Exploring AI Literacy Among Older Adults

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Abstract. Artificial Intelligence (AI) technology is increasingly being integrated into our daily lives and many aspects of society. AI is viewed as a new opportunity to promote independent living and well-being for older adults. AI literacy plays an important role in older adults' acceptance and use of AI-enabled products and services. However, to our knowledge, no research has investigated AI literacy among older adults. The study aims to address this gap by collecting and analysing data on older adults' knowledge and understanding of AI and their experiences and concerns regarding AI-enabled products and services. In total, 207 older adults, aged 60 years and over, participated in the study, including 182 who answered a survey and 25 who participated in semi-structured interviews. The results show a variety levels of AI literacy among the participants. Many are interested in learning more about AI so they can make informed decisions about AI-enabled products and services. This study has not only produced insights into AI literacy among older adults but also contributed to increasing the awareness of AI among the participants and has provided recommendations on measures to enhance older adults' AI competencies.

Keywords. Artificial intelligence, AI literacy, older adults, digital literacy

1. Introduction

Artificial intelligence (AI) is increasingly viewed as a new opportunity to overcome different challenges associated with ageing and promote independent living and well-being for older adults. AI-enabled technologies and solutions, such as social robots and smart homes, including voice assistants, have been developed to support older adults in living independently. Recent research has shown that age may affect people's experiences and attitude towards AI [1]. Compared to younger adults, older adults may have less knowledge of AI and experience of using AI-enabled products and thus face more challenges in accepting and using them.

AI literacy is regarded as a set of competencies that enable people to understand, use, monitor and critically reflect on AI applications without necessarily being able to develop AI models themselves [2, 3]. Ng and colleagues [3] argue that AI should be a part of technological literacy and propose that AI become a fundamental skill for everyone, not just computer scientists.

For older adults to fully benefit from the opportunities provided by AI technologies, they must have a basic understanding of AI and be able to make informed decisions about and interact efficiently with AI-enabled products and services. Although studies have investigated older adults' experiences and perceptions of

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specific AI-enabled products, such as voice assistants [4] and social robots [5], to our knowledge, no studies have focused on AI literacy among older adults. The research presented in this paper aims to address this gap by collecting and analysing data on older adults' knowledge and understanding of AI and their experiences of and concerns about AI-enabled products and services.

2. Related Work

2.1. AI Literacy

Research on AI literacy has mainly focused on the education domain, where courses and study programmes are provided at different levels of the education system to teach students the basics of AI, its possibilities, its limits and its potential social and economic impacts. In primary and secondary schools, AI-related topics have been integrated into the curriculum [6]. In higher education, research on teaching AI to students from backgrounds other than computer science and information technology, such as arts, medicine, business and teacher education, has also been published [7].

Despite the rapid increase in AI literacy education, defining AI literacy remains an ongoing effort [3]. According to Laupichler and colleagues [7], the most frequently cited definition of AI literacy is that of Long and Magerko [2]: "*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*. Based on their literature review of 30 peer-reviewed publications, Ng and colleagues [3] identify the following four aspects for fostering AI literacy: Know & Understand: know the basic functions of AI and how to use AI applications; Use & Apply: apply AI knowledge, concepts and applications in different scenarios; Evaluate: higher-order thinking skills (e.g. evaluate, appraise, predict, design) with AI applications; AI Ethics: human-centred considerations (e.g. fairness, accountability, transparency, ethics, safety).

We used these four aspects as the starting point for the study design and data analysis.

2.2. Older Adults' Experiences of AI-Enabled Products

Several studies have investigated experiences, perceptions and concerns regarding AI technologies and AI-enabled products among older adults, including Ambient/Active Assisted Living (AAL) technologies [8], smart home technologies [9] and voice assistants, such as Google Home and Amazon's Alexa [4, 10, 11]. These studies have shown that older users see the benefits of these technologies but also face many challenges, such as low technology literacy, lack of understanding of terminology and poor usability. Older users also have concerns about privacy and the level of control they have. For voice assistants, the quality of speech recognition, having to learn the right words to control the devices, difficulties in understanding how the devices work and where the information comes from, as well as difficulties in setting up the devices due to a lack of information in instruction manuals have been identified as challenges for older users. Kim and Choudhury [4] reveal that the older participants in their study worried about becoming lazy and inactive, which could negatively impact their quality of life. The studies have also shown older users' interest in learning and understanding

and controlling their data, as well as their willingness to contribute to the design of technologies that can support independent living.

