ACIT5900

MASTER THESIS

in

Applied Computer and Information Technology (ACIT)

May 2023

Universal Design of ICT

Artificial intelligence (AI) literacy among older adults

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OSLOMET

Preface

I am thankful that I got the opportunity to work with such an important topic for my master thesis, and I have learned a lot during the process of working with it. The process has been challenging, but also very educational.

I would like to thank all the participants who participated in this study, this study would not have been possible without the interest shown by all the participants. In addition, I would also like to thank my supervisor Weiqin Chen for her guidance and giving suggestions for changes and improvements throughout the process.

Finally, I would like to thank my family and friends who have motivated me and supported be throughout the process of writing this master thesis.

Oslo, 15.05.2023

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Abstract

The use of artificial intelligence is increasing in many areas of society and is also being seen as a possible opportunity to overcome challenges associated with aging. However, there is not much research on older adults' knowledge, experience, perceptions, and concerns of AI in general.

The aim of this study is to investigate AI literacy among older adults based on their knowledge, experience, perception, and concerns related to AI. The current definition of AI literacy is focused more on students, but in this study the current definitions were used as a starting point for understanding AI Literacy among older adults.

This study used a mixed method approach, with survey and semi-structured interviews. The survey received 182 replies from older adults with age between 60 and 99, and the interviews were conducted with 25 participants age from 61 to 90.

The results showed that most older adults have heard about AI in news, internet or from friends/family. However, their knowledge varies. Some have heard the term, while some have more knowledge about how AI works. Further, the results show that older adults evaluate what AI-enabled products and services they use based on their experience, knowledge, and perceptions. The results also showed that older adults are critical to how AI is used in the health sector, and they have concerns related to it replacing human contact, increase isolation and loneliness. Further they also have concerns related to privacy and security in AI-enabled products and services.

The study suggests that more research needs to be done to understand how AI-enabled products and services effect older adults' well-being. Most older adults are interested in learning more about AI, so they can make better decisions for themselves. Therefore, it is suggested that they are given courses and guidance about AI. The study also suggests that there should be a well-defined definition of what AI Literacy is for older adults.

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1 Introduction

The use of Artificial Intelligence has increased in many areas of society, like business, science, art, and education. The definition and use of AI have evolved throughout the years from when it first was defined in 1956 as “The science and engineering of making intelligent machines” (Ng, Leung, Chu, & Qiao, 2021). Today many products and services that we use for our everyday life use AI, for example smart home appliances, smartphones, online shopping, voice assistance (e.g., Alexa, Google Home), chatbots, search engines, video streaming services, and social-networking applications. (Ng, Leung, Chu, & Qiao, 2021) (Shandilya & Fan, 2022)

From a global perspective, the fastest growing age group is of those aged 65 and over. According to the World Population Prospect: the 2019 revision, by 2050 16% of the world population will be over age 65, this is an increase from 9% in 2019. In addition, 2018 was the first time in history that the number of people over age 65 where more than the number of children under age five. Moreover, the number of people over age 80 is expected to triple from 143 million in 2019 to 426 million in 2050. (United Nation)

AI is increasingly viewed as a new opportunity to overcome different challenges associated with aging and promote independent living and wellbeing for older adults. Recent research has shown that age might affect people’s experiences and attitude towards AI. Compared to younger adults, older adults have less experience with AI products and might face more challenges using them (Shandilya & Fan, 2022). However, recent research has focused more on older adults’ experiences using specific AI-enabled products (Shandilya & Fan, 2022).

Even though, research studies are trying to find solutions that can help older adults with age-related issues like, loneliness, functional decline that impacts both physical and mental health, and other factors that hinder them from doing their daily life activities, using Artificial Intelligence, there is not much research about how older adults understand the term “AI”, how they expect it to work, their knowledge and (mis)perceptions about AI, and their trust in AI (Shandilya & Fan, 2022). Understanding and promoting AI literacy among

older adults is the first step to assist them to take advantage of the potential benefits of AI. However, most of AI literacy studies have focused on children and young people and few have studied AI literacy among older adults (Shandilya & Fan, 2022).

This project aims to investigate AI literacy among older adults and to understand their perception, experiences, knowledge, and concerns related to AI. This will be done through a mixed method approach, with questionnaire and semi-structured interviews. The focus will be to understand how older adults experience and perceive AI-enabled products, their knowledge about AI and where they get this from, and their concerns related to AI.

In short, the aim of this study is to understand:

- How much knowledge older adults have about AI?
- What experiences do they have with using AI enabled products and services?
- What is their perception and attitude towards AI?
- What concerns do they have related to AI?

These questions are based on the definition of AI Literacy that is presented in chapter 2.1. Since the definition of AI Literacy is under development and is mostly used for students in educational context, the current definition was used as guidance to make the research questions, and further questions for the survey and interview.

2 Literature review

2.1 AI literacy

The term “Literacy” was defined as the ability to read and write. However, the meaning of this term has changed in today’s time. It has been extended to new literacies, such has media literacy, digital literacy, and AI literacy. However, AI literacy is a new concept, and the definition of AI literacy is under development. In a study done by Ng, Leung, Chu, & Qiao, they did a literature review to get a better understanding of the term “AI literacy”, how it can be learned, and ethical concerns related to AI literacy. Most papers focused on AI literacy in education. The study showed that there were four aspects to AI literacy, “Knowing & understanding AI”, “Use & apply AI”, “Evaluate & create AI” and “AI ethics” (Ng, Leung, Chu, & Qiao, 2021).

Although there are different definitions of AI literacy, the common understanding is that AI literacy is attitudes, abilities, and competencies that can be used to effectively and ethical use AI in everyday life (Ng, Luo, Chan, & Chu, 2022). The term was first presented as the ability to understand the basic knowledge and concepts behind technologies that use AI, and knowledge needed to use AI ethically. AI literacy is a set of competencies that help users in critically evaluate AI technologies, communicate, and collaborate effectively with AI. Further, researchers added that AI should be a skill for everyone, and should be a part of the technological literacy, as it is needed for work and everyday life. (Ng, Luo, Chan, & Chu, 2022)

The first most basic definition of AI literacy, also mentioned by Ng, Luo, Chan, & Chu, is “*The first most fundamental definition of AI literacy has focused on basic AI concepts, skills, knowledge and attitudes that require no prior knowledge. Instead of merely being the end users of AI applications, students should understand its technologies and working principles […]*” (Ng, Luo, Chan, & Chu, 2022). Even though this statement is headed towards students, it also applies to other groups of users, since it helps in making better decisions and more ethical decisions when consuming and using AI-enabled products.

When the use of computer applications in different industries increased, the need of users to become digitally competent also increased. From this the term “digital literacy” emerged, and the importance of being digital literate increased as the dependence of computer technologies increased. The same can be said for AI literacy. Since the use of AI-enabled products are increasing the need of being AI literate is also getting more important. (Ng, Luo, Chan, & Chu, 2022)

Long and Magerko provide a concrete definition of AI literacy based on recent research. They define AI literacy as “a set of competencies that enables individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI as a tool online, at home, and in the workplace.” (Long & Magerko, 2020)

2.2 AI applications for older adults

This chapter presents research related to understanding older adults' knowledge, experiences, perceptions, and/or concerns in general or with specific AI-enabled products and services.

2.2.1 Independent living, and well-being

Studies have shown that older adults prefer to “age in place” or to live independently at home. Different type of technologies, including Artificial Intelligence, can be used to support independent living, improving mental and physical health and also increase quality of life. A study done by Wang et al. identified older adults’ perspective regarding Ambient/Active Assisted Living (AAL) and AI technologies, and found that they face a number of barriers due to low technology literacy, lack of understanding of terminology, physical challenges and poor usability. However, they also showed interest in learning, and understand and control their data. They were also willing to contribute to design of technologies that can help in independent living. (Wang, et al., 2019)

The exploration of assistive robotics for older adults is increasing. For instance, CARESSES is a project that aimed to develop and evaluate a “culturally competent artificial intelligent system embedded into social robots to support older adult wellbeing”. An experimental

study was done at older adult care homes in England and Japan, where participants were divided in two groups. One of the groups received a Pepper robot for 2 weeks. The other group did not receive a robot. The quantitative results show that there was significant difference in emotional wellbeing over time, no significant changes in physical health, and loneliness was slightly better among the group with the robot, but this was not significant (Pappadopoulos, et al., 2021).

Another study evaluates a service robot for seniors, where 10 older adults interacted with the Care-O-bot in an environment that was home-like. The results showed that the participants wanted the robot to perform more complex tasks, like fetching and carrying objects, contact others in cases of emergency, opening doors and cooking. For tasks that required touching, like showering, toileting and dressing were seen as not possible by the participants as it would require very high level of intelligence. They also mentioned that a future robot should to tasks based on personal preferences. Caregivers who participated in this study said that a future robot should support the older adults on a similar level as a human caretaker. For example, human care givers can see if something is wrong, like if someone has a wound or dry skin, and can quickly act. The future robot should be able to do the same, hence it needs to be very smart. Overall, the older adults were more positive, than caregivers, and other stakeholders. They were more concerned about the sue of assistive robots, including technical issues. However, they all agreed that future robots need to be able to perform more complex tasks, so they help older adults in living independently for as long as possible. In addition, it should be comparable to human caregivers (Bedaf, Marti, Amirabdollahian, & Witte, 2017).

A literature review done by Abdi, Al-Hindawi, Ng and Vizcaychipi looks at 33 studies focusing on socially assistive robots (SARs) for older adults. Out of these studies 28 reports positive results related to assisting older adults. Five positive aspects of SAR were found, and they were related too: cognitive training, therapy, companionship, social facilitation and physiological therapy. However, these studies have some issues with the methodology and focused only on small robots, especially the PARO seal robot, and in general did not give any clear idea of whether SARs are beneficial or not (Abdi, Al-Hindawi, Ng, & Vizcaychipi, 2018).

Another systematic review and meta-analyses of randomized controlled studies done by Pu, Moyle, Jones, and Todorvic makes similar conclusion. Nine studies were included in the meta-analysis. The studies showed that social robots have positive impact on agitation, anxiety, and quality of life for older adults, but still no statistical significance was found in the meta-analysis. Still results indicate that interactions with social robots could improve engagement, interaction, and stress, reduce loneliness. However, the conclusions are made with caution since the quality of these randomized controlled trials studies were not of high-quality (Pu, Moyle, Jones, & Todorvic, 2018).

Similar results are presented by Abbott et al. They did systematic review of qualitative and quantitative studies that focus on the effect of using robopets on older adults living in care homes. The results showed that interactions with robopets can have positive impact on different aspects of well-being (loneliness, depression, quality of life), however there was no statistical significance was found in the meta-analysis. It is also important to mention that not all had positive experiences with robopets. However, the studies had low to moderate quality, and more research needs to be done in order to understand the effect of long-term use of these robots (Abbott, et al., 2019).

Studies focusing on increasing psychological well-being using social robots has increased in recent time. A systematic review done by Chen, Jones, & Moyle to understand the effect of social robots on older adults related to depression. seven studies were selected, and the results showed that social robots do have the potential to reduce depression symptoms in older adults. However, the collected evidence is not enough to make strong clinical effectiveness suggestions for older adults (Chen, Jones, & Moyle, 2018).

G.Belam and R.Nilforooshan did a literature search on papers that focused on AI used for taking care of people with dementia. There is not much literature in this area, but those who exist show that AI does have potential, but people with dementia and their care takers must be a part of the development process. (Belam & Nilforooshan, 2021)

2.2.2 Smart home technologies

Another study aimed at understanding the perceptions, acceptability, expectations, and concerns of smart home technologies among older adults. Through surveys, focus groups and case study interviews with adults over 50 it was found that participants saw benefits with smart home technologies but also had concerns related to privacy, ease of use and the amount of control they had. Survey responses with 30 participants showed that 10.7% were familiar with nanotechnology, 42.9% with smart showers, 70.4% with home sensors, 74.1% with telehealth, 71.4% with smart appliances, 81.5% with personal sensors, and 96.4% with voice-activated devices. Out of these they were most willing to implement home sensors (66.6%) and voice-activated devices (64.3%). (Guan, et al., 2019)

The use of digital assistants based on Artificial Intelligence, like Apple's Siri, Google Home, Amazon's Alexa has increased among people. AI-based digital voice assistants perform tasks based on voice commands made by the user, like reading the news, playing music, checking the whether, setting alarms, ordering products online, controlling smart home devices and answering general questions, ordering products online etc. (Chattaraman, Kwon, Gilbert, & Ross, 2019) (Kim & Choudhury, 2021)

Studies has shown that older adults are positive towards smart speakers after they have been introduced to it, and preferer voice-based user interfaces compared to traditional interfaces where they must type and click. However, the actual adoption of smart speakers is very low among older adults. Recently, more researchers are focusing on the benefits smart speakers can have for older adults, and their experience with it. A study done by Kim & Choudhury focuses on investigating how older adults' perception and use of a voice assistant change over time as their experience grows. The results showed that during the first interactions the participants liked the simplicity and ease of using a voice-based interaction. They did not have to learn anything new, just talk with the assistant. Also, it was easy because there was no need of physical input and read visual output. However, after some time they started getting concerned that this might make them lazy, and it could impact the quality of life. There were no worries of making mistakes, like with computers and smartphones. However, they also faced challenges. In the early stages they did not understand how the device worked, and where it got all the information from. This was seen

as a psychological barrier. For some tasks like turning the device on/of and adjusting the volume they expected a button and got confused when they did not find it. They also had to get familiar with the wake word, like “Hey Google” and “Alexa”, they could often use wrong words. They also had to deal with functional errors due to the limited speech recognition. (Kim & Choudhury, 2021)

Social isolation and loneliness are issues among older adults. A study was done to understand how voice assistants could be used to reduce loneliness and social isolation among older adults living at home. Patients were recruited to use Google Home for 4 weeks and then give feedback. Participants said that it was good for educational purposes, like getting answers about simple questions, finding definitions, and food recipes. Also, it was mentioned that having a voice that speaks to them makes them feel that they are not alone. Other positive aspects were related to home control, administrative support and health and well-being. However, there were also challenges with using this device, including setting up the device, learning the right words to control the device, and being overwhelmed by the large number of features. For setting up the device it was mentioned that the instruction manual did not provide enough information. (O´Brien, Light, Bradley, & Lindquist, 2022)

A similar study was done where Amazon Echo was deployed in 7 older adults’ homes for 3 weeks, to understand how older adults who do not use computing devices regularly perceive voice assistants, what they use the device for and what challenges to they face. Results showed that the smart speaker was used for a number of tasks, mostly asking questions about different topics, like health business, and food and drinks. The ease of use led to seeking more information. They did not use memory supporting, like reminders and timers features as much as it was expected. This was due to concerns related to the reliability of these features. The study showed that most participants felt that this voice-based device was easier to use than traditional computing devices. However, there were also issues with the device related to voice recognition, and when the device was unable to answer questions. They also mentioned problems with the device timing out after using the wake word if it took some time to complete their command after the wake word. In addition, the study showed that only one of the participants had concerns regarding conversations being recorded. However, three participants were concerned about others using the device, like

visitors. One of them mentioned that their grandson who said “Alexis, call the police, come get my grandma.”. In other words, they did have location-based privacy concerns. (Pradhan, Lazar, & Findlater, 2020)

