they utilise AT/WT and how decisions are taken when considering procuring new technologies.

Aims

The overall aim of this thesis is to explore decision makers' and professionals' perceptions and utilisation of and decision-making about AT and WT within the interprofessional field of care for older adults. The specific aims are as follows:

Study I

Study I aims to identify policy features, such as decision models and guidance for the provision of AT/WT, as reported in the current scientific literature.

Study II

Study II aims to explore the following key questions: (1) How do those who work with and make decisions about welfare technology in municipal eldercare perceive welfare technology? (2) What challenges and opportunities do they identify in utilising welfare technology?

Study III

Study III, aims to explore the perception, experimentation, evaluation, and procurement of welfare technology practices among professionals working in municipal eldercare in relation to their gender, age, and profession.

Study IV

The aim of Study IV is to explore aspects influencing decision-making in assistive technology organizations concerning new technology procurement.

Methods

This thesis comprises three empirical studies and one literature review. An overview of the design, sample, data collection, and data analysis for all four studies is presented in Table 1.

Table 1. Overview of methodology in Studies I–IV

Study	Design	Sample	Data collection	Data analysis
I	Literature review, descriptive	9 Peer reviewed scientific articles	Data extraction template	Deductive descriptive, qualitative analysis.
II	Cross-sectional survey	393 Officials and health care providers	Questionnaire	Inductive content analysis of open-ended questions
III	Cross-sectional survey	393 officials and health care providers	Questionnaire	Descriptive and inferential statistical analyses of closed-ended questions
IV	Explorative	24 Decision makers and managers	Semi-structured interviews	Inductive reflexive thematic analysis

Settings and participants

The first study was a literature review based on data from peer-reviewed scientific international journals. The other empirical studies involved 417 participants in the project. The demographic characteristics of the participants in Studies II and III are presented in Table 2. The decision makers and managers in Study IV are presented in Table 3.

Table 2. Questionnaire respondents' demographic data (n = 393)

Professional affiliation and gender *Male/female %*	*Respondents, n (%)*
Information technology staff in municipal eldercare agencies 80/20	29 (7)
Chief medical nurse responsible 30/70	78 (20)
Chief rehabilitation officer responsible 50/50	28 (7)
Occupational therapist/physiotherapist 30/70	104 (27)
Specialist dementia nurse 10/90	51 (13)
Other (managers/e-health strategist) 70/30	103 (26)
Total 100	393 (100)

The settings for this project were municipal eldercare and assistive technology organisations in municipal and regional regimes.
Studies II and III are based on data from a questionnaire of officials and workers responsible for, involved in or working with WT within municipal eldercare. The participants were recruited through the "registrar" in the municipalities within eldercare. The inclusion criteria were all based on registrars' purposive selection (Polit & Beck, 2012) of participants who were responsible for, involved in, or working with WT within municipal eldercare.

The participants in Study IV were decision makers within AT organisations at the regional and municipal levels. The participants were purposively sampled (Polit & Beck, 2012) by representatives from the network of "National Assistive Technology Centers Managers" (sv. Nationella hjälpmedelschefsnätverket), in this thesis referred to the reference group. The criteria to participate were managers on a strategic level with a decision mandate when new AT/WT considered to be bought or procured into the AT assortment and municipal. The group recommended 30 decision makers as contacts, out of which 20 participants answered that they were interested in participating in the interview. Those who did not respond were either retired, had changed position, or did not have time to participate, and some suggested other names instead of themselves. The 20 decision makers were also asked to recommend additional people that could contribute to the study, which gave a small snowball effect and resulted in the final participants being 24 decisionmakers. The participants characteristics are described in Table 3.

Table 3 Demographic characteristics of decision makers in Study IV

Characteristics	(n = 24)
Sex (number) female (F) male (M)	F = 15 M = 9
Age	
36–45	22.5%
46–55 years	22.5%
5665 years	55%

Data collection and analysis in Study I

A literature review search was conducted between February 2017 and April 2018 in the CINAHL, Medline, PubMed, and Web of Science databases, including articles published between 2000 and 2018. It resulted in 2,123 articles (see the flowchart below). To understand and describe the decision-making processes and health policies within the field of AT/WT, a deductive approach was used by applying Khasnabis et al.'s (2015) GATE model

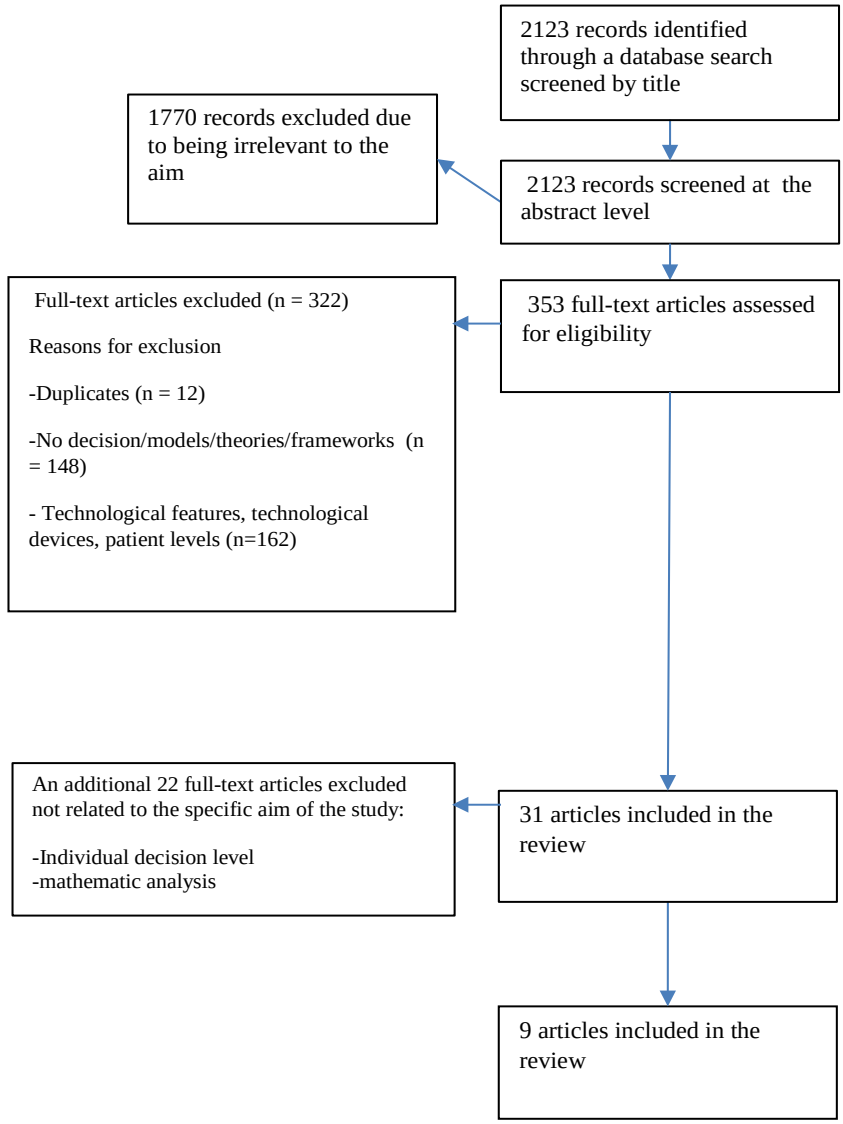

Figure 2. Flowchart of the exclusion and inclusion processes.

To retrieve the data from each article matching the inclusion criteria, a template (Table 4) was developed to guide the data extraction process. The data extraction template depicted the included article's content, referring to the GATE model of Khasnabis et al. (2015), including the eight domains (policy, assessment, procurement, technology, environment, usability, sustainability, and rights).

Table 4. Template of the included article content referring to Khasnabis et al. (2015).