Shandilya and Fan [1] collect both quantitative data through a survey of 35 participants and qualitative data through semi-structured interviews with 15 participants aged 60 years or over. Their study shows that most participants have "some knowledge" of AI and are interested in learning about AI and using AI-enabled products, but their possibilities for learning are limited. They also have concerns about privacy and the impact AI will have on their intuitive decision-making skills. Although this study covers older adults' knowledge of AI, most of the data focus on the participants' experiences and perceptions of AI.

3. Method

The present study adopted a mixed methods approach. First, a survey was conducted to understand the general AI literacy among older adults. In addition to demographic information and digital competencies, questions in the survey were based on the four aspects of AI literacy identified by Ng and colleagues [3]. These aspects were mapped to questions and provided with examples to help respondents understand the questions. As the context of this research differs from the focus on AI literacy in formal education in [3], we reduced or removed aspects related to applying AI algorithms and creating AI applications. To accommodate older adults who may not be aware of AI, we provided examples of AI-enabled everyday technologies, such as a robot vacuum cleaner and recommendations of radio programmes based on programmes previously listened to. The survey was followed by a semi-structured interview aimed at gaining a deeper understanding of AI literacy among older adults by allowing participants to tell their own AI stories. In addition to a pilot study, we received feedback from an organisation for older adults on the formulation of questions and suggestions for suitable examples. The survey was revised accordingly before it was distributed.

The study utilized a convenience sampling method to recruit participants aged 60 years or older. Information about the survey and invitations to participate in interviews were distributed through organizations for older adults, senior centres and the researchers' personal networks.

Survey data were collected anonymously and analysed using descriptive statistics, and the interviews were audio recorded and subsequently analysed using thematic analysis. The study was reported to the Data Protection Services in the Norwegian Agency for Shared Services in Education and Research (Sikt), which evaluated and approved the processing of personal data in this study.

4. Results

4.1. Participants

The survey yielded 182 responses from 90 female and 92 male participants. Twenty-five older adults participated in the semi-structured interviews, including 19 female and 6 male participants. The distribution by age is shown in Table 1.

Table 1. Age range of participants.

Age group	Survey	Interview
60–69	33	3
70–79	100	14
80–89	48	7
90–99	1	1

The participants represent many professional backgrounds in different sectors such as education, health, industry, and business. Table 2 shows the smart devices they reported using. Some added that they use smart solutions, such as Apple Home and smart electricity consumption controls.

Table 1. Smart technologies used by participants.

Device	Number of participants in survey	Number of participants in interview
Robot vacuum cleaner	32	4
Voice assistant (Alexa, Google, Assistant, Siri, etc.)	49	4
Smart watch	57	1
Smart TV	106	1

4.2. Results from the Survey

Nine participants reported that they know nothing about AI, five reported having much knowledge, and the rest (N = 168) reported having heard of or having some knowledge about AI. Thirty-three participants reported that they understand how AI works to a large extent and 76 reported that they understand it to a small extent. Regarding whether they would like to learn more about AI, 73.1% responded "Yes" and only 2.2% responded "No". The responses about whether they are interested in understanding how AI works are similar.

More than half the respondents reported having experience of interacting with customer service chatbots (N = 101), fingerprint or face recognition to unlock smart phones (N = 111), a spam filter in emails (N = 115) and video and song recommendations, such as on Netflix, YouTube, Spotify and radio and TV programmes (N = 118). Some added that they use robot lawn mowers. About 48% of respondents (N = 84) reported that they are confident in using AI-enabled products. More than half the respondents learned to use them through searching the Internet (N = 113) and reading the user manual (N = 92).