2.2.3 Other services

AI is also being used for other services, for example debunking online spam reviews. A study done by Xiang, Zhou, & Xie, looked at younger adults and older adults trust in text-AI tool and behavioral-AI tool for spam review detection. Text-AI tool detect spam reviews based on textual features of a review, and behavioral-AI tool detect spam based on behavioral features of a review. The result showed that most older adults, aged between 50-78, trusted AI tools’ perception, however 48% of them said that if the AI tool prediction is different from their own judgment, they abandon the AI tool. Both age groups perceived AI tools as more competent when it outperformed their own abilities of detecting spam reviews. (Xiang, Zhou, & Xie, 2022)

2.3 AI experiences in general

There is not much research done about how older adults experience and perceive AI-enabled everyday technologies. However, one study done by Shandilya & Fan tried to understand older adults’ experiences and perceptions of AI. They found out that older adults wanted to learn about AI and use AI-enabled products. However, limited learning possibilities can hinder them from doing so. In addition, they worried about privacy, and the impact AI would have on their decision-making skills. The survey done in the study, with 35 participants over the age 60, showed that most of them had “some knowledge about AI”. In addition, the study showed that “internet search”, “Friends/family” and “newspaper” were the most used sources to learn about AI. They were also given a list of AI-enabled products, out of which search engines, navigational applications, email spam filters, and online shopping recommendation feature were the most used. (Shandilya & Fan, 2022)

To get a better understanding of older adult’s experience, possible challenges using AI-enabled products and their expectations a semi-structured interview was done. The findings showed that older adults could find it hard to keep up with the fast growth in new

technological trends. Limited knowledge about AI is due to lack of exposure to such technology, or negative news about products. They also face challenges and had concerns about privacy and getting over dependent on such products. Their perception of AI is based on the quality of their experience with AI-enabled products. They also felt that AI-enabled products assisted them in their daily tasks, but scams, bad interaction experience with conversational agents, and targeted advertisements concerned them. (Shandilya & Fan, 2022)

A study done by Spangler et al. focuses on privacy concerns among older adults using voice assistant systems. This study was done with 55 older adults with mean age 73, and showed that older adults did not have significant privacy concerns, but wanted additional regulations for privacy. The data that was collected showed that 71% believed that their data was used with consent, and 67% believed that it was stored properly. However, the data also showed that only 43% were comfortable with daily activity monitoring, 71% wanted new privacy regulations. Moreover, 85% needed the data to be highly protected. (Spangler, et al., PRIVACY CONCERNS AMONG OLDER ADULTS USING VOICE ASSISTANT SYSTEMS, 2021). An extended version of the study where they also included younger adults aged 18-64, showed that compared to the participants aged >65, older adults were less concerned about privacy then younger adults. However, it was not clear if older adults understood the privacy risks. (Spangler, et al., Privacy concerns of older adults using voice assistant systems, 2022)

2.4 Relevance to this project

There has not been any research done on understanding AI literacy among older adults. Most of the research is related to testing or understanding experiences older adults have with specific AI-enabled products and services. Few have also researched experiences in general. In addition, most of the research has focused on AI literacy in education and among students. Still, the research presented was used to formulate the questions for the survey and interview, and the definitions of AI literacy were used to make sure that the questions covered the aspects of AI literacy. The research questions were also based on the definitions of AI literacy.

3 Methodology

This study used a mixed method approach, using both qualitative and quantitative data. Semi-structured interviews were done to get an in-depth understanding of AI literacy among older adults. In addition, a survey was conducted to get an overall understanding of AI literacy among older adults.

3.1 Ethical Approval from NSD

Since this study is collecting personal data, approval from The Norwegian Centre for Research Data (NSD) was needed. NSD approval was needed because the interviews collected personal data. This process started with filling out a “notification form”. This included information about which personal data will be processed and how, project description, how participants will be recruited, how data will be collected and stored and for how long, and how consent will be documented. In addition, project description, the information letter, consent form, interview guide and first draft of the survey was submitted.

3.2 Pilot-testing

3.2.1 Survey

The survey questions were pilot-tested before sending it out. The pilot-test was done with four students. Some of the feedback was related to the number of questions and the amount of time the survey took. Other comments were related to the answer options, question formulation, and language. Taking this into consideration, some of the questions were removed or similar questions were merged into one. The reason it was tested with students, was due to not having accessibility to seniors over 60 at that moment who could participate in pilot-testing.

After contacting one senior organization for distributing the survey, they also tested the survey and came with useful suggestions related to answer options, language, and the question setup.

3.2.2 Interview

The interview questions were pilot tested with two older adults. Feedback from the first pilot-test was related to the structure of the questions, and the flow. The second pilot-test showed that some of the questions were repetitive, and created some confusion for the test person, and interviewer, therefore some of the questions were merged and reformulated so that there were less specific questions, but more general.

3.3 Survey-questions

The survey was made in nettskjema.no created by UiO and was anonymous, and the survey did not collect any personal data. The questions were divided in six sections.

- General information about the participant
- Digital literacy
- AI knowledge
- AI experience
- AI perception/attitude
- AI trust, privacy and safety

The questions tried to cover all aspects of AI literacy given in the definitions in chapter 2. After the participants submitted the survey, they got an invitation to participate in an interview, and how to participate if they were interested.

3.4 Interview-questions

The interview guide was divided in three parts. The first part focused on getting some general information about the participant, as age, work and education. The second part focused on digital literacy. The purpose of this was to get some general understanding of how much digital literacy the participants had. The third part focused on getting information about what the participants know about AI, their experiences, perception/attitude, and concerns towards AI. Also, these questions were made so that they could cover the aspects of AI literacy definitions. (Appendix A)

3.5 Recruitment and participation

The recruitment for the survey and interviews used a convenience sampling method. The survey was sent to a number of organizations for seniors, and senior centers. Out of these, two senior organizations, and two senior centers shared the survey with their members. After the participants submitted the survey, they got an invitation to participate in an interview, and contact information if they were interested. In addition, a senior center was contacted separately in order to get more participants for interview, and also some elderly acquaintances were asked in person if they wanted to participate in this project.

Those who contacted via e-mail got the information letter and consent form digitally, which they could sign if they wanted to participate. Those who wanted to do the interview on telephone could sign the consent form digitally or send an e-mail where they agreed that they had read the information letter, if they agreed to participate, if they agreed that their personal data could be stored till the project end, and that the interview could be recorded.

For the interviews that were done by physically meeting the participants, the information letter was given to them on paper so they could read the information, and the consent from was signed before starting the interview. Before starting the interview, the participants were asked if they had any questions related to the project or information letter. In addition, the information was repeated in brief to make sure that they did not miss anything when reading the information by themselves.

4 Result from survey

4.1 Demography

The survey received in total 182 replies. The results show that 50.5% of the respondents were men, and 49.5% of the respondents were women. In addition, 54.9% of these were between the age 70-79. One person was between 90 and 99, and the rest were either between 60-69 or 80-89. The education level among the participants can also be considered high. 68.6 % of the participants had at least a college degree, bachelor's degree or master's degree (figure 4.1). 34.1 % had a background in technology, and 31.9% were related to other fields, including arts, HR, journalism, marketing/banking, logistics, economy etc.

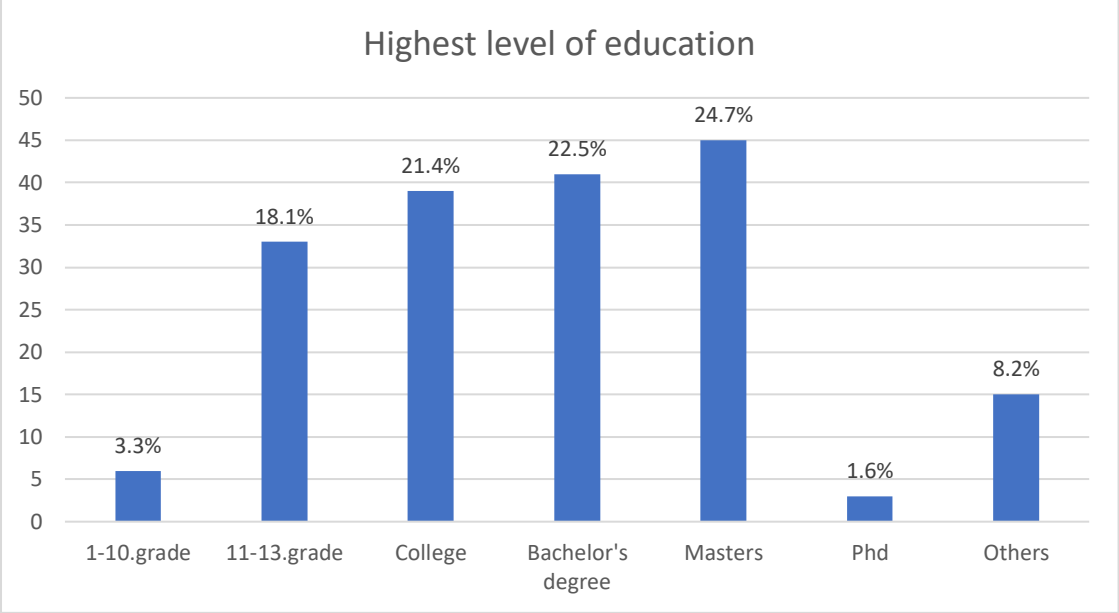

Figure 4.1 shows highest level of education amongst the participants.

4.2 Digital Literacy

Data from the survey shows that smartphone, MAC/PC, and iPad/tablet are the top three most used devices among seniors (table 4.1). In addition, the data shows that banking services, streaming services and social media are the top three applications of use among seniors (table 4.2).

Table 4.1 shows what digital devices the participants use.

Device	Usage
Smartphone	175
Mac/PC	165
iPad/tablet	136
Smart TV	106
Smartwatch	57
Digital assistants (e.g., Alexa, Google assistant, Siri, etc.)	49
Robot vacuum cleaner	32
Others	4

Table 4.2 shows what application the participants use.

Application	Usage
Banking services	180
Streaming services	159
Social media	153
Online shopping	144
Health applications	135
Customer service chatbot	74
Others	13

When asked about how often they face challenges using these applications and devices, the result showed that the majority rarely faced any challenges (figure 4.2). In addition, the majority rated their experience of using technology as “much experience (4)” (figure 4.3).

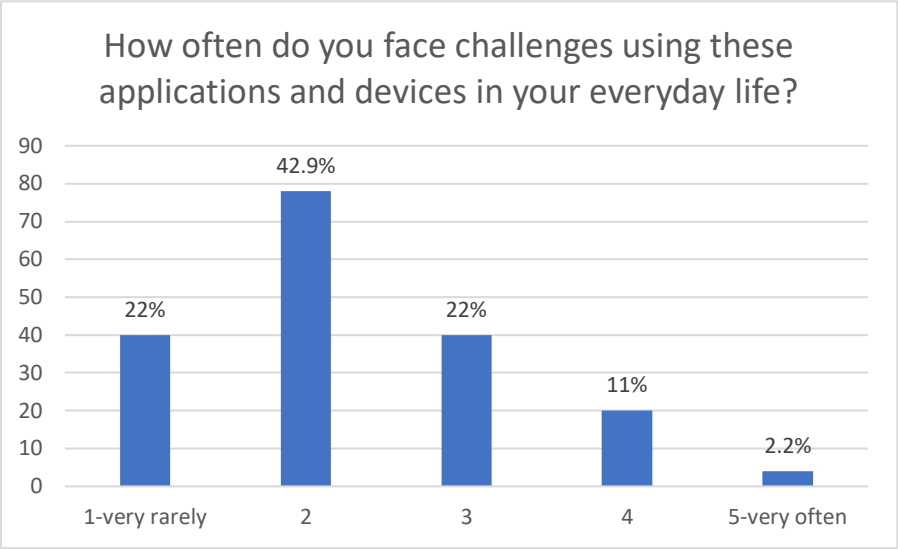

Figure 4.2 shows how often the participants face challenges using these application and devices in their everyday life.

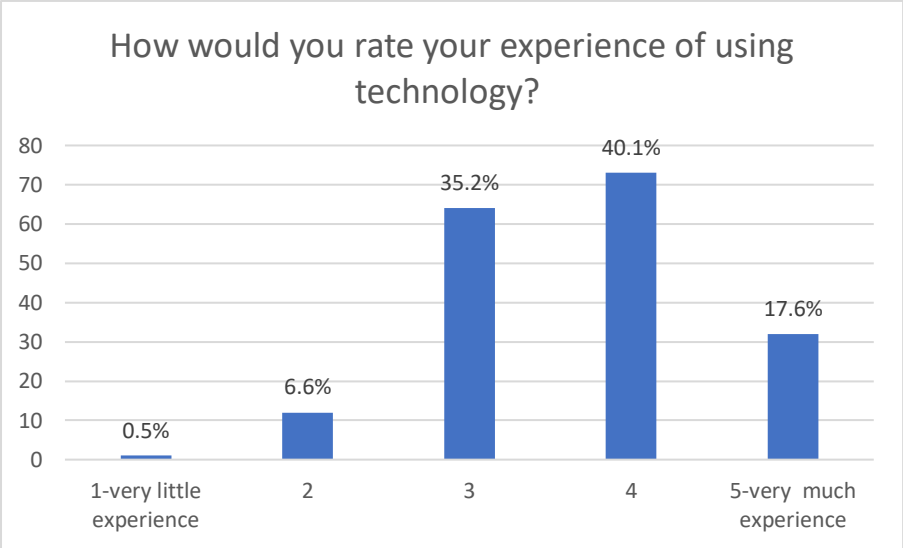

Figure 4.3 shows how the participants rated their experience of using technology.

4.3 AI knowledge

When asked about how much knowledge the participants have about AI, 41.8% replied that they have some knowledge about AI. Only 4.9% said that “I know nothing about AI”, and 2.7% said that they “have a lot of knowledge about AI” (figure 4.4).