Domains according to Khasnabis et al. (2015)	**Kidholm et al., 2012**	**de Witte et al., 2018**	**Layton, 2015**	**Durocher et al., 2017**	**Andrich et al., 2013**	**MacLachlan & Scherer, 2018**	**MachLachlan et al., 2018**	**Lersilp et al., 2018**	**Henschke 2012**
Policy	X	X	-	-	X	X	X	X	X
Assessment	X	X	-	-	X	X	X	X	X
Procurement	X	X	-	-	X	X	X	X	X
Technology	X	-	X	-	X	X	-	X	
Environment	X	X	-		X	X	X	X	X
Usability	X	X	-	-	X	X	X	X	X
Sustainability	X	X	-	X	X	X	X	X	-
Rights	X	X	X	X	X	X	X	-	X

The search was limited to the most recent developments in this field. Exclusion criteria were reviews, mathematical models, or patient involvement, duplicates, technological features and mathematic cost analysis. Furthermore, a manual search of the reference lists of the included articles was also conducted. In total, nine articles were included in the review (Figure 2). The included articles were published conferences, position papers and workshops, questionnaires, interviews, and different theory applications.

The methodological analysis approach was a deductive qualitative descriptive method (Sandelowski, 2000). In the first step, the text was read for an overall picture of the material; this step was repeated several times.

With a deductive approach, the data were reduced to the essential content following the eight domains, and the extracted findings were examined and analysed for similarities, differences, and variations and grouped in the next step. The final stage was to reach a consensus within the author group regarding variations and to classify the categories.

Data collection in Studies II and III

The data collection in Studies II and III was performed using an online questionnaire regarding decision-making, work, attitudes, and utilisation of WT. The questionnaire consisted of closed questions and open-ended questions in which the respondent could respond without a word limitation. The open-ended questions covered four areas: the concept of WT; advantages and potentials of WT; barriers to using WT; and evaluation methods (study II). The questionnaire also covered areas of closed questions with a fixed number of options for the respondent to choose from: perception of speed of technological change, participation in decision-making regarding WT, experimentation and exploration of WT at work, involvement in procurement, and "about you" (Study III). The questionnaire was pilot tested with three potential users. The potential users were asked to answer the questions and to determine face validity at the end by answering: "Please write your reflections and comments about the question concerning readability, relevance, clarity and layout". The pilot results showed that the survey was easy to answer, and that the questions were appropriate, complete, and effective to fulfil the purpose of our study. The psychometric properties in the questionnaire were tested for both validity and reliability (Polit & Beck, 2004).

The self-administered online questionnaire was distributed in May 2018 to a registrar in each Swedish municipality (n = 290). The registrar received a

hyperlink to access the online questionnaire and was asked to distribute the link to those who were involved with WT at the municipality's eldercare organisation.

The data collection in Study III was performed with the same questionnaires as in Study II but with a focus on the closed questions with a fixed number of options within the areas of perception of speed of technological change; participation in decision making regarding WT; experimentation and exploration of WT at work; involvement in procurement; and about you . The questionnaire's psychometric properties were tested for both validity and reliability (Polit & Beck, 2004). The questionnaire's content and face validity and test-retest reliability were examined after it was constructed (Polit & Beck, 2004). Four established, experienced research colleagues rated the items' content validity using a 4-point scale (4 = very relevant, 3 = quite relevant, 2 = somewhat relevant, 1 = not relevant). The same experts were asked to determine face validity by answering the following question: "Please write your reflections and comments about the questionnaire concerning readability, clarity, and layout." After three weeks, the comments on content and face validity were read and discussed, and some changes were made. The test-retest reliability tests, conducted at two-week intervals with three potential users, showed that the questionnaire was easy to understand and answer and took 10–15 minutes to complete.

Data analysis Studies II and III

In Study II, four open-ended questions were included in the analysis. Qualitative data analyses of the free-text answers to the open-ended questions were performed using NVIVO 11 software. The data were analysed according to qualitative data analysis principles with inductive and

deductive phases (Graneskär et al., 2012; Elo & Kyngäs, 2007). The analysis was conducted in several steps. Initially, two researchers read the free-text responses separately to get an overall picture of the material. Each researcher then reduced the data to essential expressions concerning the conceptions, impacts, functions, evolutions, and barriers to WT. Next, each researcher coded the text into meaning units using NVIVO 11 software, wrote condensed meaning units, and interpreted the underlying meaning. The condensed meaning units were examined concerning similarities, variations, and differences and grouped into sub-themes. The researchers then compared their separate analyses and investigated whether there was a pattern in the data according to the participants' professional affiliations; however, no such trend was visible in the qualitative data. The final stage saw the researchers came to a consensus regarding categories and classified the sub-themes into four main themes: what is included in the concept of WT; circumstances when WT is superior or even more reliable than humans; problems related to exploring or buying WT; and evaluation of WT.

In Study III, the data from the questionnaires with closed questions with a fixed number of options were imported into and analyzed using IBM SPSS Statistics (version 24, IBM, Corporation, USA). The analysis included chi-square tests for correlations and descriptive statistics for each item with fixed answers. The chi square was used to determine if a difference between the expected and the observed data was a result of chance or if it was due to a relationship between the variables that were studied (Polit & Beck, 2004). All the reported p-values were two-sided, and $p \leq .05$ was considered to be statistically significant (Polit & Beck, 2004).

Data collection and analysis in Study IV

To explore decision makers' perceptions and experiences of their work with AT/WT within their organisation, semi-structured interviews were conducted (Kvale & Brinkman, 2017). Semi-structured interviews allow the participant to talk freely about the topic of interest, but the structure ensures that the interviewer covers the same areas (Polit & Beck, 2012). The domains of the GATE model by Khasnabis et al. (2015), "policy, assessment, procurement, technology, environment, usability, sustainability and rights," were used as the basis for the semi-structured questions. The reference group consisting of seven decision makers from the "National Network of Assistive Technology Center Managers" was sent the areas of questions, and they were asked if it was of relevance and if any question areas were missing. Based on these responses, the semi-structured interview was pre-tested in a pilot study with two managers (a unit manager and an operations manager) within one assistive technology centre in the middle of Sweden. Some of the semi-structured questions were added, and some were excluded because of the lack of relevance. The question topic areas in the interview guide were 1) organisation, 2) policy, 3) AT provision, 4) AT procurement, 5) decision-making, 6) accessibility of information, 7) AT development, and 8) competence. The MOHO was used to understand how person-centredness was considered by managers when making AT decisions; it was elaborated on and discussed with the managers within the question topic areas 2–8.

The participants were invited by email, including an information and consent letter about the project. By accepting the invitation, an appointment was set for the 30–60 minutes semi-structured telephone interview, thereby giving their consent of participation. The interview was transcribed verbatim, and the text was then read repeatedly by the authors for an overall picture of the content (Braun & Clarke, 2006). The qualitative data analyses of the answers

were performed using NVivo 11 software. An iterative process about the different themes, subthemes, and codes was done to reach a consensus.

Ethical considerations

Ethical considerations are essential to ensure that no harm is done to any individual, group, organisation, or environment due to data collection and publication of research studies. In all four studies, the ethical principles of respect, autonomy, non-maleficence, beneficence, and justice (Beauchamp & Childress, 2001) and the Declaration of Helsinki (World Medical Association Declaration of Helsinki [WMA], 2013) were adhered to. The studies were also in line with Swedish research ethics legislation (SFS 2003:460) and the Data Protection Act (SFS 1998:204).

In this dissertation, no research involving direct interaction with human participants were conducted. The questionnaire in Studies II and III included questions about the utilisation and decisions of WT within municipal eldercare and did not involve sensitive questions about any specific people. Study IV was conducted using telephone interviews and included questions about decisions and strategies when working with AT/WT. However, there are still some ethical aspects to consider when conducting research.