Regarding why they do not use certain AI-enabled products, "Do no need" was the reason given by 89 participants, followed by concerns about privacy (N = 49) and safety (N = 40). According to 73.1% of respondents (N = 133), AI can be useful for older adults. About 31.3% (N = 57) trust AI. When asked whether they would trust AI more if they knew how it works, about the same number of respondents replied "Yes", while 100 participants responded "Maybe". About 42.3% of respondents (N = 77) stated that they do not feel comfortable with sharing their data with AI to improve its outcomes. Even more respondents (N = 88) shared that the current laws and regulations do not provide enough protection of personal information in AI-enabled products. More than half the respondents (N = 113) expressed concern about data security against malicious attacks in AI-enabled products and services. According to about half the respondents (N = 90), the current products and services that use AI for decision-making do not follow ethical standards.

4.3. Results from the Interviews

The results from the interviews are organized according to the following themes adapted from the four aspects of AI literacy [3]:

- Know & Understand: know the basics of AI and the main functions of AI-enabled products and services.
- Use: use AI-enabled products and services to achieve goals.
- Evaluate: evaluate AI-enabled products and services according to needs and the benefits of these products and services.
- AI Ethics: have awareness of AI ethics, data privacy and security.

4.3.1. Know & Understand

The interview data show that most participants had previously heard the term "artificial intelligence" and have heard about many AI-enabled products, such as robot lawn mower and vacuum cleaner, voice assistant and ChatGPT, from media and family/friends. Some reported having seen others using some of these products. Several participants have also noticed recommendations they receive on social media or online shopping websites. Some have used chatbots in customer service. One reported owning a smart speaker and three reported having used Siri on their phones or tablets. Four indicated that they own a robot lawn mower and a robot vacuum cleaner, respectively.

However, there is a high degree of variation in their knowledge of AI and understanding of how AI works. For example, some participants reported having heard of AI, while others were able to talk about some technical aspects of AI, such as that the recommendations one receives online or from social media are created by algorithms which record search activities:

> *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)
>
> *You can get those machines to also think for themselves and draw conclusions until they start to function in a way almost like a human.* (P10)

Some had read about AI to prepare for the interview and were able to give a more formal definition, such as "computer systems that can learn from their own experience and that can solve complex problems" (P9).

Many expressed that it is important to learn and know about AI so they can make better judgements concerning AI-enabled products and services: "You have to know enough about it to be able to be critical and opt out of what you can opt out of if it's negative" (P9).

Although most participants showed an interest in learning about AI, they also commented that it is challenging to keep up with rapid technological development in general and AI development specifically.

4.3.2. Use

Participants have various levels of satisfaction with the AI-enabled products and services they have used. The four participants who reported owning a robot lawn mower expressed that they are satisfied with it. Of the four participants who reporting owning a robot vacuum cleaner, only two are satisfied: "*I am very happy with my*

robotic lawnmower because then I can go away for weeks without thinking about the lawn" (P21).

Five participants understand that it is possible and are also able to change the settings to adjust the recommendations they receive on social media or on online shopping websites so they can reduce the number of unnecessary recommendations and advertisements, while two stated that the settings are difficult to understand because of the technical language. The participant who owns a smart speaker reported challenges with speech recognition but has found ways to use it anyway. Another participant tried to use the voice assistant on the TV for searching but was unsuccessful and therefore went back to inputting search words in the search field manually.

Most participants who have used chatbots for customer service have not been satisfied. The main challenge is that users must formulate questions "correctly" for the chatbot to understand them. Only three reported that they have received satisfactory answers, but they also stated that they prefer to talk to a human in customer service: "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 passed on" (P12).

4.3.3. Evaluate

Most participants could evaluate AI-enabled products and services according to their needs, constraints and the potential benefits. Some participants explained why they have used or not used certain products:

> *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)
>
> *Something about bending down and straightening up – 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).