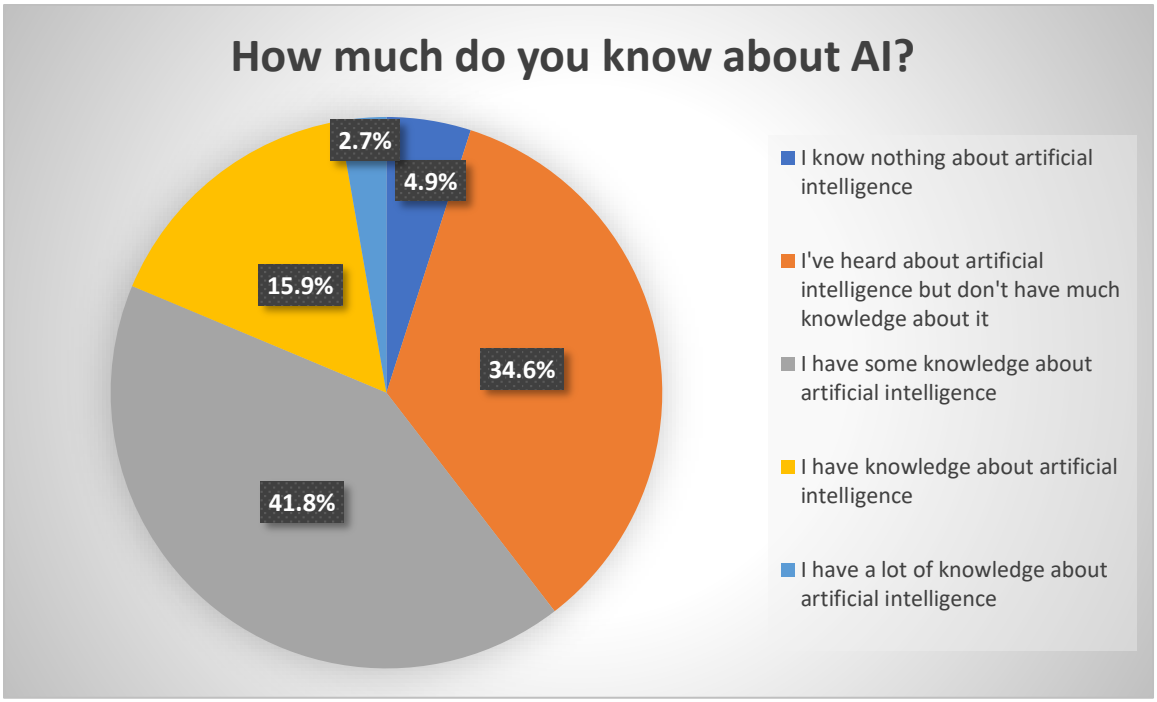

Figure 4.4 shows how much the participant know about AI.

When asked about how well they understand how AI works, the majority said medium extent (3), however 34.1% said that they understand how AI works to a small extent (table 4.3). Further when asked about where they got information about AI from, the top three sources were internet search, newspapers and magazines, and TV (table 4.4). The participants were also asked about how useful they fund the sources they used, and the majority did not have an clear opinion on it (43.4%), but otherwise most of them found these sources useful (29.5%) (figure 4.5).

Table 4.3 shows how well the participants understand how AI works.

1 – to a very small extent	9.8%
2	34.1%
3	37%
4	16.8%
5 – to a very large extent	2.3%

Table 4.4 shows where the participants got their knowledge about AI from.

Source	Number
Internet search	98
Newspapers and magazines	99
TV	73
Academic articles	60
Social media	43
Friends or/and family	34
Other courses	28
Others	15
Online courses	12
From the store	5

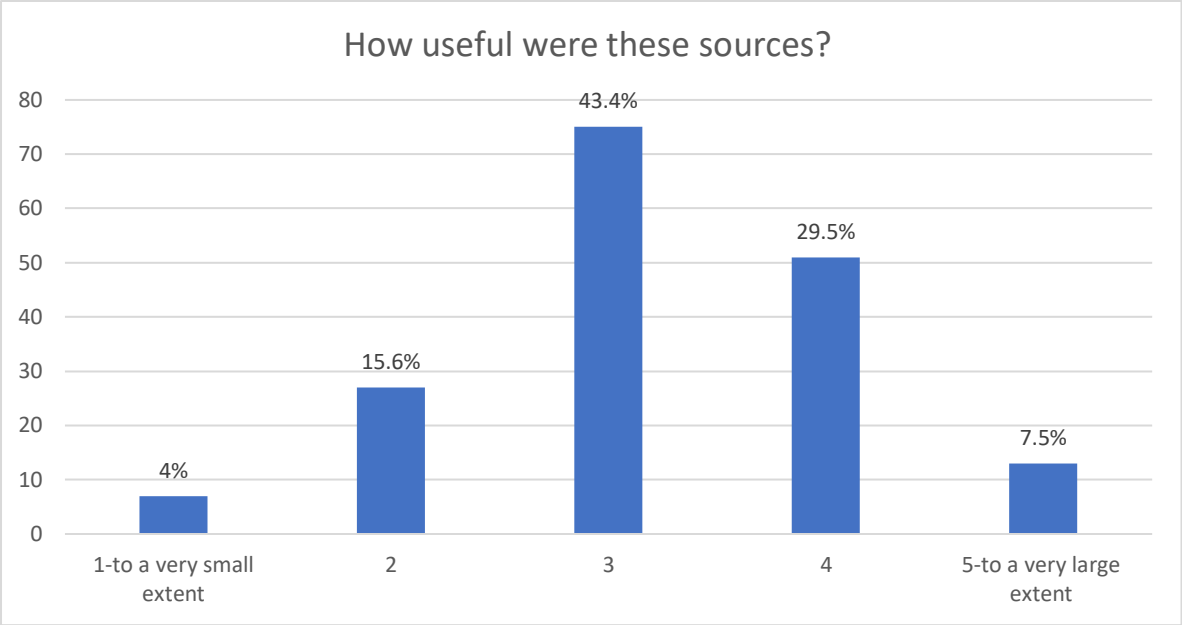

Figure 4.5 shows how useful the sources the participants used for getting knowledge about AI where.

4.4 AI experience

The participants were given a list of some products and services that use AI. When asked about whether they use any of these AI enabled products or services, Search engines (e.g., Google), social media, and video and song recommendation were the most used AI enabled services (table 4.5). Further when asked about how confident they feel using these products and services, 38.9% felt confident to a large extent (4), and 11.4% to a small extent (2) (figure 4.6).

Table 4.5 shows what AI-enabled products and services the participants use.

AI enabled product/service	Number
Search engines (e.g., Google)	169
Social networking applications (e.g., Facebook, Instagram, snapchat, LinkedIn, TikTok)	129
Video and song recommendation (e.g., Netflix, YouTube, Spotify, TV2 Sumo, NRK TV, NRK Radio)	118
Email spam filters	115
Finger and facial recognition for unlocking mobile	111
Customer service chatbot	101
Online shopping recommendation (e.g., Power, Elkjøp, Ark, Oda, Ellos)	83
Voice assistants (e.g., Siri, Alexa, Google Assistant)	64
Robot vacuum cleaner	36
Social robots/assistive robots	13
No, I don’t use any of these or other AI enabled products and services	7
Others	5

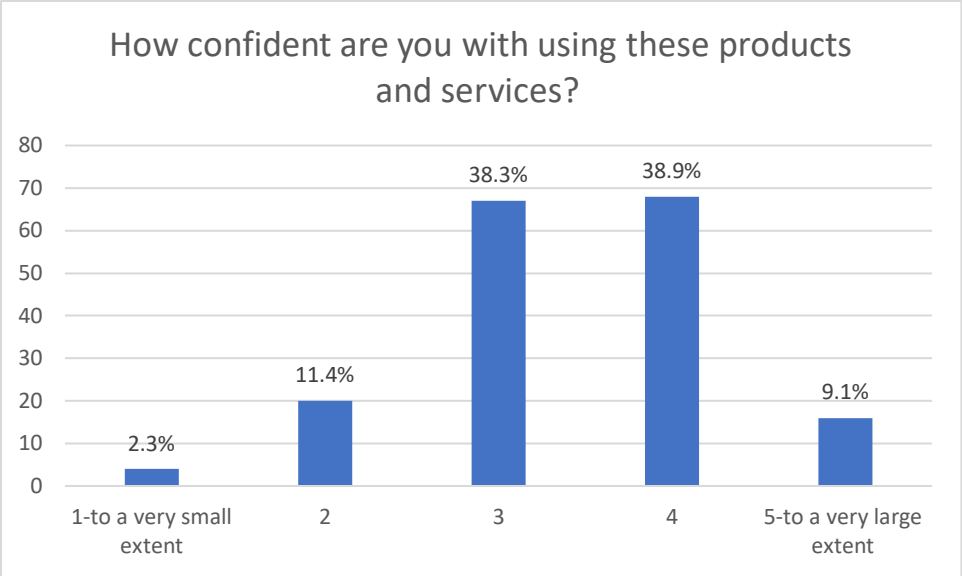

Figure 4.6 shows how confident the participants are with using AI-enabled product and services.

Most of the participants got information about the products and services that they use from the internet, newspaper and magazines, and social media (table 4.6). They also learned using these products and services using the internet, product manual and with help from family and friends (table 4.7).

Table 4.6 shows where the participants got information about the AI-enabled product and services they use.

Source	Number
Internet search (e.g., Google)	119
Newspaper and magazines	74
Social media (e.g., Facebook, Twitter, YouTube)	70
Friends or/and family	69
TV (e.g., movies, series, documentary)	46
Academic articles	43
From the store	43
Other courses (arranged by senior organizations)	30
Online courses	17
Others	14

Table 4.7 shows how the participants learned to use the AI-enabled products and services they use.

Source	Number
Internet search (e.g., Google)	113
Product manual	92
Help from family and/or friends	84
Social media (e.g., Facebook, Twitter, YouTube)	65
Newspaper and magazines	42
Other courses (arranged by senior organizations)	33
TV (e.g., movies, series, documentary)	25
Help from the store	25
Online courses	20
Others	11

Further the participants were asked about what AI-enabled product or service they found challenging to use. Figure 4.7 shows that the majority said that noting was challenging to use. However, other than that, the results shows that customer chatbots, email spam filters and social-networking applications were among the products and services that were challenging to use.

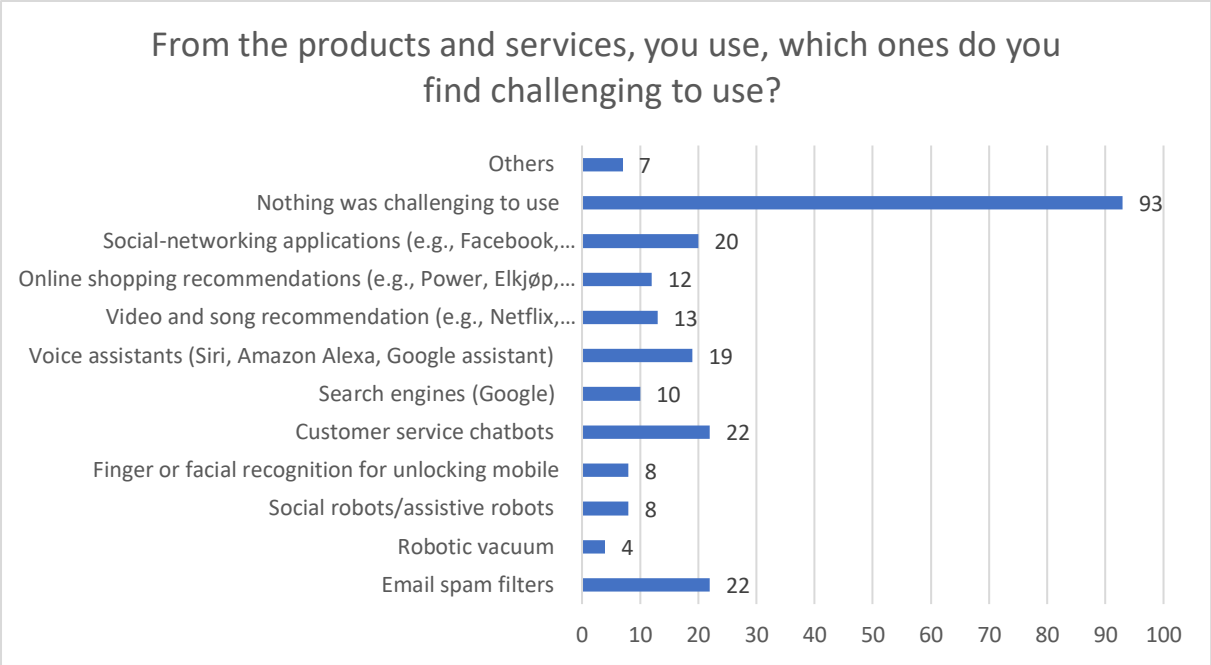

Figure 4.7 shows what AI-enabled product and services the participants find challenging to use

4.5 AI perception/attitude

Figure 8 shows that the majority feels that it is necessary to learn about AI to a large extent. Further when asked about whether they feel that they know enough about AI, 79.7% said no, and only 3.8% said yes (figure 4.9). In addition, they were asked if they want to learn more about AI, 73.1% said yes and only 2.2% said no (figure 4.10).

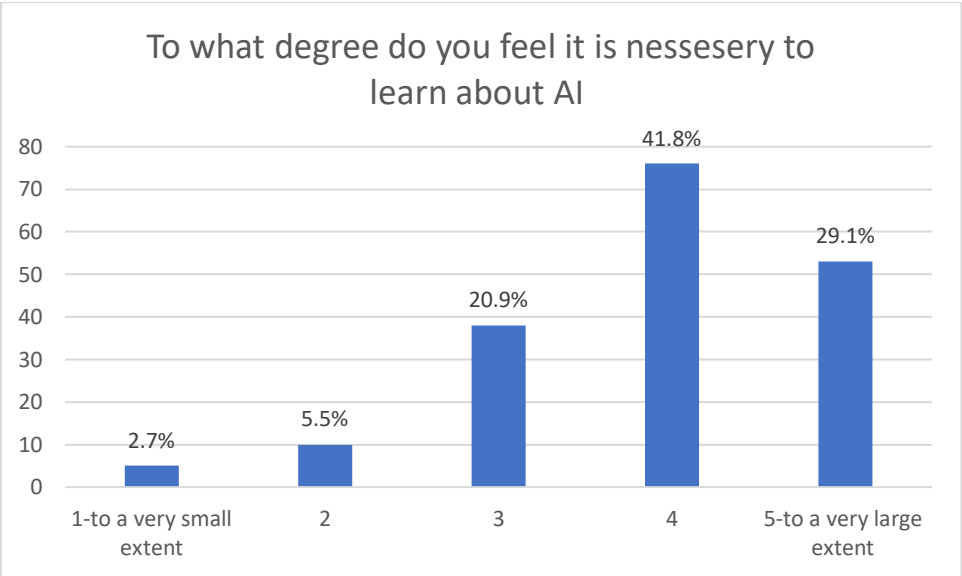

Figure 4.8 shows to what degree the participants feel it is necessary to learn about AI.