The participants were informed about the aim, value, and confidentiality of the study, that their right to integrity would be respected, and of their right to decline participation or to withdraw from the study at any time without having to give a reason. Informed verbal consent was obtained for Study IV. The questionnaires in Studies II and III included information stating that submitting the completed questionnaires constituted informed consent. Contact and confidentiality information, such as data coding, sharing and archiving, disposal and other potential risks, were also declared. Only the researchers had access to the responses from the questionnaires (Studies II and III). Only the doctoral student (KB) knew which ID code was connected to which study participant in Study IV. The risk of causing harm, violation,

or suffering to the participants was considered low in all four studies. The benefits, such as the opportunity for individual persons to share their experiences and contribute to increased knowledge of the healthcare system, outweighed the negative aspects.

Regarding the ethical considerations for Study V, the literature review was conducted in an unbiased and well-considered manner.

Summary of findings

This chapter summarises the main findings presented in the four studies. These findings will be consolidated in the subsequent discussion chapter to present a more general discussion of the outcomes of the thesis as a whole, highlighting new insights and understandings concerning AT/WT. The results from the different studies in this thesis have generated knowledge about different perspectives of the perception, utilisation, and decision-making of AT/WT. Figure 3 illustrates the four studies conducted in this thesis and their different contexts.

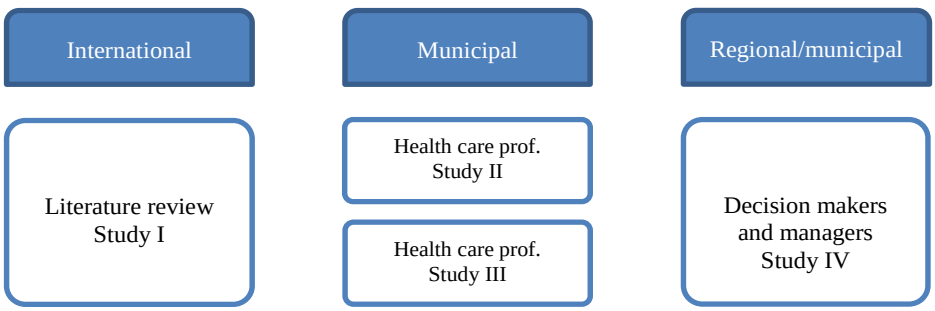

Figure 3. Illustrations of the studies.

The AT/WT policies and guidelines

The aim of **Study I** was to identify policy features, such as decision models and guidance for the provision of AT/WT, as reported in the current scientific literature.

The review presented the structure of the eight domains from the GATE model (Khasnabis et al., 2015): policy, assessment, procurement, technology, environment, usability, sustainability and rights, which are further grouped into categories exploring the variations in every domain.

The ***policy domain*** of the results covers the existence and aspects of a national policy on AT/WT. The overarching and common finding regarding AT/WT policies is that they constitute a complex area without guidance. Without any national policy, decision-making processes are long and complicated, which has a negative and unequal impact on the provision of AT/WT. The ***assessment domain*** of the results reveals that, in a good service delivery system, skilled and competent staff are necessary to assess the needs of patients and prescribe AT/WT. In this regard, the assessment domain concerns the issue of sufficient competence in providing care for patients. Sufficient competence, skills and knowledge in responding to users' needs, the use of standards and regulations, the search for available information, and the proficiency to learn from feedback are crucial. The provision of AT/WT has to be centred on the individual needs of users, and qualified practitioners should establish an individual assessment of disorders, including the potential use of AT/WT. The ***procurement domain*** of the results relates to opportunities to provide quality and affordable AT/WT. Efficiency in the system pinpoints the complexity of regulations, procedures, the control of the system over the process, the mechanisms that are able to control costs and effectiveness, and the delegation of decision-making power. Effective systems in AT/WT include structured ways to meet face-to-face and should be designed to connect developers and users in such a way as to facilitate innovation based on real user needs captured in the field. The availability of AT/WT and a service delivery system's accessibility, in a way that no one is excluded or discriminated against for the services, are also important findings. The ***technology domain*** of the result reveals AT/WT's reliability or sufficient function. The technology domain includes AT/WT with both low- and high-technology functions. Low-tech AT/WT devices include canes, crutches, walkers, wheelchairs, and adaptive tricycles. Some literature concludes that the most commonly used AT/WT devices are low-tech, recycled, second-hand (57%), and borrowed ones. Other mentions

technology deployment and a new specialised area—high-tech AT/WT, digital technology, and ICT devices. The domain ***environmental*** aspects of AT/WT includes the environmental support, in this context, refers to the infrastructure for maintenance and repair, meaning that there has to be an appropriate infrastructure to support the use of AT/WT for both primary users and the staff to ensure that the products and the services continue to meet the needs of the end user. As some authors argue, the support system must follow users throughout their lifetime with the expected concurrent changed needs. The environment around the provision of AT/WT could be identified as space, which refers not only to the physical setting but also to the societal infrastructure within it, such as the government, health policies and institutions, as well as psychosocial and cultural contexts. The ***usability domain*** of the results refers to AT/WT users' satisfaction and the products' usefulness and effectiveness. The patients' perspective is also described in the literature and is related to the perception of the actual technology device/artifact. By considering the users' perspective, the AT/WT products and solutions can include flexibility and compliance with the requirements of both users and caregivers. With a user-involvement approach, the user is a partner in the process. The user is the best judge of whether a specific technical solution to an operational limitation is functioning. A good process is designed to empower users to make their own choices, and the users should be assigned an active role throughout the process. The ***sustainability domain*** of the results is broad and involves sufficient resources to support the maintenance of AT/WT. Sustainability includes climate factors, such as respect for nature, economic justice, and universal human rights. The economic perspective on resources emphasises sustainability when delivering AT/WT and reuse of the products. Additionally, the related changes in the use of healthcare are highlighted, such as management, organisational structure, and ethical, legal and social issues. The findings reveal that the system is efficient when using available and sustainable

resources in the shortest amount of time and at the lowest cost. The ***rights domain*** extends the exploration of AT/WT as a human right in facilitating independence in daily life or social participation. Inclusion and participation in society are important human rights that can be facilitated by AT/WT. One challenge that arose was the complexity of different financial contracts in the provision of AT/WT.

Different welfare systems limit patients' access to specific AT/WT or health care providers. The GATE model (Khasnabis et al., 2015) can form the basis of guidance for decision-making within AT/WT provision, but further research is needed.

Welfare technology within municipal eldercare

The aim of **Study II** was to explore how those who work with and make decisions about WT in municipal eldercare perceive WT, as well as the challenges and opportunities they identify in utilising WT.

The municipal officials and professionals who make decisions and work with WT in municipal eldercare were found to be generally very positive about the deployment and utilisation of WT. The results also show how the discourse surrounding WT is noticeable in the thinking of people who work with and make decisions about WT in municipal eldercare, also creating cultural and social expectations. Respondents referred to WT as various kinds of technology that enable both traditional and emerging types of welfare services for older adults in need of care. The themes and subthemes are presented in Table 5.

Table 5. Themes and sub-themes that emerged from the analysis

Themes	Sub-themes
The concept of welfare technology	• Welfare technology as an enabler for the individual and for the healthcare provider • Welfare technology as a simplifier • Welfare technology that increases and/or maintains the quality of life of care receivers • Different kinds of technology
Advantages and potential of welfare technologies	• Increased reliability and safety • Increased quality of care for care receivers
Barriers to using welfare technology	• Resistance to change • Lack of funding • Lack of supporting evidence or proof • Lack of infrastructure • Difficulties with procurement • Uncertainties about responsibility and laws • High staff turnover • Proponents of welfare technology leaving their positions
Evaluation methods	• Lack of evaluations • Implementation of technologies used by other municipalities and those evaluated elsewhere • Strategy for evaluation and implementation • Methods depending on the technology and the project

The respondents perceived WT as enabling new ways of working that could benefit both the health care providers and the receiver. WT was also perceived as simplifying everyday life for the older adults and the care providers by providing for example a higher degree of mobile data accessibility. The WT were even perceived as even being more reliable and safer than humans with regards to supervisions and reminders. The technology was perceived as progressive and cutting-edge, while the organisational structure and culture was perceived as regressive and resistant to change. The acknowledged factors that slowed down the implementation of WT in municipal eldercare organisations, such as resistance to change, lack of finances, lack of supporting evidence, lack of infrastructure, high

staff turnover, difficulties with procurement, and uncertainties about responsibility and laws. The Table 6 shows the most frequently used WT the participants mentioned in the questionnaires.

