Connection Between the Real World and the Digital World: Voice Assistants as Promoters of Socialization for Older Adults

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Abstract: Socialization is crucial for the mental and emotional well-being of older adults, combating isolation and loneliness. In a digital world, voice assistants provide a simple, intuitive interface that enhances social engagement. These technologies facilitate communication with family and friends while offering activities that stimulate cognition and emotional connection. This paper explores the potential of voice assistants to promote socialization among older adults, focusing on their role in creating intergenerational connections and improving quality of life. The study presents findings from HUGTV - Helping Unite Generations through TV, a pilot project that demonstrates how voice assistants foster positive social interactions and emotional support in senior communities. The results of 12 tests conducted with participants in their homes show that voice commands effectively bridge the real and digital worlds, enabling seniors to converse on various topics, search the internet, and send voice and text messages, tasks they previously did not engage in.

1 INTRODUCTION

Socializing is an inherent part of human nature and is essential for cognitive development at all stages of life. In adulthood, especially among older adults, this need remains ever-present (Beauvoir, 1990). However, this "exchange" does not always happen. Various factors, such as physical disabilities, digital exclusion, lack of financial resources, and the loss of loved ones, contribute to social isolation and loneliness. In Portugal, for example, 44,000 older adults live alone or in isolation[1], a situation that is repeated in many countries around the world. That is why there is a need for projects and/or consistent initiatives to encourage the inclusion of older adults in society.

Technology, in turn, is a key factor in reducing such indicators, according to the United Nations (UN) and the World Health Organization (WHO) (WHO, 2021) (UN, 2023). According to the WHO, the use of digital tools is essential to combat discrimination and ensure autonomy for individuals over 60. In this regard, the WHO emphasizes that there must be efforts from public and private institutions to make information and communication technologies more accessible to older adults, preventing digital exclusion (WHO, 2021).

Facilitating access means providing adequate resources on a large scale that are simplified and dynamic. When older adults are involved in the process of creating a platform, for example, the chances of adopting the technology tend to be higher (Taylor et al., 2023) (Howes et al., 2019). It is also essential to provide proper guidance and support so that they can ask questions, for example. Finally, integrating devices they are already familiar with, such as television, can also help reduce feelings of fear and anxiety toward new digital platforms (Wang & Wu, 2022). All these points show that digital inclusion is possible, but it depends on different factors. Consequently, socialization will be the result of more consistent strategies, specifically designed for this audience.

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This paper addresses exactly this point. To facilitate access to technology and, consequently, encourage connections between generations, we came up with a system that combines voice assistants and notifications displayed on the television. The goal is to encourage elderly people to use voice commands to access the internet in a simpler way, send messages, make calls, among other tasks commonly performed in the digital environment. The aim is to create a connection between the "digital world" and the "real world," making technology a means to foster relationships. This paper is therefore divided into: related work, which provide examples of how voice assistants promote digital inclusion and socialization; description of the prototype; field tests; results and discussion; and finally, conclusions. It is important to mention here that, based on the experience during the preparation of this work, it became clear that elderly people seek to stay updated. They enjoy and feel included when they are able to perform some activity online, for instance. However, everything happens at a different pace, which we need to respect. It is necessary to work with this audience with love and patience, according to each person's timing. This is how everything works out.

2 RELATED WORK

Voice assistants, such as Alexa, have gained attention as tools that simplify interactions with technology and help reduce social isolation (Yan et al., 2024). Yan et al. (2024) found that among 15 seniors over 75 years old, regular engagement with Alexa provided a sense of companionship. A systematic review by Upadhyay et al. (2023) across 16 studies confirmed that many older adults perceive voice assistants as "good company." Camargo et al. (2024) surveyed 110 seniors and noted that most valued voice technology for enabling effortless communication with family and friends.

Kim & Choudhury (2021) conducted a 16-week study with 12 seniors over 65, revealing three key findings: voice assistants reduced loneliness, increased confidence in using technology, and encouraged engagement due to ease of use. However, the study also highlighted limitations, particularly the need for more natural interactions to sustain engagement. To address this, Alessa & Al-Khalifa (2023) developed a ChatGPT-based voice assistant, which showed promise in generating relevant responses for elderly users.

In addition to social benefits, voice assistants may also support healthcare. Nallam et al. (2020) found that seniors recognized advantages in using AI-based voice systems for health-related tasks.

These studies suggest that voice commands play a key role in empowering older adults by reducing digital anxiety and enhancing communication. To explore this further, an in-depth study was conducted with 12 participants aged 60 to 89 in their homes, evaluating their interactions with Alexa and its potential to improve socialization.

3 HUGTV PROTOTYPE

The development of the HUGTV – **H**elping **U**nite **G**enerations through **TV** – prototype was divided into different stages. It was a fully iterative and participatory process, as we aimed to develop a solution based on the needs of older adults, our target audience. We therefore started with a literature review and conducted a focus group to assess the perceptions of elderly people regarding the topic (TV notifications + voice assistants) (Camargo et al., 2022). In parallel, we conducted interviews with 110 older adults to dive even deeper into this universe. (Camargo et al., 2024). Thus, we had consistent inputs to design a functional prototype, consisting of:

- A platform that sends notifications to the television, developed in partnership with a Portuguese IPTV provider (MEO [2]) (Camargo et al., 2023) (Velhinho et al., 2022);
- A virtual assistant, specifically Alexa (Camargo et al., 2024).