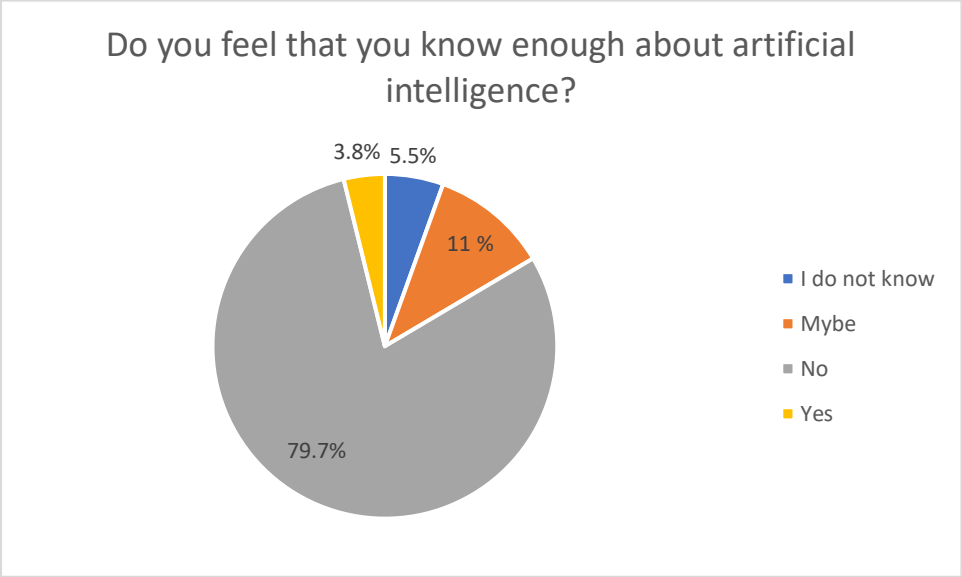

Figure 4.9 shows if the participants feel that they know enough about AI.

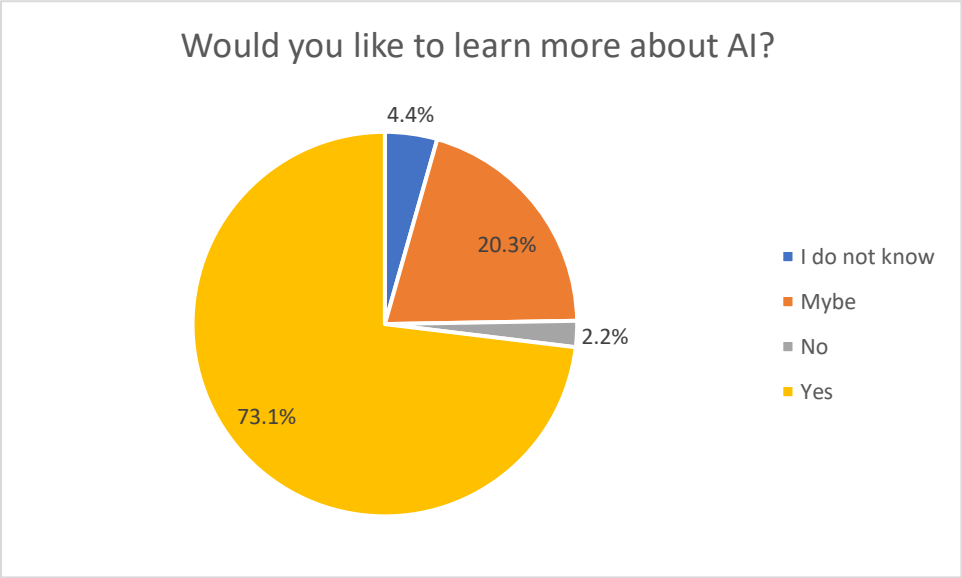

Figure 4.10 shows if the participants would like to learn more about AI.

To get some understanding of whether the participants were interested in understanding how AI works, they were asked “to what degree would you like to understand how AI works?”. Figure 4.11 shows thar the majority wanted to learn of AI works to a large extent. Further they were asked about what learning sources they would like to use to learn more about AI, where most of the participants wanted to learn more about AI through internet search, courses set by organizations like and online courses (figure 4.12).

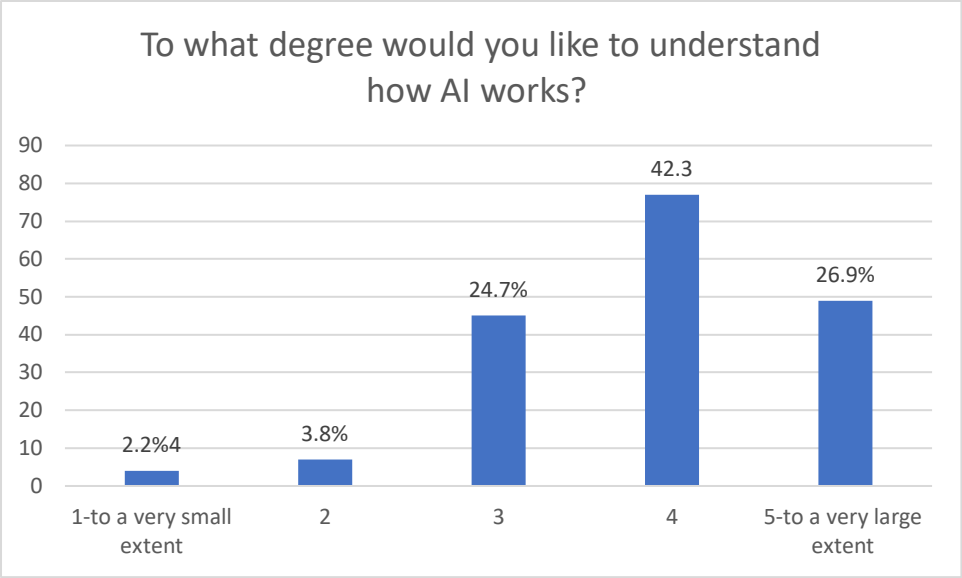

Figure 4.11 shows to what degree the participants would like to understand how AI works.

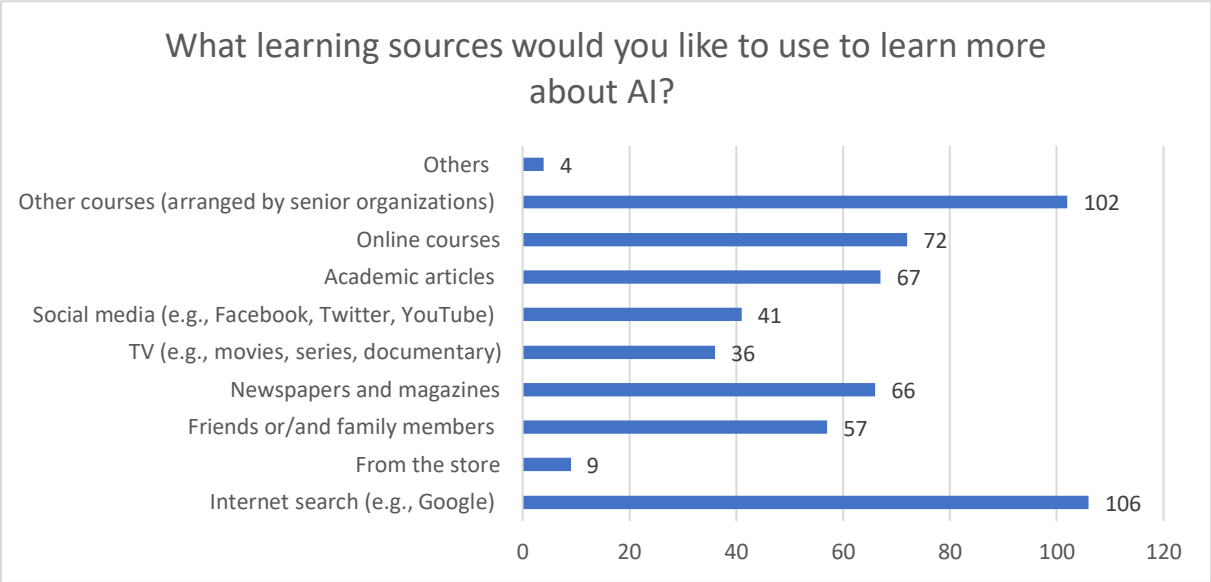

Figure 4.12 shows what learning sources the participants would like to use to learn more about AI.

Figure 4.13 and 4.14 shows their perception on how useful AI can be for older adults, and if it can have negative impact for older adults. Most participants think that AI can be useful for older adults. However, when asked about the negative impact it can have on older adults 32.4% said medium (3), but adding those who agreed to this to a very small extent (16.5%) and small extent (30.2%), that becomes 46.7%.

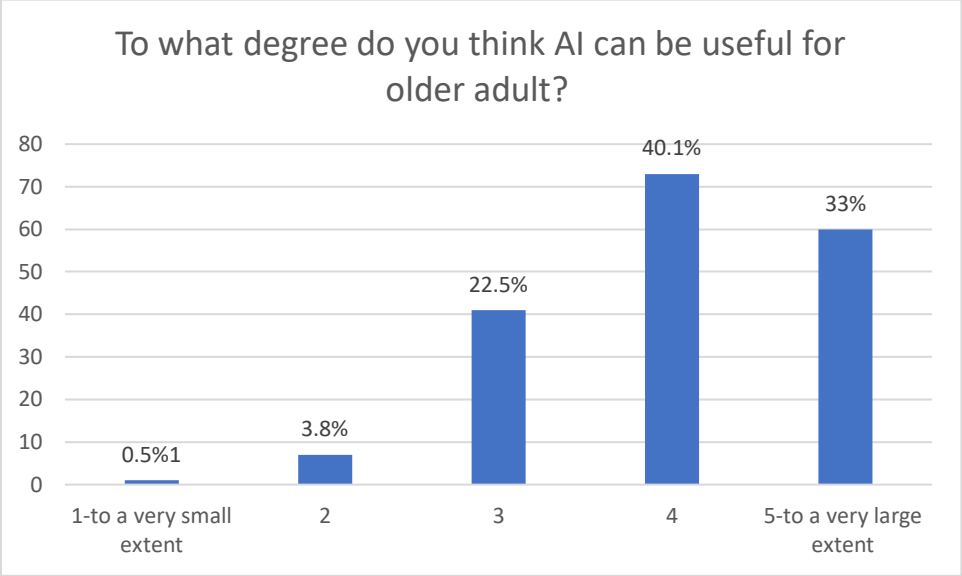

Figure 4.13 shows to what degree the participants think AI can be useful for older adults.

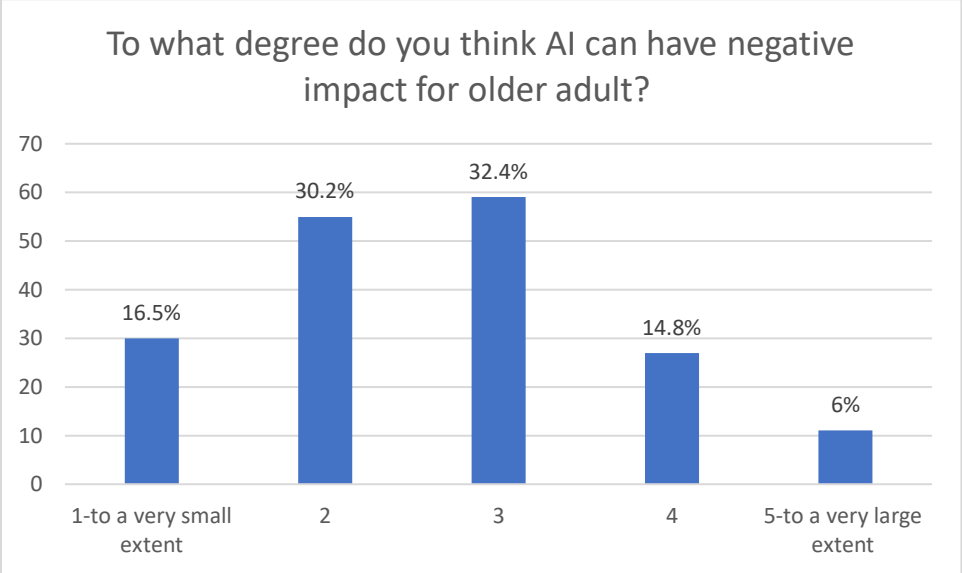

Figure 4.14 shows to what degree the participants think AI can have negative impact for older adults.

4.6 AI trust, privacy, and safety

The survey shows that most of the participant are not sure about whether they trust AI or not, but 31,3% trust AI, and 24,7% do not think AI can be trusted (figure 4.15).

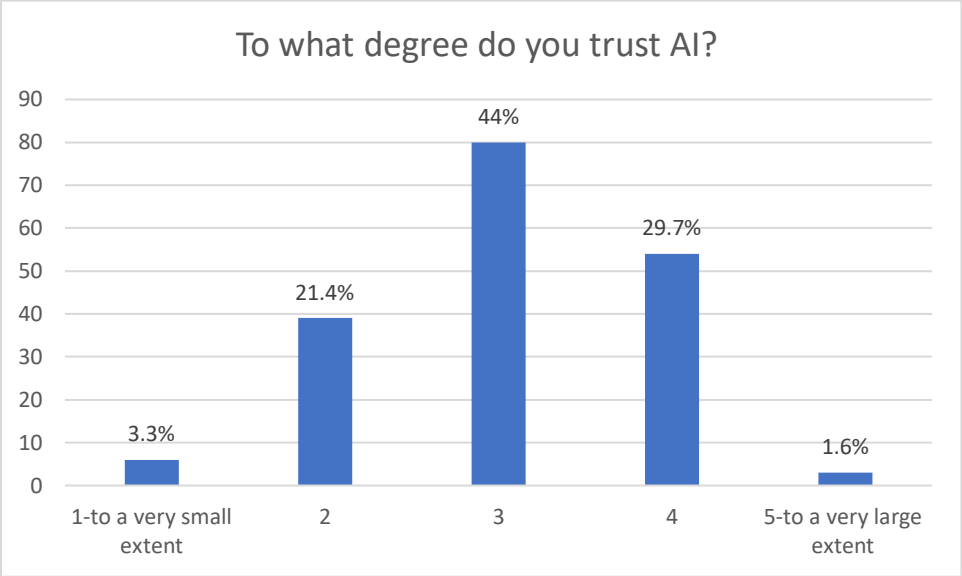

Figure 4.15 shows to what degree the participants trust AI.

Figure 4.16 shows that most might trust AI if they know how it works.

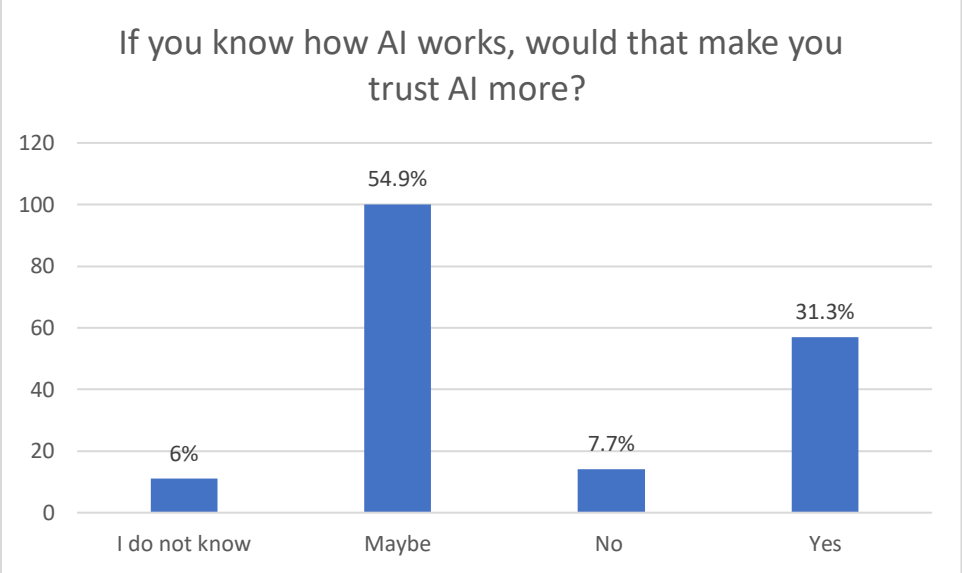

Figure 4.16 shows if the participants would trust AI, if they know how it works.