Table 6. A selection of welfare technologies mentioned by the participants

Welfare technology	Objectives
Surveillance cameras	Replaces physical visits with digital surveillance. The cameras can be used for digital visits during the day or night.
Key-free locks	Enables the home help staff to open different homes with their mobile phones; in this way they do not have to drive and retrieve keys if the round or visit schedule changes.
GPS alarms	Allows care staff to see the location of a care receiver.
Virtual doctors	Medical opinions or medical examination via video links; the patient does not have to leave her home to get a medical opinion.
Security safety bracelet with sensors	Analyses the movement patterns and can warn if there is an increased risk for falls; the technology is believed to help prevent accidents and can raise an alarm so that personnel can quickly aid the care receiver in case of a fall.
Mobile access to journals	Enables home help staff digital access to the patient's journal on their smart phones so they do not have to drive back and forth to an office for documentation or bring paper lists.
Digital signing of medications and drugs	Replaces paper lists and provides a digital notification if any action has not been carried out.
e-services	Enables digital communication with health care providers.

The lack of structured implementation processes and coherent evaluation models indicates inequality of the access to WT. As a result, even though Swedish eldercare is publicly funded, the availability of welfare technologies and their usage differ between municipalities.

Study III aimed to explore the perception, experimentation, evaluation, and procurement of welfare technology practices among professionals working in municipal eldercare in relation to their gender, age, and profession.
The results revealed that personnel working within municipal eldercare were generally very positive towards new technologies; however, there are gender, age, and professional differences. Differences were particularly evident in attitudes towards technology, both with the use of technology in general and in the workplace, and with participation in decision-making regarding the procurement of new welfare technologies. Men (37/53, 70%) expressed a more positive attitude towards and curiosity regarding new technologies than women (157/336, 46.7%) ($p = .03$). Regarding age, the younger respondents (18–24 years old) perceived the digital transformation in the workplace as "too slow" (4/4, 100%). By contrast, the majority of older respondents (65–74 years old) perceived it as happening at the "right pace" (4/7, 57%). The eldercare personnel felt encouraged by management to explore and experiment with new welfare technologies but never did so either for management or patients. Even though the majority of the respondents were women, more men (4/7, 57%) were involved in the procurement process for WT devices and solutions than women (98/336, 29.2%)

Both gender and age differences may influence the perspectives of new WT, such as the personnel's resistance to WT and their participation in WT usage and deployment. Therefore, the people working closely with patients who are expected to implement the new technologies need to be more involved in the procurement process.
Different participation levels in the decision-making process regarding new technology deployment may negatively affect overall digital transformation within municipal eldercare.

Decision regarding new AT/WT

Study IV explored the aspects that may influence decision-making concerning new technology procurements in assistive technology organisations.

The results show that supportive aspects, technology aspects, patient aspects, and knowledge aspects influence AT decision-making (see table 7). Although AT/WT has been portrayed as having the potential to solve some of the challenges of an ageing population, decision-making regarding AT/WT is complex and an evolving process. The study identified that managers in AT organisations had an overall positive attitude and curiosity towards new technology to support older adults. The findings show an overall theme*: decision-making is in the making.* This theme refers to the ongoing decision-making work that managers undertake when a new technology is being considered for procurement by the AT organisation.

Table 7. Themes, subthemes and codes emerged from the analysis of the interviews

Theme	Decision-making is in the making									
Sub-themes	Supportive aspects			Technology aspects		Patient aspects			Knowledge aspects	
Codes	Policies and guidelines	Development initiatives	Diverse management	Cost and function	Sustainability and function	Legal rights	User perspective	Access to new technology	Competence discrepancy	Knowledge sharing	Supplier dependency

The study highlights that it is crucial that older adults are in focus and that all older adults are treated equally and have the same opportunity to access AT despite where they live. This is a legal right that patients (and older adults) have in Sweden. Moreover, the study reveals that there are challenges related to AT decision-making, as decision makers aim for a person-centred approach that might lead to better outcomes and reduce the risk of AT abandonment. One challenge is the general lack of evidence-based support in AT decision-making. Another challenge is the lack of national support in the form of national guidelines and policies. Increased communication between government, regions, and municipalities to support the development of national guidelines and policies would likely enhance the possibility of reaching the goal of person-centred care. Collaboration between AT organisations might also contribute to decreasing current ad hoc and diverse AT decision-making.

The subtheme ***supportive aspects*** emerged from the support the participants had in written documents and guidelines, which they needed to take into considerations. They used available local guidelines and policies, which

were dependent on the AT organisation in which they worked, which in turn were influenced by the municipal and regions they belong to. These regulations and guidelines supported managers when procuring a large volume assortment, such as walkers, scooters, wheelchairs, etc. However, the different guidelines that regulated and directly supported decision-making, parts of these formal written guidelines, were not detailed enough regarding innovative technology, and some of the managers need to make ad hoc decisions. The agreements between the regions and municipalities were also perceived as unclear, which led to patients being stuck too often between the agreements. The ***technology aspect***, the second subtheme, emerged when the participants highlighted the aspects of cost and function, sustainability and function. The managers worked proactively and used cost, price, and functions tools when considering new technology, but they also mentioned that these were not always sufficient tools. The aspect of sustainability was a highly important factor mentioned. They all followed the national sustainability policy, and they were all concerned about global environmental resources and wished they could fulfil these goals better. But these are costly and the barriers many, and sometimes it is easier and cheaper to discard than reuse the AT/WT. The reuse of new digital technology was also a challenge—it worked only for a limited time and was rarely compatible with new artifacts or products.

The third theme, ***patient aspects,*** describes decision makers' thoughts about patients' needs and legal rights for AT/WT. The managers highlighted that equality and equity were of great importance for the patient in terms of AT/WT. Most of the organisations had patient evaluations on different levels; however, the foremost and best way for the patient to give their user perspective of their AT/WT was during a prescriber-patient meeting. Some of the managers at the AT centres have tried to involve different user organisations, but these have seldom yielded positive outcomes as a result of addressing concerns on a subjective perspective rather than on a group level.

The fourth theme, ***knowledge aspects,*** refers to the rapid technological development within healthcare and social care, as well as in the society. Most of the managers perceived having competence within their organisations but not in the entire team of health care providers who met the patients. The managers highlighted that these health care providers (e.g., OT, PT and nurses) were overloaded with work and did not have enough time to increase their competence. However, some managers argued that this was only an age and generation factor, as the younger prescribers were more interested and managed to increase their competence.

Discussion

The discussion will highlight different aspects of the main findings related to the aim of the thesis, which was to *explore decision makers' and professionals' perceptions, utilisation and decision-making about AT and WT within the interprofessional field of care for older adults.*
The findings are discussed in relation to the literature delineated in the introductory chapter of the thesis.

Perceptions of AT/WT

This thesis has shown that the perceptions of the concept of AT/WT is under development, as researchers, health care providers, and decision makers differently perceived AT/WT (I, II, III, and IV). As mentioned in the introduction, there is ongoing discussion among researchers on the definitions and meanings of the concepts of AT/WT. While researchers outside Scandinavia tend to prefer to use terms other than WT, for example, 'ambient assisted living technologies', 'smart home technology', 'telehealth' and 'e-health', there is a considerable overlap among the concepts (see e.g. Aaen, 2019; Boogerd et al., 2015; Cozza, 2018, Cozza et al., 2019; Frennert & Östlund, 2018; Greenhalgh et al., 2012). Researchers in Scandinavian countries tend to use the term WT. Thus, there is no consensus within the research community about the terms AT/WT and that there are different perceptions of the two terms. Regarding Studies II and III, the context is the Swedish municipality eldercare and therefore WT is commonly used among these practitioners. However, managers in Swedish AT organisations use AT/WT interchangeably and in an overlapping way. How the terms were used depended on which municipalities or region the managers were located (see Study IV).