Some of them have done thorough research on the products before buying them. For example, P22 bought a robot lawn mower after reading a lot about it: "We bought it ourselves. We have read a lot about the types in terms of what kind of terrain you have and slopes and the capacity in relation to size" (P22).

Several participants shared their thoughts on the different needs of older adults and what kinds of AI-enabled products or services might be useful or not useful for them. For example, participants showed scepticism and were critical of installing voice assistants in the homes of people with dementia:

> *They [people with dementia] can get scared easily because they don't understand they have an aid in their home that is going to help them, but then they wonder if there are people inside their house when it starts talking. […] I'm very sceptical about that [aspect] of artificial intelligence because they don't really understand what's going on.* (P4)

4.3.4. AI Ethics

The participants see the positive side of AI and acknowledge its benefits in helping with practical tasks at home. However, several participants also shared concerns about the risk of AI replacing humans in healthcare, which may result in a reduction in healthcare staff and lead to further reduced human contact, isolation and loneliness. Many emphasized the importance of human contact:

I'm so worried that politicians are overestimating this [AI] and think that it could replace humans and reduce healthcare staff even more […] That's a tendency I am very afraid of because human contact is very important for everyone. (P9)

One participant mentioned that AI can be affected by the perceptions behind the data that are collected. In other words, if the data used by AI are affected by negative perceptions, such as racism and discrimination, that will affect the outcome of the AI-enabled product or service.

Several participants also shared concerns about privacy and data security in AI-enabled products and services as well as the risk of AI being exploited to spread fake information or to defraud older people.

5. Discussion

The results from the survey and interviews confirm some of the findings in [1]. Many participants in both studies report having limited knowledge of AI, although they have experience of using various AI-enabled products. They find it difficult to keep up with the rapid technological development and have concerns about their privacy and date security in AI-enabled products.

Our study covers a wider range of themes related to AI literacy than those reported in [1]. For example, we investigate older adults' considerations of AI ethics and their ability to evaluate AI-enabled products and services according to their needs. Further, we have gained an understanding of participants' thoughts and reflections concerning AI in healthcare, including the critiques and scepticism about the use of AI-enabled products and services in the homes of people with dementia.

Our study shows that older adults experience challenges, such as difficult terminology and poor usability, when using AI-enabled products and services and that they are interested in learning and understand the possibilities that AI technologies can offer in making informed decisions. These findings support the results from [8]. Both studies emphasize the importance of taking older adults' needs into consideration when developing AI-enabled products and services.

Although we achieved gender balance in the survey, we could not recruit as many male as female participants for the interviews. Another limitation is the study's reliance on self-reported data, which may not provide an accurate description of older adults' AI literacy, thus affecting the reliability of the results.

6. Conclusion and Future Work

This paper has presented a study focused on understanding AI literacy among older adults. The results show a high degree of variation in AI literacy among the participants and most of them are interested in learning. Some of them have (mixed) experience with AI-enabled products and services. Many discussed their decisions to use or not use AI products and services depending on their needs and the information about these products, which they gained through family and friends, media or searching online. The participants were able to reflect on the advantages and disadvantages of AI and discuss their concerns regarding contact with humans versus AI in healthcare and privacy and data security in AI-enabled products and services.

Further research should focus on developing a more systematic definition of the competencies in and objective measurement of AI literacy for older adults. In addition, studying AI literacy among older adults in different social and cultural contexts will provide a richer and broader understanding of their AI literacy.

This study has not only contributed to a better understanding of AI literacy among older adults but also raised participants' awareness of AI, as evidenced by the fact that those who intended to participate in the interviews began reading about AI and engaging in discussion with family and friends regarding AI-related products and challenges.

The results have shown that the involvement of older users in the design and development of AI technologies, particularly those targeting older populations, is essential for acceptance of the technologies. Further, governmental policy and strategies and resources in AI training to enhance competencies among older adults can help to bridge the gap in AI literacy between the young and older populations.

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