Also, when it comes to sharing data 41.8% are unsure whether they are comfortable with sharing their data with AI products (figure 4.17). However, adding up those who are comfortable with sharing their data to a very small extent (11%) and small extent (31.3%) is more that those who are comfortable to share their data to a very large extent and large extent.

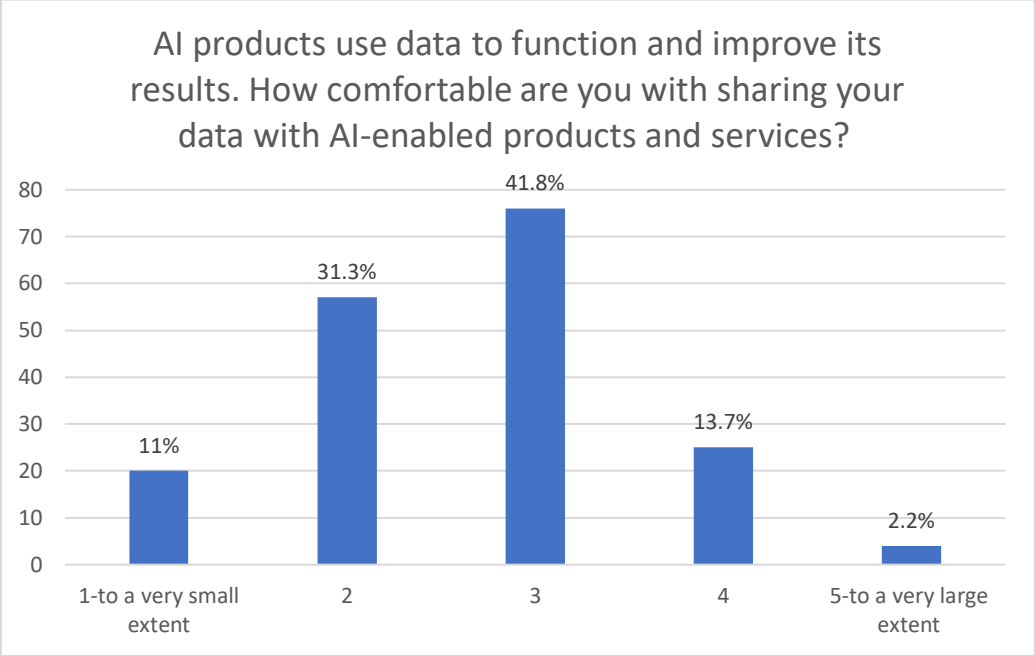

Figure 4.17 shows how comfortable the participants will be with sharing data with AI-enabled products and services.

Similar results are seen when asked about what extent they think current laws/regulations protect personal data when using it in AI products (figure 4.18). The majority are unsure (39%), but adding up those who think that current laws/regulations protect personal data to a very small extent (13.7%) and to a small extent (34.6%) is more than those who think that current laws/regulations protect personal data to a very large extent and large extent.

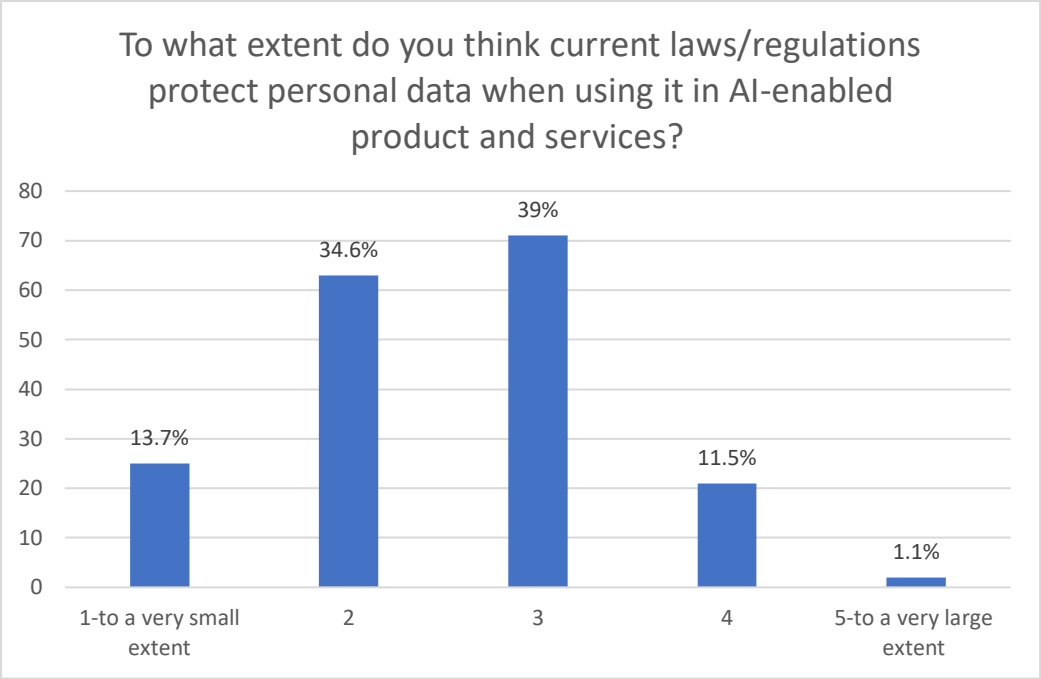

Figure 4.18 shows to what extent the participants think current laws/regulations protect data when using it in AI-enabled products and services.

Figure 4.19 shows that 42.9% think that AI products are safe from hackers attack to a small extent, and only 8.2% think it is safe to a large extent.

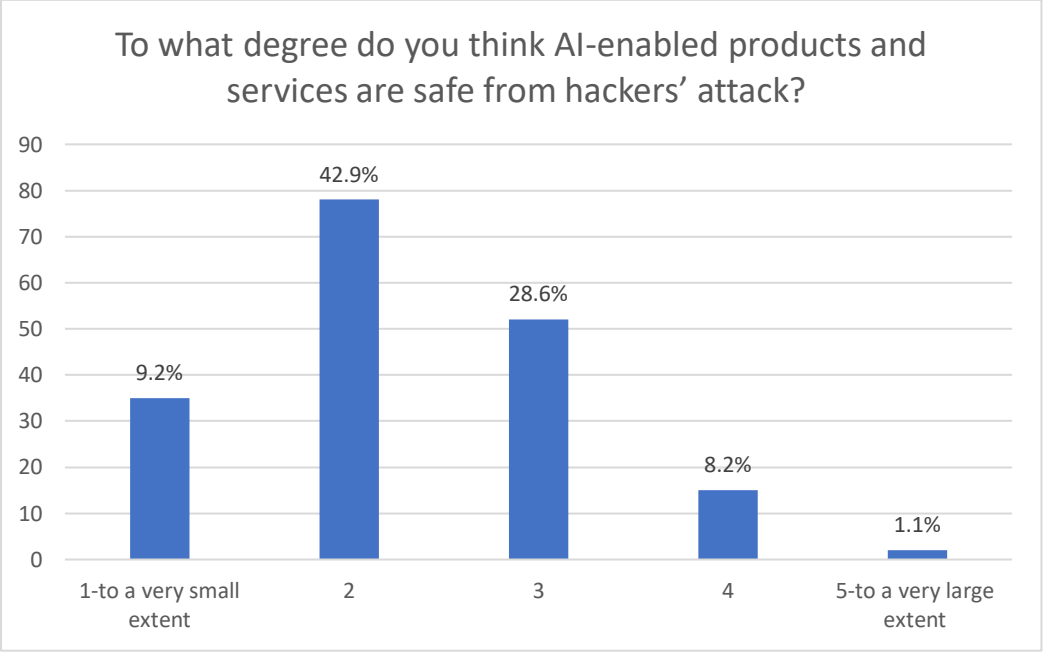

Figure 4.19 shows to what degree the participants think AI-enabled products and services are safe from hackers.

Further, the last question was related to AI and ethics. When asked about to what degree the participants think AI products and services make decisions according to ethical standards, the majority (39.6%) were not sure. However, out of the rest 15.4% thought that AI products and services make decisions according to ethical standers to very small extent, and 34.1% said to a small extent (figure 4.20).

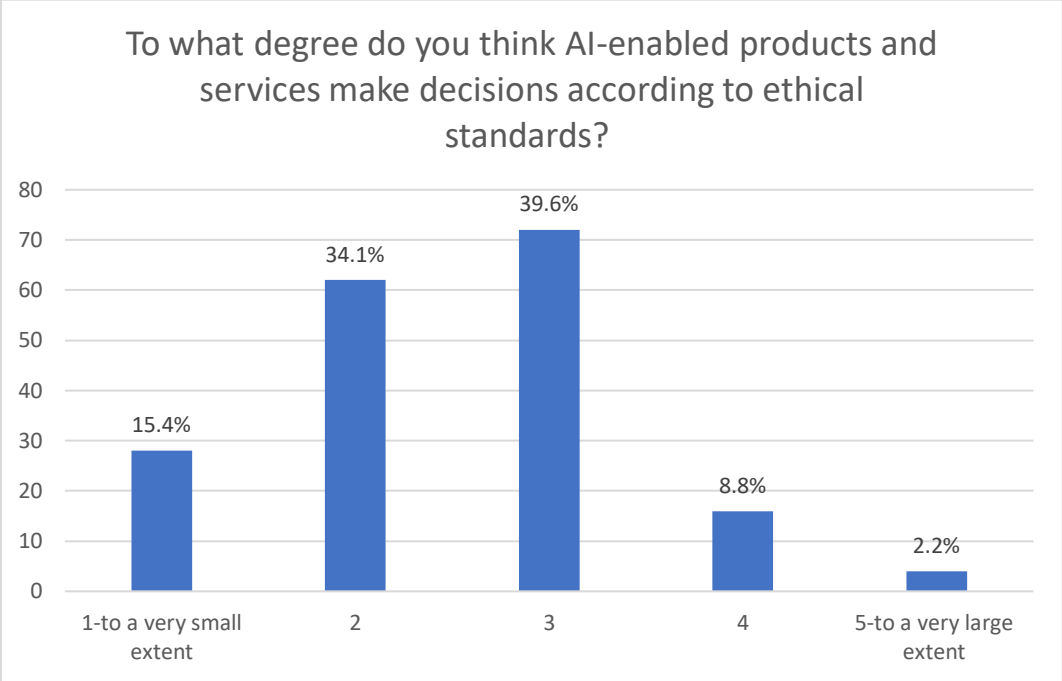

Figure 4.20 shows to what degree the participants think AI products and service make decisions according to ethical standards.

4.7 Main findings

AI knowledge

The results show that most of the participants have some knowledge about AI, but most of the participants knew how AI works to a small or very small extent. Further, most of the participants got their knowledge from internet search, newspapers and magazines, and TV.

AI experience

Most of the participants use AI-enabled services, such as search engines, social media, streaming services, e-mail spam filter. Compared to this, few uses AI-enabled products, such as voice assistants and robot vacuum cleaner. Further, most of them were confident using the AI-enabled products and services they used. The results also showed that most of them

got information about the AI-enabled products and services from internet search, newspaper and magazines, social media, and friends/family. Further, most of the participants learned to use them from internet search, product manual, with help from friends/family and social media. Most of the participants mentioned that nothing was challenging to use, but other vise chatbots, e-mail spam filters, and social media were challenging to use for most.

AI perception/attitude

The results showed that more than 70% found it necessary to learn about AI, and almost 80% felt that they did not know enough about AI. In addition, more that 70% wanted to learn more about AI. Most of the participants (69.2%), also showed interest in understanding how AI works. Further, most of the participants mentioned that they would like to use the internet, attend courses, or use online courses to learn more about AI. Further, most of the participants answered that AI can be useful for older adults, and that it is less likely to have negative impact on older adults.

AI trust, privacy and security

The results show that most of the participants are not sure about whether they can trust AI or not, but apart from that most of them trust AI. In addition, most of the participants answered that they will maybe trust AI if they know how it works.

There was 0.5% difference between those who were not sure if they were comfortable with sharing data with AI-enabled products and services, and those who were not comfortable with it. Only 15,9% were comfortable with sharing data with AI-enabled products and services, so looking away from those who were not sure, most were not comfortable sharing data with AI.

Most of the participants do not think that current laws/regulations protect personal data when using it in AI-products and services. In addition, most do not think AI-enabled products and services are safe from hackers. Further, most participants think that AI-enabled products and services do not make decisions according to ethical standards.

5 Results from Semi-structured interviews

After collecting demographical data about the participants, and information about their everyday usage of technology, the participants were first asked if they had heard about artificial intelligence, and if so, what they had heard. Depending on how much they knew about AI and how much they themselves mentioned from their experience, they were given examples of services and products that use artificial intelligence to investigate how much experience they have with artificial intelligence. It was also briefly explained how these services and products use AI.

5.1 Demography and experiences with technology

Since the participants were recruited through convenience sampling, some of the participants know each other. So even if each participant has been given a code (P1, P2, P3...), it may be possible that they identify each other with information about age, education and working background. Therefore, age has been divided into age groups (Table 5.1), and work and education background has been categorized (Table 5.2 and Table 5.3). The same has been done with education. In total 25 older adults participated in the semi-structured interviews, including 19 women and 6 men.

Table 5.1 shows the age group of the participants

Age group	**Number**
60-69	3
70-79	14
80-89	7
90-99	1

Table 5.2 shows working background of the participants.

Working Background	**Number**
Health (nurse, doctor and pharmacist)	5
Technology/IT (radiography, IT techniques, technical manager and typographer)	3
Education sector (early childhood educator, adult education and pedagogy)	8
Business administration/management (office job, administrative secretary and accounting)	7
Other (shop, military, librarian and agriculture)	8

Some participants had worked in several sectors, so the total number is not a representation of the number of participants.

Table 5.3 shows educational background of the participants.

Education	**Number**
Realskolen, Handelsskolen, Exam artium and/or **Framhaldsskole**	4
Teacher education and/or **pedagogy**	8
Health (nurse, doctor, pharmacist)	5
Social sciences (Administrative education, Humanities education, Accounting and economics)	3
Other (radio telegraphist, property manager, natural sciences, agriculture, miscellaneous courses)	7

Table z shows the educations that were mentioned, but it must be taken into account that it is not certain that the participants mentioned full educational history.