Four studies (I, II, III, and IV) showed that the adoption and implementation of new AT/WT within healthcare and social care were perceived as challenging. Gender, age, and professional differences affected the implementation of the new AT/WT into healthcare and social care (II, III, and IV). Depending on the characteristics, the professionals will have different perceptions of AT/WT and will introduce technology they favour to the older adult. Notably, this might influence the adaptation and implementation processes of new AT/WT. Thus, professionals' perceptions of technology risk limiting the possibility of access to new AT/WT for older adults which was revealed in study II, III, and IV, and also confirmed in the literature (Dahlberg et al., 2014; Berge, 2016; Fläckman et al., 2015; Granje et al., 2018) and also considered a closed system (Lilja et al., 2003).

The studies (I, II, III, and IV) identified this perceived challenge due to contextual factors such as patient populations' characteristics, policies, resources and staffing. Furthermore, it is clear from the four studies that the perception of challenges differs depending on who is in foci, for example, professionals or managers (c.f., II, III, and IV) and that there are disagreements regarding the nature of the problems and that there are competing interests. However, although this perceived challenge exists, it is essential that the problems be addressed and resolved (e.g., Barlow, 2017; Fuglesang & Rönning, 2014; Kannampallil et al., 2011).

Perceptions of opportunities

There are several positive perceptions about the AT/WT in the form of opportunities that come with the capability of the technology (I, II, III, and IV). More precisely, the findings in the studies (II, III, and IV) showed that both health care professionals and decision makers had a positive attitude towards new technology and perceived opportunities with the technology

regarding, for example, supporting older adults in their everyday lives, safety, and inclusion in the society. This is in line with prior studies that have demonstrated the benefits of AT/WT (e.g., Haak et al., 2007; Löfqvist et al., 2007; Scheerer, M., 2017, among others).

There is also a strength to cater for older adults with different needs or health declines, and global phenomena such as the Coronavirus Disease 2019 (COVID-19) pandemic have been a catalyst for technology to be more inclusive and sustainable. The findings (II and III) showed that the municipalities described several committed projects and piloting phase projects for future investment in new technologies. This is in line with previous research showing that public innovations are viewed as necessary for progress in society (Lundvall, 2013), and governments in Western societies have allocated generous funding to the promotion of new technologies within healthcare (Greenhalgh et al., 2012; 2018). In the thesis (I, II, III, and IV), the technical innovations in health care were highlighted as being high on the agenda, with large allocations of resources (Frennert, 2019; Kamp et al., 2019; Kaiserfeld, 2015; Regeringskansliet, 2016; Wickström et al., 2017). The decentralization of health care and social care services and limited public resources have led to pressure being placed on (primary) healthcare to develop different sustainable services; however, it is not possible to maintain the status quo (European Commission, 2018).

Perception of participation

The perception of participation and a person-centred focus on care and the provision of AT/WT is elaborated in this thesis (I, II, III, IV). These are important concepts that reflect the view of an older adult as being unique and complex, also considered in MOHO (Taylor, 2017; Kielhofner, 2017). For example, the findings (Study I) highlight this in the result “right domain”, where the AT/WT is considered an actual human right in social inclusion and participation to facilitate the everyday life. Furthermore, working

person-centred within a team, such as collaboration and communication with older adults as well as within the team, are key elements in goal setting and planning of health care (Scobbie et al., 2011).

Perception of safety

The perception of safety is shown in the majority of the studies (I, II, III). For any devices that are prescribed by an OT/PT within primary or municipal health care and social care, safety of the older adult was a top priority. A device, such as a GPS watch, places a high demand on the prescribers. Because AT/WT is a medical or/and technical product, there are demands for control of certain factors (e.g., technical, supplier, ISO standards) and security that the product entails. However, while requirements for patient safety are high, there are perceptions that AT organisations should provide AT/WT as fast and straightforward as possible. This perception can result in the prescribers feeling uncertain in their work and that the AT organisation will be perceived as resistant by the older adult and their relatives. Thus, AT/WT today places higher demands on IT structures and standard IT solutions.

Another example of a safety factor impacting digital transformation within healthcare and social care is the General Data Protection Regulation (GDPR) instituted in Sweden (April 2018). Findings in Studies II and III reveal that collaboration between IT units and organisations requires concentration on the AT/WT and the digital solution within the older adult's home to ensure they are fully functional. However, the introduction of the GDPR has contributed to additional complexity in the handling and storing of personal information. Simultaneously, the National Board of Health and Welfare Investigation is discussing the potential of legislating personal integrity within this field. A new report (Government offices, 2020, p. 14) emphasises the need for further legal discussion about WT to facilitate the

responsibilities, administration, and clarification of allocation of WT. The study results (II and III) showed that these three characteristics—the responsibility, the administration and the allocations of WT—were results of the most critical areas, and managers and decision makers within the municipalities perceived these as barriers to working with and implementing WT within municipal eldercare.

Safety technologies, such as GPS trackers, reminders, and night surveillance cameras, were among the most prevalent and frequently mentioned technologies in Studies II and III. WT was even perceived as being more reliable and safer than the healthcare staff, who were perceived as being subjective and unreliable in relation to supervision and reminders (II). This may reflect the fact that the top priority within global health is ensuring patient safety (Johannesen et al., 2019). This is also in accordance with the definition of WT, as given by the National Board of Health (2019), and confirms that safety is a fundamental expectation of WT from the perspective of both the health care professional (Johanessen et al., 2019) and the government (Wickström et al., 2017).

The utilisation of assistive and welfare technology

This thesis emphasises the need for an increased focus on AT/WT among interprofessional health care providers as well as the older adults. The most essential is to ensure that those who are most impacted by a declined health or disabilities, as well as the changes in AT provision– the AT/WT users – are at the centre of the conversation and engaged in the development of user-centred technologies, systems and policies (Desmond et al., 2018). The older adults' perspective is of great importance at this point, as the result of study I and IV highlights. The technology needs to be AT user friendly, but also, for example, safe, sustainable and reliable, as shown in the studies (I, II, III, and

IV). A factor impacting the use of technology might also be age (Study III). Although the daily use of digital services is increasing among all age groups, it is more common for older adults to be non-users or not daily users of internet services (Findahl, 2018). Some research (see e.g., Huber & Watson, 2014; Czaja & Lee, 2003; 2007; Deng et al., 2014) indicates a negative association between age and technology use and assumes that older adults have problems with learning new skills, resistance to change, and using new technologies, whether due to physical capabilities or lack of interest. However, despite the physiological changes of healthy ageing (Larsson & Rundgren, 2010) and most homecare users being of advanced age (Lagergren, 2013), older adults are not a homogenous group. Older adults are often in need of technical support to learn to operate new technologies, and the support they receive will affect their continued use (Lee & Coughlin, 2015; Fisk et al., 2009; Hernández-Encuentera et al., 2009). They also need to understand the benefit of a particular technology (Hernández-Encuentera et al., 2009; Kim, 2008; Selwyn, 2004), and family members and friends can influence the availability of support in technology use. This implies that there are differences among older adults in their capabilities to adopt and use technology.

Therefore, it is important that health care providers have both time, competence, and knowledge about a new AT/WT to be able to fully support older adults (Studies I, II, III, and IV). Within the OT, PT, and care professions, it is compulsory to conduct follow-ups and evaluations when prescribing new AT/WT. Yet, this mandate has not been equally applied, as WT is a new form of service, solution, or device, and some may have already been introduced and built into (smart) homes. The results (in Study II) revealed that the majority of eldercare personnel did not perform evaluations when a new WT had been implemented. When follow-ups and evaluations are neglected, the AT/WT may well be abandoned or not used,

as predicted in the theory of innovation (Rogers, 2003). The everyday ethics is also an important and central theme to consider (Greenhalgh et al., 2013; Greenhalgh et al., 2015), as technology is used when it enables, and to the extent that it works and at a more abstract level, when the technology achieves what matters to us. When technology interferes with what is important to us (for example, when it makes the bedroom look and feel like a hospital ward), it is quickly rejected (Greenhalgh et al., 2013; Greenhalgh et al., 2015). The utilisation of AT/WT should be designed for ease of use and with a holistic approach, which was shown as important (I and IV) and enabling the older adults to realise the life project (Dahlberg & Segesten, 2010; Law, 2002) as well as being active in their everyday life. Such research, together with MOHO, affirms the view of older adults as beings who need and have a desire to engage in meaningful and purposeful activities (Drolet, 2014; Kielhofner, 2012; Law, 2002; Wilcock, 1993).