5.2 General technology use and experiences

Table 5.4 shows an overview of the devices the participants use or have used, and table 5.5 shows what they use these devices for. However, it must be taken in account they might use these devices for other purposes as well that they did not mention, because not everyone got the same follow-up question during the interview, and they may not have mentioned everything on the first question.

Table 5.4 shows digital devices used by the participants.

Digital device	**Number**
Smartphone	**25**
Ipad/tablet	**19**
PC/MAC	**20**
Smart TV	**1**
Smartwatch	**1**
Robot vacuum cleaner	**4**
Robotic lawnmower	**4**
Digital voice assistant (Alexa, Google Home, etc.)	**1**

Table 5.5 shows what the participants use their digital devices for.

Services	Number
Banking services	**18**
Social media (Facebook, Instagram, etc.)	**19**
Streaming services (Netflix, Viaplay, HBO, etc.)	**10**
Email	**6**
Read the news	**10**
E-commerce (ordering tickets, goods, etc.)	**12**
Web search (for information)	**13**
Messages (SMS, Messenger)	**7**
Other (Word, Excel, Indesing, various apps, music, crosswords, games)	**9**
Voice assistant on phone, tv (siri, google assistant, chrome)	**3**

The participants were asked what they think about the digital devices they use, and if they find anything challenging. The results show that for some, everyday use is not challenging, but in some cases challenges can arise.

5.2.1 Experience and challenges with digital technology

After asking the participants about what devices they use, they were asked about what they use their devices for and if there is anything they find challenging or easy. This was asked to get a better understanding of what their thoughts are about technology in general and their experience in general. They then mentioned their experiences with social media, e-commerce, how they get help if needed, concerns and how their daily use is. Some also mention that they have used digital tools at work, including programs for work for management, accounting and digital school systems.

General everyday use:

When it comes to their daily use, the results showed that it is a variety in how much they use their devices and for what, how many challenges they face dements on their frequency of use and what purposes they use it for. However, it emerged that most considered their daily use to be manageable, or that it gets easier over time. Most of the participants also mention that if they face challenges in their daily use they ask family for help. Further, some are open to learning new things while other say that they are more cautious because they are afraid to do mistakes, and this can sometimes limit them from trying new things.

P21: "[...] I was going to buy a bus ticket on the routes app 2 days ago I had never done that, just learning it so please help me as it I like challenges like that."

P4: "[...] So I'm cautious about trying new things. Because I see what I have, it gives me opportunities for a lot of things that I don't use."

However, some of the participants also mention specific challenges their face in their daily use. For example, it was mentioned that it can be difficult to learn new systems after updates, and that older adults' needs are not taken care of in these updates. Further, some also mentioned that the language used in digital systems can be challenging to understand sometimes, which increases the chances of making mistakes.

P8: "I have problems accessing NRK on TV after a while, then there have been updates. Then I have to call and ask customer service."

P10: "[...] There have been a few times I've seen there have been changes in online banking, for example, and it seems like it is only made for those who made it and not for those who are going to use it [...]."

Social media:

Most of the participants mention being on social media, out of these most have Facebook, but some are also on twitter and Instagram. However, there is a variety in how of they use social media. Most only use it for keeping contact with their family and friends and stay updated on what they friend and family post on social media. However, some use it for

active debate and discussion on topics related to e.g., politics, and are active in different organizational pages on social media.

P11: "[...]so Messenger has been team building in our family, even though we don't live together anymore, so between the kids between us and the people we have contact daily actually because of what"

P25: "yes I'm on social media on Facebook, but I don't use but don't post much about myself, I mostly spend seeing people I scold, birthday happy birthday."

E-commerce:

The level of experience participants has with e-commerce varies slightly. Some have tried it a couple of times, while others are actively ordering goods, plane tickets, travel, etc., some have never done it. Those who don't shop much online mention that they don't do in because they preferer shopping at the store, or because they have simply not thought about trying it. Those who have tried it have said that it mostly works fine, and in cases it does not they just ask their family for help.

P6: "I've been doing that for years, so to speak, because what I'm supposed to have for my hobby often doesn't exist in this country [...]."

P17: "[...] especially now in the winter where I have a hard time going out and stuff like that on the ice, I think is very nice as it is so I can order all sorts of strange things then come in the mail or you come to the door so [...]."

5.2.2 Suggestions

Include older adults in development:

The participants also made suggestions on what can be done to reduce the challenges older adults might face in their daily use of technology. Some participants mentioned that it is very important to include older adults in the development process, so that the products and services that are developed meet older adults needs and preferences as well. For example, one participant mentioners that a lot of technology seems to be developed for the younger population, without thinking about the seniors.

P5: "I think you should spend just as much time finding what is desired by the user, what do the users need, and what do the user also make suggestions. [...]"

P12: "[...] technology is so fantastic and the future prospects for this here are also absolutely fantastic, but then it has to be considered that the technicalities are so easy that users are able to use it and that is probably what I see as a big challenge"

Learning:

Some participants also suggested that since they are expected to use digital services such as baking services, tac services, pension services, it is very important that that they receive training and guidance using these so that they can use these services effectively without making mistakes. In addition, it was mentioned by some participants that its even more important that older adults who don't have families get sufficient training in using technology that is necessary for them in their everyday life, because they might not have anyone to ask for help.

P16. "What's gotten wrong really with all this is that we've never really gotten a proper training in it, so when we face a problem and for example discuss it with an employee of the bank, then it ends up with her saying that you should go and ask your grandchildren. [...]"

P19: "[...] you can say that when you need a tax deduction card and you get other information that you have to retrieve online on Altinn [...] those who do not have children and grandchildren they feel much more isolated when they are told that you have to use the net you have to use it, they might have to go somehow outside the family to get someone to help."

5.3 AI knowledge

The participants were first asked about what they knew about AI. Some of them had heard about AI on the news, and some had heard about it from friends/family and social media. All the participants had heard the term artificial intelligence, but how much they knew about it varied. The brackets show how many participants

5.3.1 AI-enabled products

Nine participants had heard about artificial intelligence being used in homes of the elderly to help them stay at home for as long as possible and improve their well-being, and in nursing homes. For example, five had heard about medicine dispensers that are used to remined seniors on when to take their medications. Furthermore, four had also heard about carpets that tell seniors whether it is day or night. In addition, many of them mentioned that they have heard that these devices are used for people with dementia.

Four participants had also heard that assistive or companion robots are used to improve older adults' well-being and reduce their loneliness. Two also knew that such robots are being used in Japan, and that it may also come to Norway as there as there is a shortage in health workers hear as well.

Eight had heard the news about students using artificial intelligence for exams and assignments, and that it was almost impossible for teachers to distinguish between an assignment written by this intelligence and by the student. Three also mentioned that this was called chatGPT.

Further, three participants had also heard that AI can be used to interpret medical images, such as X-rays, MRIs, mammography images etc., as well as geographical images. In addition, it was mentioned by them that AI can also be used to find the right diagnosis, improve medical treatment, such as cancer.

Moreover, two had also heard about how AI can be used to streamline work in different sectors, and that it can then replace cumbersome human processes and replace humans. Further, it was mentioned by one that AI can also cause many people to lose their jobs, especially in the financial sector.

Some of the participants also knew about other AI-enabled products and services, such as AI-enabled GPS, voice assistants in smartphones, eye-controlling of digital devices, text-to-speech and speech-to-text, self-driving cars, robot vacuum cleaners and lawnmowers, and that AI could be used at airports for passport control and self-checking.

5.3.2 The definition of AI

Seven participants also had some idea of how artificial intelligence worked. For example, one participant mentioned that, "*Artificial intelligence is mostly based on programmers so that the machines can try to fail in order to learn (P6).*" Another participant mentioned that, "*you can eventually get those machines to also think for themselves and draw conclusions until they start to function in a way almost like a human (P10)".* Further it was also mentioned by one participant that AI can be used by advanced computers and robots for data processing, that it can further use to make decisions.

Two participants also mentioned that they had look up the definition of AI before the interview and tried to understand it. For example, one of them mention that: "According to the definition, it should be computer systems that can learn from their own experience and that can solve complex problems (P9)."

Furthermore, four participants also mentioned that algorithms are used for giving recommendations on e.g., social media, search engines, streaming services etc., based on your usage pattern. For example, one of them said, "[...] it *in a way records all your searches and gives you suggestions. For example, when I'm on Spotify and listen to an artist, then a week later or a while later I get suggestions of similar artists (P7)."* However, only one of them clearly knew that these services use AI for recommendations.

There were also two who commented on the term "artificial intelligence" regarding how the word artificial might not be used because of the AI-enabled products and services are human made, and that it does not match human intellect.

P16: "I am actually a little opposed to that expression because we have been given aids that are artificial, [...] but basically it is the human who has used its intelligence to make these machines, so the machine itself, it is made by ordinary not artificial intelligence then [...]."

5.4 AI experience

This chapter presents the experiences the participants have had with different AI-enabled products and services. Most of the participants mentioned having heard about or been recommended AI- enabled products, such as voice assistants, robotic lawnmowers and robotic vacuum clears from their friends and families or have seen them use it. When it comes to AI-enabled services such as recommendations on social media, online shopping websites etc, some have noticed that they get recommendations some have not, and this might depend on their frequency of use. Some have also had experience with chatbots. This chapter also presents their opinions on why they decided not to by one or more of AI-enabled products, and what their opinions are on getting recommendations.

5.4.1 Recommendations on social media, ecommerce, streaming services, etc.

Three participants mentioned that it can be nice to get recommendations on some services, such as recommendations for series and movies on streaming services, recommendations for products on online shopping websites if they are relevant, and also video recommendations on YouTube.

P6: "[...] yes I see especially on ebay, so if you have looked at something you get similar recommendation so it obviously uses quite a lot of artificial intelligence there, to steer it in the direction of certain products [...] there, it's fair enough, because the products I'm looking at have mostly to do with my hobby with model building, then I get tips on tools that you may not have thought of, so in that sense, it might be okay."

Four participants also mentioned that they do not like getting recommendations because they feel that it gets annoying after a while and that it is unnecessary. One of them said that if you have looked at something once you keep on getting advisements of products on every page you visit which is quite annoying. For example, one of them said, "*I'm not very fond of it at all I have to say, [...] if you look at car tires or holiday trips or whatever it may be, you get overloaded with it afterwards [...] (P10)".* It was also mentioned by some of them that it is unnecessary to get recommendations of similar products after you have already bought

something e.g., washing machine, coffeemaker, because those recommendations are then no longer needed.

However, seven participants mentioned that they only look at whatever they find interesting, and if there is something uninteresting or unnecessary, they ignore it. For example, one of the participants mentions, "I *don't think it's good or bad, I just judge for myself whether I'm interested or not, it can show up or not[...] (P9)."* One participant mentioned that you learn to overlook it after some time.

Some of the participants also mentioned concerns related to getting recommendations. For example, two participants mentioned that such recommendations can spread disinformation and can lead to single-mindedness. One of the participants states, "*you get this echo chamber all the time with people who think like you, so you get a little single-minded (P18)".* Further, three participants mentioned that they feel getting monitored when they receive recommendations based on what they have done earlier. Due to this, one of the participants mentions not being on all types of social media, and one mentions that such recommendations can be scary.

P22: "I *think it's a bit scary, when I go on google [...] then I look up small kitchens for example and then the next time I go in, a lot of suggestions come up without me having searched for it, so the artificial intelligence puts inn things that I haven't asked for and it's kind of scary, I kind of feel like society is watching me and giving me offers based on what I've wanted in the past [...]".*

Five participants knew that it is possible to control and reduce recommendations to a certain extent. For example, one of the participants states, "F*ortunately, I can turn off some of the functions with choices one can make to reduce parts of it (P9)."* In addition, they mentioned that they want to control the recommendations they get so that they do not get a lot of unnecessary recommendations and advertisements. Further, two of them also mention that it can be difficult to understand these settings as they use difficult and very technical language.

P9: *"[...] I accept that there will be some advertising, that's fair enough, but I don't want to be flooded by algorithms that want me to read something I have not asked for, and also not conspiracy theories and other disinformation, that I think is very harmful [...]."*

P7: *"[...] I kind of want to decide for myself what I want suggestions on, and I guess it's gotten a little better on Facebook. I think you can kind of separate out what you're not at all interested in, but I think it's cumbersome to do it. [...] I guess it's gotten better because I don't get as many suggestions as I got before, but I find it cumbersome to correct what the intelligence has suggested. [...] Google I have read has become stricter on that it should be easier for you as a customer or user to decide what Google should see and suggest, but I think it's too cumbersome, and such long list that you have to approve [...]."*

5.4.2 Digital voice assistants

5.4.2.1 Smart speaker

Only one of the participants reported to have a smart speaker at home and mentioned some challenges with it. For example, it was stated that, *"so yesterday I got the message "I don't really understand what you mean", so I had to take a reboot then it figured it out. That was annoying [...]"* and it was also mentioned that, *"I just say "ok Google turn on lights" then it turns on 7 lights."* However, it was mentioned that this is not recommended from an environmental perspective as it creates a lot of electronic garbage.

Fifteen participants had heard about smart speakers and that they can be used to for example control, lighting, music, television, get information etc. They had seen it on TV, news and/or had heard and seen friends and family who use it. However, many of them mentioned that they have decided not to buy it because they think it is unnecessary for them as long as they can do such practical tasks by themselves. For example, one of the participants said, *"I don't think we found it very useful. I think it's better to get up to turn on the lights or turn on the TV instead of just sitting down (P24)."*

Further, they mentioned that it might be useful for those who have physical challenges that make them unable to move, or make it necessary to use their voice for doing tasks like

turning on/of light, searching on the net etc. For example, it was mentioned, "[...] *it can help you if you need it because you have a reduced ability [...] many people who have various disabilities have huge can have huge benefit from it (P10)."* One participant also specified that this may be useful as long as you do not have dementia or similar challenges that affect memory and understanding. Because then you may not realize that the voice comes from a machine, and that does not create security.

One of the participants mentioned that: "*[...] I think it's too extreme. It's like "Hello Google can you write the shopping list for me, can you dim the lights and dim the music, I want to listen to music", no I think it's too extreme (P22)".* Moreover, one participant mentioned not having the possibility to have a smart speaker as it requires wi-fi.

5.4.2.2 *Voice assistants on smartphone, tablet, pc, etc.*

Three participants reported that they had used voice assistants either on their smartphone, tablet/ipad or laptop. Two of them said that they had used it just for fun and to test wheatear it worked and answered correctly or not, and they said that it replied correctly. However, one of those who have used it mentioned that it did not work. The participant stated that: "*I have looked at Siri but the times I've tried it misses more then it hits, so then I do it manually instead."*

In addition, three participants mentioned that they have observed their family members using voice assistants. They mentioned that they have observed that answers such voice assistants give depends on how you formulate your questions and commands. For example, one of them stated that, "*[...] how successful it is, also depends on how clearly you have defined what you are wondering about, [...] I've seen it being used (P19)."*

Further, eleven participants had heard about voice assistants such as Siri and Google Assistants from their family, seen it on tv or online. However, they had decided to not use it due to different reasons such as not being interested, and some said that they did not need it or have not thought about it. However, one of the participants who had not used it, intended to test it. The participant stated, "*I haven't used yet, but I'm going to try to look at (P7)".*

5.4.2.3 *Voice assistants on other devices*

Three participants mentioned that they have voice assistants in the car, but not used it because they do not feel the need for using it. For example, one of them said, "*I can turn on the radio and everything in the car with my voice, but I haven't used it and I don't know if I'm going to use it either (P7)".*

Three participants mentioned having the possibility to use voice assistants on their TV. One of them mentioned having used it on TV for searching, but it did not work as intended, and one of them mentioned using speech-to-text on their TV and Word and said that it worked and that could be a good tool for those who might struggle with writing. In addition, one has not tried using the voice assistant on their tv, because it has not been necessary.