Health care providers need to develop the skills and capacity to deliver services and to provide training and appropriate AT/WT to AT users and their health care providers in such a manner that they facilitate engagement with health services and the community. The findings (II, III, and IV) affirmed the importance of having an evidence-based approach when deciding on and prescribing AT/WT to AT users and older adults, which is in line with previous literature (Illot & Taylor, 2006; Karlan & Parette, 2007). The findings (IV) also highlight that fundamental principles should be tailored to the context and available resources. Despite the Swedish welfare system being publicly funded and older adults generally enjoying good everyday health, there are still inequalities among the regions, with differences in fees and services (Study IV).

Additional findings from this thesis (II and III) illustrate that several WT products and solutions were implemented and in usage. Nevertheless, in agreement with the literature (Andreassen et al., 2015; Barlow, 2017; Barlow

& Hendy, 2009; Essén & Lindblad, 2013; Halford et al., 2010), despite promising results in several projects, many projects never pass the pilot stage (such as starting WT projects), as demonstrated in the findings in Studies II and III. The concept of utilisation of WT does not always include organisational factors, such as culture and implementation climate. Yet, these factors can create critical barriers, affecting adaption and change, as well as the utilisation of the technology (Damshroder et al., 2009; Nilsen et al., 2016; Pols, 2017; Sanchez-Criado et al., 2014).

Challenges with the utilisation of AT/WT

There are challenges with the use of WT, and the studies revealed (II and III) that WT often includes more than one product and solution. The WT service needs to be connected to those who are close to the older adult, such as significant others, health care providers, and other teams who already support and help older adults in everyday life. The interprofessional healthcare providers allocate their work in different ways and therefore have different needs relating to its execution. The AT/WT solutions create high demands for collaboration between different actors, and frequently, other dynamics need to be at work within the organisation to obtain the best effect (I, II, II, and IV), as confirmed by the literature (D'amour et al., 2005; la Cour & Höjlund, 2019; Nilsen, 2015; Plsek & Greenhalgh, 2001; San Martin- Rodriguez et al., 2005). Since some AT centres have different providers in multiple municipalities, there is a need for cross-over cooperation and a common approach regarding both the technology and the working dynamic. The WT can, besides being a part of an older adult's everyday life, also be used as a tool that could enable sharing and transparency between the interprofessional field of care and the older adult throughout the rehabilitation process and provide the participants with reminders and feedback.

Another aspect of the complexity is the adaption and implementation process and the need to start on a small scale, giving the personnel time to build their experience and reflect on the changes. Starting on a small scale is recommended in Roger's theory of diffusion as being a critical feature in successful adaption (Rogers, 2003). The findings (II and III) revealed that, besides eldercare personnel being overloaded with work, those who had introduced the new technologies had changed their employment position, and other personnel had to continue the process with the implementation (II). Similarly, those working on the frontline with the prescription of AT (primary healthcare and municipal homecare personnel) were described (by the managers) as being too stressed to be able to update their competencies, while this left them with little time for adaptation and reflection (IV). According to Rogers' (2003) theory of diffusion, another key feature is that the adoption of innovation is more likely to succeed when the results are visible to the individuals concerned. This was evident in Studies II and III, in which those who decided on the new technology bought or procured the new technology without involving the frontline staff. This lack of involvement, together with high staff turnover, resulted in the personnel not seeing any visible or positive outcome. Previous study (Damschroder et al., 2009) also pointed out that a project is more likely to succeed when the team members remain on the same team for an adequate length of time, meaning a low staff turnover. The results of this thesis (II and III) revealed consistently high staff turnover within municipal eldercare.

Existing critics state that a limitation of the AT/WT system is that it is more or less closed, and that AT users are usually dependent on their prescribers (Lilja et al., 2007). Similar findings were revealed in the thesis (II, III, and IV), in which health care providers, such as nurses, OTs, and PTs, had neither time nor competence to introduce the new technologies. These professionals already juggle the roles of clinician, educator, supervisor,

manager, and various advocacy roles (Barbara & Curtin, 2008), and there is much research confirming that these occupations are heavily affected by stress, burn-out syndrome, and other mental illnesses (Lasalvia & Tansella, 2011; Morse et al., 2012).

Decision making and AT/WT

AT/WT creates a high demand for changing the dynamics within an organisation. Unless the approach to work can change, positive outcomes involving care providers and staff will falter, and the technology results will be both expensive and time-consuming (II and III). The work dynamics in organisations demand compassionate management, control and awareness of how to measure outcomes and processes. The decision makers' goal is to predict different outcomes, to understand the alternatives that exist, and to choose the best alternative (e.g., Walley and Baum, 1994). The findings in Study IV resemble these prior findings, where the managers in the AT organisations shared the same focus on exiting the decision-making process with satisfying outputs. Furthermore, existing research has shown similar results that contextual aspects (e.g., organisation, policies, resources) and cognitive aspects (e.g., knowledge) influence this process (c.f., Eisenhardt & Zbarackiy, 1992; Schwenk, 1995; Nutt, 2005; Bercu, 2013; Elbanna et al., 2020). Youngson (2008) declared that the experience of people and their families seeking care is often a reflection of how the care organisation treats its own employees. The leaders of healthcare organisations provide role models for the values and principles that underlie people-centred care. Achieving and maintaining excellent patient care requires strong role models, mentors, and managers who lead by example (Francis, 2013; Johnston, 2013). Studies II, III, and IV showed both opportunities and challenges that participants perceived in relation to work, decisions and

AT/WT usage. Some of these findings pinpointed that the decision basis lacked clarity, and with a lack of supportive policies and guidelines. The findings in the studies (II, III, and IV) showed there is a need for an evidence-based approach to make better decisions and evaluate AT/WT outcomes. This need for an evidence-based approach and a lack of decision-making support made it hard to confirm the positive outcomes with AT/WT. This finding confirms the conclusions in the report of Vårdanalys (2020). Furthermore, the results (I) suggested that the GATE model of Khasnabis et al. (2015) can support decision-making since it helps decision makers to consider important factors (e.g., policy, assessment, procurement, technology, environment, usability, sustainability and rights) within AT/WT field.

Assistive technology provision

The scientific literature review (I) showed that most existing decision-making models cover only a portion of the AT/WT provision procedure. However, there are several reports on local guides and models to support the provision of AT. These guides and models show that the AT service delivery process is important for (older) persons with disabilities or impairments (Bartfai & Boman, 2014; Lenker et al., 2012; Scherer et al., 2007; Scherer, M., 2017). One of the crucial issues for decision makers within AT organisations, highlighted in the thesis (I), is AT assessment and service delivery, where the focus is on involving the AT user and making decisions that are directed by evidence-based knowledge. As the results showed (I), the assessment should be based on the older adult's needs, regardless of age, gender, or impairments, and it should be easy to gain access to the AT provision system and start the procedure. This is also supported by the literature that highlights the person-centred care approach, and it involves including the AT user's needs, preferences and abilities when prescribing

AT (Borg et al., 2012; Brandt et al., 2015; Buchanan & Layton, 2019; Larsson Ranada & Lidström 2019).