P16: "[...] I'm supposed to be able to use it on the TV on some channels, but it doesn't work. [...] it shows a field where you should be able to use your voice, but it doesn't work, so then I have to press so that I can write what I want to search for."

5.4.3 Chatbots

Some of the participants reported that they have used chatbots, for example chatbots for banks. Six participants said that they were not satisfied with them, because the chatbot could not answer their questions or did not understand what was being asked. For example, one of the participants mentioned that, "*I never benefit from talking to them because what I'm asking is never what they can answer, what they can answer I can figure out on my own without asking [...] (P9)."*

In addition, three participants also mentioned that it seems like you have to formulate your question "correct", according to the chatbot for it to be able to understand what is being asked. For example, one of them stated that, "*you have to ask the questions, so that they understand it, if you don't formulate yourself in terms of how they're programmed, then you'll just be referred on (P12)".* Further, some of them also mentioned that they are not sure if they formulate their questions wrong or if the chatbot is not advanced enough.

P19: "I've used it in connection with the bank [...] how much it understands if you're not good at explaining yourselves, I've been a little unsure about that, at least the one time I did it for a while, so then I just gave up and called and got a dialogue and I think it worked a lot better."

Three of the participants mentioned that they received correct answers from the chatbots they have used. However, they also mentioned that they have used it very little., since they like to call and ask for help instead. For example, one of the participants said, "*I haven't used very often but [...] I got the information I was supposed to get, I find it even easier to just talk to a human, but it went well (P20)".*

5.4.4 Robotic lawnmower and vacuum cleaner

It was mentioned by four participants that they owned a robotic lawnmower, and they were all satisfied with it. For example, one of them said, "*I have a small garden and I am very happy with my robotic lawnmower because then I can go away for weeks without thinking about the lawn [...] (P21)".* In addition, one of the also mentioned that they did a lot of research before they bought their robotic lawnmower, "*[...] We have bought it ourselves and then we have read a lot about the types that paid off and in terms of what kind of terrain you have and slopes and the capacity in relation to size (P22)".*

Further, it was mentioned by four participants that they owned or had owned a robotic vacuum cleaner. Out of these two were satisfied. For example, one of them said, "*I think it works very well. Our son recommended it, so we got a little curious about what it was and bought it (P19)".* Two were not satisfied and said that the robotic vacuum cleaner did not clean the floor properly, or that it kept getting stuck in chare and table legs.

Many participants had heard about robotic lawnmowers and robot vacuums due to different reasons. Five mentioned that they have not bought one of them or both, because they don't feel it is necessary for them as they want to stay active by using manual machines. For example, one of them said that, "*[...] I chose not to get myself a vacuum cleaner because I think it is better for me to do practical work, so that I stay physically active (P8)".*

Further, four participants mentioned that they do not have robotic lawnmower because their garden is not suitable for it e.g., very small garden, the terrain is not suitable for it For example, it was mentioned by one that, “I don't have such a big garden, so it is not impossible to cut it manually [...] (p11)”. In addition, seven participants mentioned that they do not have a robotic vacuum cleaner because their house is not practical for having it, e.g., small house, two floors, a lot of stuff on the floor that can get in the way. In addition, one of them mentioned that, “I would have to vacuumed by myself because I have dogs that jump up on the couch, it probably doesn't go up on the couch and vacuum (P13)”.

Four participants who did not own either a robotic lawnmower or/and robotic vacuum cleaner showed interest in buying it, because they think it can help them and make their everyday life easier. For example, one of them said, “*there's something about bending up and down, you're not as good as you were. I see that it can be beneficial, so I wish to have a robot vacuum cleaner (P5)”.* However, one of the participants, mentioned that the round vacuum cleaners are very unpractical as they do not clean the corners.

5.5 AI attitude/perception

5.5.1 Advantages

Six participants mentioned that they think that there are more positive things about AI then negative, and that this is an exciting and interesting topic that can provide new opportunities in the future. For example, one of the participants mentioned that, “*[...] AI is of great importance, just imagine [...] in the future there'll be a vehicle outside, you tell it where you want to go, and it automatically drives you there (P18)”.* Further, it was mentioned by one participant that AI can be beneficia in streamlining work, such as replying to e-mails, and process applications. One of the participants also mentioned that chatbots can be used to provide elderly with information about everyday things, such as what is happening in the world, so that they feel less lonely.

In addition, ten participants mentioned that AI-enabled products such as robot vacuums, robotic floor cleaner, stove detectors, smart speakers, fall detectors, etc. can be useful and ease everyday life of older adults. For example, one of the participants mentioned that, *"I think there may be advantages with having assistive devices in your home that can help you especially if you live alone, many elderly people live alone because their partner is dead. (P17)".*

Further, three participants also mention that some AI-enabled products and services can help people with disabilities become more digital, for example AI gives the possibility to control digital devices with eye movements and speech, and tools such as speech-to-text, and text-to-speech can be useful for a lot of people, not only seniors.

Moreover, three participants mentioned that AI can be useful interpret medical images such as MRIs, X-rays, mammography, etc., help in finding the best diagnosis and also contribute inn improving medical treatments, such as cancer. However, they also emphasised that it is important that the final judgement and decision is made by a human.

5.5.2 General concerns

Seven participants also showed general concern regarding the use of AI. For example, one of the participants said, "*I find it very frightening how it can be used for disinformation [...] It's very hard to see through often whether this is real or not, I think that's pretty eerie. (P9)".* Further some of them also showed concerns regarding how fast the use of AI is happening, and that it might be beneficial and enjoyable for the second older generation, but perhaps not as useful for the very oldest, because as you get older it gets difficult to learn new things specially if you are not interested in learning it.

P10: "the biggest drawback is that changes happen so fast that you may not have time to keep up, also learn things well enough, and because you may eventually also use it too little, suddenly the things become even more difficult to use [...]".

Other concerns were related to AI getting too much control. For example, one of the participants mentioned that, "*have some healthy scepticism about not giving up control of*

things [...] you don't know how these things can evolve in the future. The day you start to lose control, that's when it starts to get scary (P10)". Further another participant said, "*We invent things before we learn to control them [...] I would absolutely insist that we should keep human control, we shouldn't unleash such artificial intelligence in a way where we lose track and control [...] (P9)".*

Further, it was also mentioned by five participants that AI-enabled technology should be developed with seniors in mind so that they also could benefit from it, and that it should be adapted for elderly as well. In addition, one of the participants also said that, "*[...] It should not be used as an easy way to get rid of a problem, you should consider it both factually and critically (P5)".*

Three of the participants who had heard about ChatGPT being used in school were sceptical about it, because they had heard that it was used for cheating. In addition, one of the participants also said that, "*it (ChatGPT) might be a bit silly because it's it fails to distinguish lies from facts but […] (P18)".* Furthermore, another participant commented that, "*[...] you can ask this artificial intelligence whatever you want, but you don't know if you get the right answer because you do not know what articles or what it uses to give the answer (P23)."*

5.5.3 AI replacing human contact

Six participants mentioned that it is important to make sure that AI-enabled products and services do not replace human contact, because that can lead to more isolation and loneliness. P13 mentioned, "*it might be beneficial if it can help them to stay at home longer, but it can be scary if it replaces human contact [...]."*

Further, most of the participants who had heard about devices that are used to remind older adults about, e.g., taking medicines, eat and tell them what time of the day it is, were sceptical about it. For example, one of them mentioned that, "*a machine is not going to tell me that now I have to take a tablet, no, no, no [...] I think it's better to have contact with people (P15)."* Most of them said that it is much better if a person or a healthcare worker

comes and checks that everything is correct, as that feels more secure and safe. In addition, they say that human contact is very important, so such devices should not replace human contact.

P3: "I'm sceptical at least when it comes to machine that say, "take your medicine now", "now you're going to eat", "now it's night now", "it's day" it's terribly confusing, I think it would be a bit disgusting and problematic so I'm sceptical."

Further, eight participants were more sceptical about such devices being used at homes of elderly people who have dementia. Some of the participants mentioned that they have seen on TV or heard from older people they know that such devices that are made for reminding things create major challenges for older adults with dementia, especially because they struggle with understanding were the voices they hear come from, and why. For example, one of the participants mentioned that, *"they can be scared because they don't understand that they have an aid in their home [...] they wonder if there are people inside their house when it starts talking (P4)".* It was also emphasised by them that therefore it is important with human contact, especially for people with dementia. One of the participants said that, "*only human follow-up is needed for those with dementia, that is required and to put machines to look after dementia patients. It's horrible [...] it should be only people who should be dealing with sick people (P16)".*

P9: "[...]they had a medicine dispenser, which could tell that now you have to take your medicine and stuff, but then there was the fact that this poor lady she didn't understand that machine, she also forgot what she was doing and then she just got totally confused, and it was absolutely heart-breaking."

The participants also mention that carpets that tell seniors whether it is day/night can make them feel persecuted, and that medicine dispensers are of no use seniors with dementia, since it is not always known if it is day/night. One of the participants also mentioned that, "*there were very often male voices as well, and that's even worse for old ladies, because they then think they're going to be robbed. [...]."*

However, four participants also mention that such devices might be useful for those who do not have dementia or similar challenges in their everyday life, but it should still not be a replacement of human care.

P13: "it can never replace a human being, and I think that then maybe you should be a little clear in your head, but then I think you can get very scared if that voice suddenly speaks to the middle of the night, doesn't understand why, so I think I can be more intimidating than helpful, but if you're clear in your head and need help with some things, I think it could be a nice thing."

Further eight participants also showed concerns related to assistive and company robots. One of the concerns, was that such devices can increase loneliness and isolation, because they can contribute in reducing human contact. For example, one of the participants said that, "*No man is an island, that's exactly right as humans are not an island, we need other people and we can't talk to a machine, so machine can do practical jobs but it stops there (P9)".* In addition, one of the participants commented that, *"It gets a bit lonely if it's just devices like that, [...] company robot, I've seen on TV, which is supposed to be a replacement for human company, oh well, it looks a bit cold. [...] (P12)".* P19 mentioned that, "*I see that it's positive for solving some practical problems at home, but it shouldn't take over the human contact, because then people get even more lonely (P19)".*

Further, it was also mentioned by some of these participants that they do not think it is possible to have a proper conversation with a robot, and that it also sounds a bit scary to have a conversation with a robot. For example, one of the participants also mentioned that, "*[...] you should not try to replace humans with robots in all contexts, not everyone can have a best buddy to be with like in Star Wars (P10)".* P9 mention that: "*You as you get older it become more important that you don't get isolated in your home and never come out and never see a person, never talk to a person, that's a nightmare, shouldn't have it like that".*

In addition, it was also mentioned that such robots cannot take proper care of older adults, especially older adults who have dementia. Therefore, it is important that human contact

does not get replaced. However, it was also mentioned by some of the participants that robots for practical work, such as cleaning, can be beneficial.

P22: "depends on what it is, so a robot vacuum cleaner to keep it clean, I think it's a good aid, but it's not a companion in a machine and you need human contact, and that machine will never understand my needs like a human would do, so I don't think it's a solution to replace human tasks with a robot if it's not like that mechanical tasks in a way."

Four participants were also aware that there is a shortage of health care works, and this will increase as the number of older adults are increasing. Still, they do not feel that replacing human contact is the best solution. It was mentioned by one participant that if such aids are only being used to push the elderly aside, and if society is avoiding its responsibilities, then such devices are of no good. However, one participant mentioned having heard about company and assistive robots being used in Japan and have heard about it working there, so was positive about it.

In addition, six participants also had concerns related to AI-enabled products contributing to reduction of workers in the health sector. For example, one of the participants said that, "*I can say that in elderly care and home care, we need personal contact. [...] Only it does not affect staff, that they tighten the number of staff or nurses [...] (P25)".* The participants are concern, because less staff in hospitals and nursing homes can lead to reduced human contact, and that can further lead to more isolation and loneliness. In addition, some of them also mention that it is important that older adults who are in need, are being taken care of by human health workers.

P9: "it's nice in many ways that older people should be able to live at home and get help at home, [...], but if you constantly rationalize, rationalize, because with less and less staff and more and more automation, you can lead to stories like that lady who failed to Take her medication because she didn't know what to do with those tablets [...]".

P5: "*[...] you have to be a little more careful when you come up with all these artificial intelligence things, because we are dealing with humans, not machines. I think that's often a little forgotten, because you have to run faster, save and streamline."*

5.5.4 Learning about AI

Eight participants mentioned that it is important to learn about AI. Some of them mentioned that it is important to know about what AI so that one can be able to take part in discussions and conversations about AI. Further, it was mentioned by nine participants that having knowledge about how AI works and about AI-enabled products and services exist, and what opportunities it can give, so that older adults can make better decisions for themselves, buy assessing the different AI-enabled products and services. For example, one of them mentioned that, "*knowledge gives the more security (P13).*"

P6: "[...] there are many products that can make it easier for the elderly to live at home, and I try to explain this to as many of the elderly as possible that, you may benefit from think about what you can benefit from to be able to live at home [...]".

P19: "[...] I think it's fun to try to keep up with what it is and what opportunities are there because there may be opportunities that you might be able to benefit from sometime, so to pay a little attention to what's going on, I think that's fine."

In addition, one of the participants mentioned that the use of AI has increased a lot so it is important to learn about it, so that one can help guide children and grandchildren. However, to participants mentioned that I might not be very important to have very advanced knowledge about how AI works technically, as long as one knows what AI is and what opportunities it can offer.

P8: "[...] It does not hurt to know what AI is and how it can make daily life easier, [...], so it's not terribly important how much you understand of how this actually works, i.e., the technical part of it. (P8)".

Further, three participants mentioned that AI is going to be used more in the future, and will also affect the elderly, therefore it is important that older adults know what this is so that they can benefit from new products and services, but also to be able to look at them critically. In addition, three participants mentioned that you might suddenly be in need of

using an AI-enabled product or/service, then it can be an advantage to know about them in advance. One of the participants also mentioned that it is important to know how AI works, so that you can have more control over the products that use AI. Two participants also mentioned that it can be important to know about AI and how it works, so that one can avoid being deceived.