Additional aspects of including the AT user in the work and provision of AT/WT were highlighted (I and IV), as well as the importance of person-centredness. To provide person-centred care, health and social care needs to modify the care and context to suit the needs of older adults (Ekman, 2014). Moreover, as Kielhofner (2012) in MOHO and McCormack & McCance (2010) explained, person-centredness places the person at the centre of care, thus moving away from medically dominated and fragmented care and focusing on holistic, caring relationships, with a collaborative approach. The decision-makers emphasised the patient's legal right to participate in society and to maintain an active life through the support of AT. The service delivery process for AT is therefore of great interest, since the provision may be critical to the individual's participation in society, enhancing their activities and independence in everyday life (Association for the Advancement of AT in Europe [AAATE], 2012; Bartfai & Lampal, 2014; Brandt et al., 2011; 2015; 2020; Steel & Witte, 2011).

The thesis revealed the complexity of the AT provision process (I and IV), involving several areas but with knowledge gaps. From the theoretical systems' perspective, the different areas influence each other both directly and indirectly (Kielhofner, 2012; 2008). As Study I exposed, one explanation for the sparse research literature on AT provision is that the availability of AT is dependent on different countries' disability policies, social and economic conditions affect decisions, and cultural attitudes towards AT differ (Andersson et al., 2014; Chen et al., 2014; Smith et al., 2002). Other researchers pointed out the significant gap between the need for AT and its provision, also shown in Study I; this is patterned according to a range of social, demographic, and structural factors within the various

countries (MacLachlan et al., 2018). In Sweden, the AT/WT provision and possibilities also differ nationally (II, III, and IV). The managers and officials also highlighted the challenges they experienced as they tried to collaborate with other regions or municipalities (II, III, and IV) when introducing and implementing new technologies. Furthermore, the person-centred approach was advocated and found to be an essential factor for an effective AT service, giving satisfied users (Brandt et al., 2020). In fact, a review revealed that there are factors at almost every step of the service delivery process that can affect satisfaction with AT/WT, and that these can give rise to abandonment or underutilisation of the product (Larsson Ranada & Lidström, 2019). This implies that there is a need for a more person-centred development of funding policies and for infrastructures that are sustainable and resilient, having robust and accessible tools and systems and capacity for AT users, care providers, and clinicians.

A discussed in earlier chapters of this thesis, the assumptions and core values of occupational therapy and care sciences present increased participation as a means for increased health and well-being (Kielhofner, 2017; Ekman, 2011; 2014,). The findings from the thesis (I and IV) showed that policymakers and decision makers consider access to be a significant factor in participation in the AT/WT provision. However, they also stated that most of the available access to information on AT/WT is provided by the prescribers (OTs, PTs) in their daily work with patients (IV). The decision makers also recognised that AT prescriptions should be based on the individual's needs, but with an awareness and consideration of the municipality's limited resources (IV). Information on how to access services, which services are available, and how to obtain them is crucial for reaching participation in the AT provision (I and IV). The literature agrees with this, affirming the importance of improving accessibility (despite existing political agreements), especially to services and relevant infrastructure, both virtual and material, to both

transport and access to knowledge and information about AT (AAATE, 2012; European Commission, 2018; Nierling & Maia, 2020).

The municipalities and regions involved in this thesis project shared the common challenges of increased demography and diminished workforce, as well as limited resources, but all had their own ways of handling the challenges. As shown in this thesis (II, III, and IV), despite all the challenges mentioned, projects involving the implementation of new technologies have been accomplished in many parts of Sweden. It is obvious that these municipalities and regions have not only the competence but also the commitment needed to handle the agreements and suppliers themselves. Positive experiences through projects can identify needs, and the provision of AT/WT can be adjusted to meet real needs and not just presumed needs. The innovative projects need interprofessional involvement, including prescribers and frontline care providers, as well as those working at an overall level (such as managers on the strategic level) to implement the technology in regions and municipalities. It is also important to consider which group of older adults is being targeted so that no one is excluded from the healthcare and social care and AT/WT provision. It is also important that sufficient support is provided for people who are inexperienced or who have physical or cognitive impairments that might hinder the use of the new AT/WT.

Methodological considerations

In this thesis, both qualitative and quantitative methods were used to fulfil the aims, which is considered a strength (Polit & Beck, 2004). By including data from different perspectives and levels in the AT and WT contexts, a better understanding of the work, utilisation, decisions, and AT provision were provided. The different studies both validated the findings and identified discrepancies within and between the municipalities, regions and organisations. The strengths and limitations will be discussed below.

In Study I, the strength of the review was that it allowed an overarching and broad question to be answered in the same literature review. Literature reviews sometimes employ quality evaluation methods to assess the strength of evidence of the outcomes reported by the included articles. However, in this review, we did not focus on the reported study outcomes but on the process, decision-models or the guidelines. Hence, we did not conduct a separate quality evaluation but strived to achieve a high quality of the included studies by means of the rigorous eligibility criteria and search strategies outlined. The literature review was conducted using a descriptive qualitative approach (Sandelowski, 2000), which was suitable considering the broad aim and peer reviewed literature.

The questionnaires used in this thesis (Studies II and III) were newly constructed, as no previous questionnaire was considered suitable. As reported by Polit and Beck (2010), validity is a quality criterion referring to the extent to which an instrument measures what it is intended to measure. More explicitly, when assessing the validity of an instrument the key questions would be what the instrument actually measures and if the abstract concept of interest is measured. To the best of our knowledge there were no questionnaires matching our research questions that had been tested and

validated in the AT/WT context. Therefore, a questionnaire was created by following the process described by Charlton (2000). Streiner and Norman (2008) encouraged the development of a new tool if no previous tool completely covered the study domain, and this was applied here. Additional validity and reliability tests, such as test-retest and face-validity, were applied. Other tests could have been run to further validate the results, such as factor analysis, etc. However, the overarching aim of the thesis was not to develop and validate a questionnaire. Rather, it was intended to deepen knowledge and to explore the perceptions and experiences of the participants.

In Study IV, a semi-structured interview was designed to address this aim and a number of strategies were used to ensure the trustworthiness of the interviews. A pilot test was conducted and then preliminary semi-structured question areas were created. These question topics were then sent to the reference group (i.e., the National Network of Assistive Technology Managers) to obtain feedback on the topics and to see if other vital topics were missing. During the interviews, the participants also shared their local guidelines and decision-support, for clarification and as a complement of their AT systems and organization. As suggested by Thurmond (2001), these documents and decision-making supports were read multiple times and included in the thematic analysis to strengthen the validity of the findings. To improve confirmability, there were continuous discussion between the authors concerning plausible interpretations of data, leading to consensus The study used thematic analysis, which is mainly described as ‘a method for identifying, analysing and reporting patterns (themes) within data’ (Braun & Clarke, 2006, p. 79).

Qualitative approaches were used in studies I, II and IV, and the aims were therefor not to generalize the findings, but to investigate a phenomenon

experienced in a group of participants (Polit & Beck, 2016) encountered by different health care providers, policymakers, and patients (Sandelowski & Barroso, 2003), and these approaches share a similar goal in that they seek to understand a particular phenomenon from the perspective of those experiencing it. These qualitative methodologies were therefore considered suitable for this project.

The participants in study II and III were recruited purposively (Polit & Beck, 2012) by the "registrar" in the municipalities which gave a broad variety of experiences concerning age, and different forms of occupations, but an imbalance in gender. Recruitment of participants in study IV were based on stratified purposive sampling (Patton, 2012), which gave a broad variety of experiences and knowledge from the decision-makers in AT organisations on municipal and region level.

The position of the researcher

The data collection methods in the studies were all qualitative, where the researcher was the major research instrument and was involved throughout the process. Reflexivity in the researcher is a process whereby the researcher conducts critical self-evaluation and a continual internal dialogue concerning their position and pre-conceptions. It is also an active acknowledgement and recognition that this position may affect the entire research process and its outcomes (Berger, 2015; Macbeth, 2001). To ensure trustworthiness in a study, it is vital that researchers are transparent in terms of their relationship to the field and the knowledge being produced through/via the voices of others. Designing the web questionnaire and the semi-structured interview were conducted in collaboration with the co-authors. Coming with different backgrounds and experiences, this led to discussions and an awareness of the importance of having an open mind when analysing empirically generated data.