In addition, three participants mentioned that they think it is important to learn about AI and how it is used, but since the development happens so fast it can be difficult to keep up with it. For example, one of the participants mentioned that, "*it goes terribly fast, development happens so fast that for us old people it's impossible to keep up (P22)".*

However, there were also three participants who were not interested in learning about AI, because they did not have much interest for the topic. For example, one of the, said, "*I don't think it has much to do with me really, so it's okay to get a little more insight into it, but it's not something I seek out really. [...] (P2)".* In addition, one was not sure about whether learning about AI was important or not for them. Further, four participants mentioned that whether one wants to learn about AI or not, also depends on how much interest one has for AI.

5.6 AI trust, privacy and security

When the participants were asked whether they trust artificial intelligence, and whether they have any concerns related to privacy and security, some had concerns to privacy and security in general, but some mentioned things directly related to artificial intelligence as well.

5.6.1 General comments about privacy and security

Six participants mentioned that they have concerns related to getting fake phone calls, e-mails, and text messages, and that this makes them feel less safe on the internet. In addition, they mentioned that they try to be cautious about sharing personal data. For example, one of them mentioned that, "*so the concern in relation to that those criminals are at the forefront of technology as in terms of getting into bank accounts and stealing money*

from people [...] (P22)". In addition, four participants mentioned that they have concerns related to online tracking and monitoring, and that this can feel uncomfortable (p9, p11, p12).

One of the participants also mentioned that it is important that the health services take care of the privacy and security of their systems, so that information about patients do not go to the wrong hands. Further, three participants also mentioned that it can be a bit difficult to have confidence in privacy and security in general, when they hear news about data leaks in public and private systems, and that data is shared with other countries. However, three participants mentioned that they did not think much about it since they are not very digital.

Further, some of the participants mention how they try to keep themselves safe, and how they protect themselves online. One of them deletes everything that seems suspicious, two of them mentioned being careful about where they click and what websites they are visiting. In addition, one also mentioned being cautious about using unfamiliar networks. One of the participants said that, "*there is a risk of data being misused will always be present I don't think it is possible to protect oneself completely against it [...] (P8)".*

Two participants mentioned that when development happens so fast, it gets even more important that people pay attention to privacy and security. In addition, four participants also mentioned that it is important that older adults are made aware of how to protect their privacy, and that they are given guidance, e.g., through courses and lectures, because it is difficult to watch out if you do not have enough knowledge. One of them mentioned having attended a course and found it very useful.

P19: "yes, you keep reading about people who have been scammed online, right, with information and that you think you're doing it right, and then something wrong happens, so I think I think maybe you still need information on how to secure yourself online".

P24: "There's a lot that's uncertain [...] that's why I say that with the follow-up of safety, especially for the elderly, is very important. So that when you get a letter from the post office

or the tax service, that you can actually check that it is from the tax authorities. That it is not strange e-mail address[...].”

5.6.2 Concerns related to AI trust, privacy, and security:

Three participants mentioned that they don't know much about AI, so it is hard to say anything about whether they can trust AI, and what they think about privacy and security related to AI.

However, some participants did have concerns related privacy and security with AI. Three participants mentioned that they are worried that AI can be exploited by criminals, for example, by using fake voices and e-mails. For example, one of them mentioned that, “*when we get so close that it can actually manage to imitate voices very well so that you can be fooled, [...] that can be a little scary (P24)”.*

Three participants mentioned that they do have concerns related to AI-enabled products and services collecting so much data, and that this requires that privacy and security of these products and services are taken well care of. Two of them also mentioned that it is important to have control over one's data and know where it goes and what it is used for. Two participants mentioned that they do have some doubts about privacy and security of AI, and that they are a bit sceptical about it (P17, P25)

One the participants mentioned that the data used by AI can be affected by the perceptions of the person that has collected the data for the AI in the first place. In other words, AI-enabled products and services that use a lot of data, and if the data is affected by negative perceptions, such as racism and discrimination, that will affect the outcome of the AI-enabled product or service. Another disadvantage that was mentioned by one of the participants was that if there is any issue with the data or data-processing it can give incorrect answers that can create problems depending on the context.

It was mentioned by two participants that it can be difficult to use the word trust, as this is man-made. They said that can be difficult to trust everting that is made by humans, and many elderlies will probably be sceptical about this. However, one participant mentioned

that you can have confidence in much of this. Further, one of the participants said that, "*[...] when talking about artificial intelligence it is important to talk about, what we are benefiting from, what do we need to watch out for, and consider ourselves against it. That's very important [...]. (P9).*"

6 Discussion

This study shows that most older adults are positive about AI-enabled products and services being used for practical tasks, but they are concerned and skeptical for AI to replace human contact, because they think that human contact is necessary in the health sector, and that less human contact due to automation by AI can lead to more isolation and loneliness.

However, the experimental study done by Pappadopoulos, et al. (2021) showed that an assistive robot called pepper robot improved emotional wellbeing, but there was not huge difference in physical health and loneliness compared to regular health care. Further, literature reviews done by Abdi, Al-Hindawi, Ng, & Vizcaychipi (2018) and Pu, Moyle, Jones, & Todorvic (2018), also suggested that some type of robots, can have a positive impact on older adults' well-being. Both studies made it clear that the studies they based their literature review on were not of high-quality. Literature reviews done by Abbott, et al. (2019) and Chen, Jones, & Moyle (2018), also suggested that social robots might have a positive effect on older adults' well-being, but the studies used in these reviews also were not a of high-quality.

This shows that there still needs to be done a lot of research on what impact assistive or social robots have on older adults' well-being, including loneliness, mental and physical health. This study has contributed with giving an overall understanding of what perceptions older adults have on assistive and social robots.

Belam & Nilforooshan (2021) concluded that it is important that people with dementia and their care takers are included in the development process. The result of this study verifies the study done by Belam & Nilforooshan (2021), as it shows that older adults criticized the use of AI-enabled products and services in the homes of people with dementia, as some of these products and services create challenges for them. Therefore, this study also shows that it is important that products meet the user's needs, and that they are included in the development prosses.

The study done by Wang, et al. (2019) showed that older adults face challenges using technologies that are meant for helping them living in their homes for as long as possible. This could be due to different reasons, one of them being poor usability and a mismatch between the technology and the user's needs. This study supports the fact that poor usability of products and services limits the possibilities for seniors. For example, it was mentioned by some of the participants that new technology does not take older adults in account when developing. Most of them mentioned that devices placed in the homes of people with dementia, do not serve their purpose of helping, indicates that there is a mismatch between the users' needs and the technologies that are made for helping older adult stay longer at home.

The study done by Guan, et al. (2019) showed that older adults were willing to have voice-activation devices at home, but the results from this study showed that most did not have or use voce-activated devices, because they did not feel it being necessary for them. This verifies that the actual adoption of smart speakers among older adults is very little (Kim & Choudhury, 2021).

This study found that most of the participants had some knowledge about AI and wanted to learn more about AI, and that most received their knowledge about AI from internet search and newspaper. The study also found that older adults find it hard to keep up with new technology as the changes happen very fast. Further, this study found that older adults have concerns about privacy and security, related to data sharing. These findings confirm the study done by Shandilya & Fan (2022).

The study done by Wang, et al. (2019), also indicated that older adults are interested in learning and understanding what possibilities they have. In addition, contribute to development so that the best choices are made for seniors. The findings of the study done by Wang, et al. (2019), is also supported by this study as the participants have shown great interest in learning more about AI, so they can use this knowledge to make better decisions for themselves.

6.1 Recommendations

The result from this study shows that older adults are interested in learning more about AI and how it works. In addition, they also want to learn more about privacy and security related to AI. Therefor it is recommended that the government and organizations try to arrange courses and give older adults guidance.

Another recommendation is to include older adults in development of AI-enabled products and services. It was mentioned by seniors that they feel that development happens vary fast and that it is difficult to follow up with all the changes, and that new technology such as AI-enabled products and services are not always developed with older adults in consideration.

The study also shows the need to combine different fields, to make better products and services, when developing for older adults. It might be important to include health workers, seniors etc. to understand the older adults better before developing products and services for them. So, as further work one can focus on how to best develop AI-enabled products for seniors by including people from different fields, and older adults.

The study shows that seniors have concerns related to the shortage of workers in the health sector, and that they are concerned about AI-enabled products and technology replacing human contact. As further work seniors can be presented with AI-enabled products and services that are made for older adults, to get a better understating of what kind of products and services seniors find useful and what not, and why.

In addition, this study shows that there are concerns related to how some AI enabled products can increase loneliness and isolation. For further research this issue can also be studied more in depth, by doing experimental and case studies where seniors are given products that are made for decreasing loneliness and isolation and see the impact over time. Even though, such studies have been done in some parts of the world, and it is important to do it in different places and different cultures, because the causes and effects of loneliness and isolation can be different in different countries and cultures.

In addition, this study also showed that most of the older adults have encountered challenges with chatbots, as they don't reply as expected. This could be studied closer to understand whether there are issues with formulating the questions or if there are technical errors in the systems.

6.2 Limitations

One of the limitations in this study is that there is not much diversity when it comes to gender. The vast majority of the participants in the interview were women. Out of 25 there were 19 women, and 6 men. Due to the short time, and since very few participants showed interest in participating in the survey, most of the recruitment happened through convenience sampling. Therefore, the sapling is not fully representative of older adults in the whole population. Another limitation of this study is that this is a subjective study meaning that it reported the self-reported knowledge, experience, perception/attitude, and concerns. There is no objective view on this. The definitions of AI literacy we used in this study are focused on education, which are not directly suitable for older adults. This is another limitation in this study.

6.3 Future research

This project has also contributed to increasing awareness and understanding of AI among seniors, as some of them mentioned that after the interview they have become more aware of what AI is and have reflected on how it can be useful or not for them. So, for further research it can be a good idea to investigate and understand how older adults' perception and attitude change after they get to learn more about what AI is and what it can be used for.

Since this study focused on getting a general understanding of AI literacy among older adults, many different areas that can be researched more closely showed up. For example, there could be done more research specifically on AI used in the health sector and what older adults think about this in more depth. Also, since some of the products and services are developed for seniors with dementia, it can be a good idea to look more at their experiences using products and services that are made for their help.

This was a subjective study that showed the participants personal perspective and understanding. So, in the future more objective studies can be done to build on the findings of this study, or to confirm or disconfirm the findings of this study.

As future work, the definition of AI literacy should be better defined, to be more suitable to older adults. This study could be used to get a better understanding of what is lacking in the definition and what competencies are needed for elders to be able to critically evaluate AI-enabled products and services and use it to its full potential and use it ethically.

7 Conclusion

Based on the current definitions of AI literacy these four-research question were made to get a better understating of AI literacy among older adults.

- How much knowledge do older adults have about AI?
- What experiences do they have with using AI enabled products and services?
- What is their perception and attitude towards AI?
- What concerns do they have related to AI?

The study used a mixed method approach, where a survey was used to get an overall understanding and data about older adults' knowledge, experiences, perception, attitude and concerns related to AI. Whereas the semi-structured interviews were used to get a more in depth understanding of what they knew about AI, stories of how they experienced using AI-enabled products and services, and what their perception and concerns are related to AI.

Knowledge:
The results from the survey and interviews showed that most of the seniors had heard something about AI, but how much they knew varied. Some had heard about products and services that use AI, some knew a bit about how AI works, and some had only heard the term AI. Most of the participants mention having received their knowledge from news, internet search, tv and from family.

Experience:
When it comes to their experience using AI-enabled products and services, the survey shows that most of them use services that already include AI, for example search engines, social media, and streaming services. Compared to this few use products, for example robot vacuum cleaner and voice assistants like Alexa and Google Home.

Further, the interviews give an in-depth understanding of how the seniors experienced these products and services. The results from the interviews showed that their experience of these products and services varied. When it comes to specific products like robotic lawnmower

and robot vacuum cleaner how satisfied they were depended on whether the products served their purpose or not.

When it comes to the services that use AI, like recommendations on social media, online shopping etc., their experience varied. Some felt that they were monitored, some wanted to reduce the number of recommendations they got or control it, some see it as unnecessary, irritating or that it can contribute to spreading disinformation. However, some mentioned that it can be good in some cases, like on TV and YouTube. Those who had experience with using voice assistants on their devices, like smartphone, ipad/tablet, TV etc., some said that it worked, but some said that it gave wrong answers. The same was for those who had experience using chatbots, most said that it did not give the right answers, and that they had to make sure that they asked the correct question. In addition, the results showed that what AI-enabled products and services the seniors decide to use is much based on their interest, and what they perceive as needed, or not.

Perception, attitude, and concerns:

The survey and the interviews showed that most of the participants want to learn more about AI. The interviews showed that the reasons for them wanting to learn more about AI, is so that they can make better decisions for themselves on what products and services can be beneficial for them and what they don't need. Additionally, it can be good to know what possibilities exist in case they suddenly need something.

Further, the results showed that the seniors do think that AI-enabled products and services can be good for practical help and give new opportunities, but it should not replace human contact, as that can lead to more isolation and loneliness. In addition, there are concerns regrating this being used to reduce number of health care works, as they think it is important that humans take care of humans, especially those who are not well.

When it comes to how much they trust AI, the survey showed a mixed response where most did not know if they could trust AI or not. However, the interviews showed that there is some scepticism when it comes to trusting AI, because it is human made. However, the survey showed that most think that they might trust AI more if they learn more about it, so it was mentioned in the interview that more knowledge can lead to less scepticism and fear.

When it comes to AI using data, the survey showed that most of the participants are not comfortable with sharing data, and that most do not think that current laws/regulations protect personal data used by AI-enabled products and services, and that AI does not make decision according to ethical standards.

The interview showed that it might be a bit difficult to have an opinion on privacy and security for AI when you have limited knowledge about how AI works, but for those who knew about it mentioned that it can be a bit uncomfortable that so much data is gathered and that it is shared with other countries, and that there will always be a risk that data can be misused. In addition, it was also mentioned that having control over the data and knowing where it goes is important. Further, some of the participants had concerns related to how AI can be misused, and that new innovations increase the need to pay more attention to privacy and security, and that concerns regarding how trustworthy the data that AI uses is.

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Appendices

Appendix A

The interview guide is written in Norwegian, because the interviews were done in Norwegian language.

Intervjuguide

Bakgrunn

1. Hvor gammel er du?
2. Hva er din arbeids bakgrunn?
3. Hva er din utdannings bakgrunn?

Digital-kompetanse

4. Hvilke digitale enheter bruker du (har brukt tidligere)??

5. Hvor ofte bruker du disse, og til hva?

6. Er de digitale enhetene enkle eller vanskelige å bruke?

Kunnskap og erfaring med AI

7. Hva vet du om kunstig intelligens, og hvor fikk du denne informasjonen fra?

Holdning til AI

8. Føler du at det er viktig å lære om kunstig intelligens, og eventuelt hvorfor /hvorfor ikke?

AI – tillit, personvern og sikkerhet

9. Hva er dine tanker rundt fordeler og ulemper kunstig intelligens kan ha for eldre?

10. Har du tillit til kunstig intelligens eller har du noen bekymringer knyttet til det?

12. Er det noe mer du ønsker å si om kunstig intelligens?