Conclusion and implications

The studies included in this thesis add to the knowledge about how perceptions, utilisations and decision-making of AT/WT is enabled and hindered within Swedish healthcare and social care. The studies also revealed that there is a lack of evidence-based guidelines to support decisions regarding new AT/WT as a result of their complex and multifaceted context. Municipal eldercare allocates significant resources and effort to introduce, implement and use the new WT. However, some acknowledged factors, such as resistance to change, lack of finances, lack of supporting evidence, high staff turnover, difficulties with procurement and uncertainties about responsibility and laws slow down the digital transformation and change the dynamics between the actors involved. Furthermore, there is a lack of structured implementation processes and coherent evaluation models, which indicates inequality in access to WT. The officials and healthcare providers in municipal eldercare were generally positive about new technology, but there are differences due to gender, age, participation and professional differences. Differences were particularly evident in attitudes towards technology, both in general and in workplaces where men were more optimistic. Participation in decision-making regarding new WT also showed gender differences. Differences were such that even though the majority of participants were women, more men than women were involved in the procurement process for WT devices and solutions. Age differences were also a factor as younger participants perceived the digital transformation in municipal eldercare as *too slow*, while the older participants perceived it as happening at the *right pace*. This gender and age discrepancy may influence the perspectives of new WT, such as resistance to WT and their participation in WT utilisation and deployment. Healthcare personnel who work closely with older adults and who are expected to

implement the new technologies need to be more involved in the processes of procurement, or this may negatively affect the overall digital transformation within municipal eldercare.

Regarding decision-making within the area of AT/WT the results also revealed that decision-makers had an overall positive attitude and curiosity towards new technology. Decision-makers perceived the importance of focusing on older adults, treating them equally and providing opportunities for them to access AT despite where they live. The findings show that managers in AT organisations usually focused on the standardised part of the AT assortment, but some of the decisions were made ad hoc, as they involved the unique procurement of new AT to complement the standardised AT assortment. The different aspects that influence decision-makers' decisions when new technology is being considered for procurement by an AT organisation were identified as four subthemes: supportive aspects, technology aspects, patient aspects and knowledge aspects. Among several challenges, the managers experienced a lack of decision support, such as formal national policies and guidelines for making decisions about new AT. They also perceived a need for increased communication between governments, regions and municipalities to support the development of national guidelines and policies to enhance the possibility of reaching the goal of person-centred care. This supports AT organisations' requests for an evidence-based approach to facilitate AT decision-making.

Implications

This thesis's contribution to new knowledge is relevant and highly topical within a rapidly growing technological and aging society. It has contributed to evidence-based insights about the context of AT/WT, decision-makers, officials and healthcare providers' perceptions, utilisation and working with

AT/WT. The thesis can be used to create targeted efforts and arrangements within healthcare and social care and to create more inclusive technologies, services and environments. This knowledge might contribute to guidance in assessment, interventions and support when making decisions to buy or procure new AT/WT at their organisations.
Finally, the specific professional context of this study provides valuable insights into decision-making in AT organisations. Both theoretical and empirical research insights were derived from the analysis. Specifically, the thesis was able to gain insights into how and in which limiting or facilitative conditions decision-makers experienced their roles in these organisations.

Future Research

The work presented in this dissertation opens many interesting research directions for future work. The proposed contributions can be further extended, and several avenues can be explored further to yield more knowledge. The first area of interest for future research concerns those voices that were not heard in this thesis. This will involve exploring the perspective of the AT user, how they perceive AT/WT and how specific technologies can be more or less significant in their daily lives. How does technology affect their quality of life? How do they perceive the new technology in their home? Furthermore, it will be interesting to explore how significant others perceive this implementation of AT/WT, a study of which has already started.

From the results of this study, it was revealed that there is a need for future research on AT decision-making to develop the research field. One suggestion is the development of easy-to-use tools for decision-making based on, for example, ICF and ISO 9999 as common frameworks applicable to the Scandinavian (and European) context. Another suggestion for future

research is to study different stakeholders' perspectives on AT decision-making. The analysis shows that managers rely on the engagement of stakeholders (e.g. patients, significant others, healthcare providers, suppliers, other AT organisations, municipalities, etc.) when making decisions about AT procurement. Thus, and inspired by Freeman's stakeholder theory (1993), it would be valuable to study the interconnection between stakeholders, their aligning interests and communication to improve AT decision-making.

In crises, such as the COVID-19 pandemic, access to the AT/WT and associated services, including training, maintenance and repair, may be impacted. This research supports access to AT through the development of sustainable policies and processes, which ensure that all who require AT to maintain their independence can access the necessary products and services. Thus additional interest would be to explore how AT provision has been affected during the pandemic and what we can learn from this to carry into the future. How can we work sustainably and resiliently to meet future crises and challenges?

Svensk populärvetenskaplig sammanfattning

Världens befolkning lever allt längre. Den genomsnittliga livslängden ökar vilket leder till en mängd demografiska utmaningar. Med ett växande antal äldre personer, ökar behovet av hälso- och sjukvård och äldreomsorg. Det finns stora förväntningar om att innovativ teknik, i form av hjälpmedel och välfärdsteknik är nödvändigt för att möta dessa ökade behov. Befintlig forskning inom området har främst fokuserat på att undersöka hjälpmedel och välfärdsteknik utifrån ett användarperspektiv.

Denna avhandlings övergripande syfte är att studera uppfattningar, användning samt beslutsfattande inom det interprofessionella fältet hjälpmedel och välfärdsteknik, hos beslutsfattare samt hälso-och sjukvårds- respektive äldreomsorgspersonal.
I avhandlingens första delstudie studeras beslutsmodeller respektive -stöd gällande hjälpmedel och välfärdsteknik, ur ett internationellt perspektiv. De tre empiriska studierna i avhandlingen tar utgångspunkt i vår svenska kontext, där beslut tas på regional respektive kommunal nivå, där skattemedel finansierar verksamheterna. Vidare undersöks uppfattningar respektive kunskaper om samt erfarenheter av hjälpmedel och välfärdsteknik hos hälso-och sjukvårds- respektive äldreomsorgspersonal. Dessutom studeras påverkansfaktorer (aspekter) för beslutsfattare i uppdrag gällande beslut om införande av nya hjälpmedel och välfärdsteknik.

Resultaten påvisar en kunskapslucka i forskningen inom området beslutsmodeller för hjälpmedel och välfärdsteknik. Vidare konstateras att beslutsfattare, hälso- och sjukvårds- och äldreomsorgspersonal generellt är positiv inställda till nya hjälpmedel och välfärdsteknik. Användningen av nyutvecklade innovativa hjälpmedel och välfärdsteknik kan utgöra en bra resurs för att öka möjligheter till att kunna bo kvar hemma längre, samt att utgöra stöd i den äldres vardagsliv. En viktig slutsats är att jämlik och rättvis förskrivning av hjälpmedel och välfärdsteknik till äldre personer förutsätter att besluten är såväl evidensbaserade som personcentrerade. Avhandlingen bidrar till kunskapsuppbyggnad om beslutsmodeller, med särskilt fokus på GATE-modellens (Khasnabis et al., 2015) tillämpbarhet inom området. Vidare konstateras att det föreligger behov av fördjupad kunskap inom området hjälpmedel och välfärdsteknik, då det saknas strukturerade beslutsmodeller och utvärderingsprocesser med avseende på effekter av hjälpmedel och välfärdsteknik. Resultaten påvisar även skillnader i ålder, kön och delaktighet inom forskningsområdet och behöver studeras ytterligare. Denna avhandling bidrar med, en ökad kunskap om hjälpmedel och välfärdsteknik under en digital transformation i ett samhälle med en åldrande befolkning, utifrån beslutsfattares, hälso- och sjukvårds respektive äldreomsorgspersonalens perspektiv

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