This combination was tested for 90 days by a 82-year-old beta tester and a gerontologist (Camargo et al, 2024). In subsequent interviews, they made a series of suggestions focused on improving the solution and the testing procedure. Some examples include: simplifying the project's explanatory leaflet, reducing the number of daily notifications to avoid causing anxiety, and including a virtual assistant with a simpler name (in this case, Alexa), among others. After making the adjustments suggested by both, we proceeded with refining the prototype and then with field tests, the results of which are described below.

The prototype's operation, therefore, consists of sending notifications to the television suggesting specific actions, such as "**Ana, if you miss your**

[2] https://www.meo.pt.

granddaughter, say Alexa, call Mary"; "**Today is Mary's birthday! Ask Alexa to send a message**." The elderly person can then perform the action via the voice assistant, thereby promoting the desire to socialize (**Figure 1**).

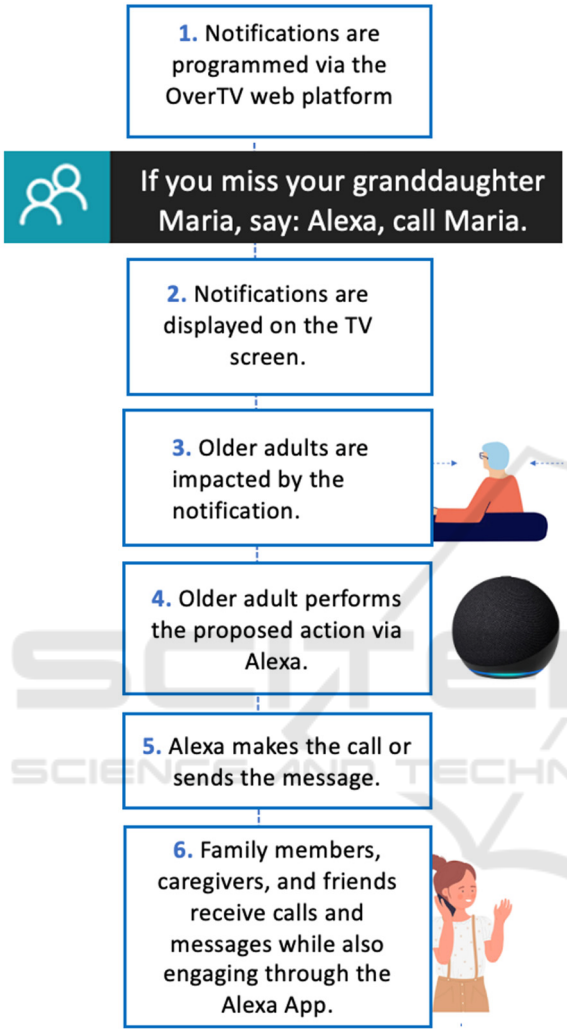

Figure 1: HUGTV Prototype Functionality

3.1 Field Tests: What an Experience!

The tests took place in the participants' homes over a total of 60 days. The sample selection occurred in two ways: the Laboratório do Envelhecimento (Aging Laboratory), an institution maintained by the Municipality of Ílhavo, referred us to some individuals who frequent the space and fit the desired profile. We also used the convenience sampling method. For the tests, an explanatory material was provided to each one, with instructions on how to carry out tasks with the virtual assistant. We introduced Alexa to each of the participants and gave

Figure 2: Participants in the field tests.

a brief demonstration of the notifications on the television (subsequently, daily notifications were programmed, suggesting sending messages, making calls, and birthday reminders). Regarding Alexa, the elderly participants performed some proposed tasks as a test so they could familiarize themselves with the solution before the responsible team left their homes.

We also provided a contact number so that participants could call and send messages whenever necessary – this support was essential to clarify doubts, preventing dropouts during the field tests. During this period, we also maintained frequent contact with the elderly via Alexa, sending messages and making weekly calls to understand how the experience was going. The goal was to encourage the use of the assistant, helping the participants build more confidence in using the technology. "*This direct contact was crucial for solving problems. I don't think I would have been able to move forward on my own, especially in the beginning*", said one of the participants. "*The booklet with the functionality explanations helped me understand better what the assistant was. It was very important*" said another participant in the project.

Each participant was also provided with a printed logbook (**Figure 3**), where they were encouraged to complete at least one daily task and document their

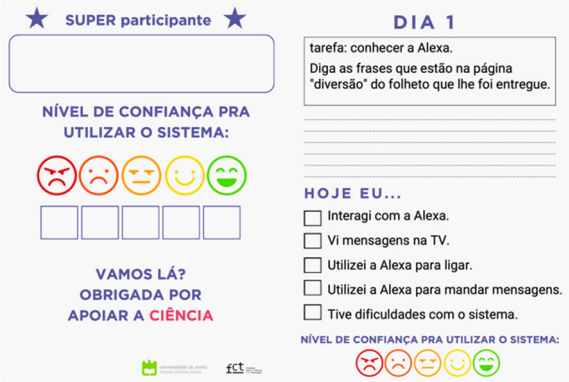

Figure 3: Logbook provided to participants so they could record their activities during the tests.

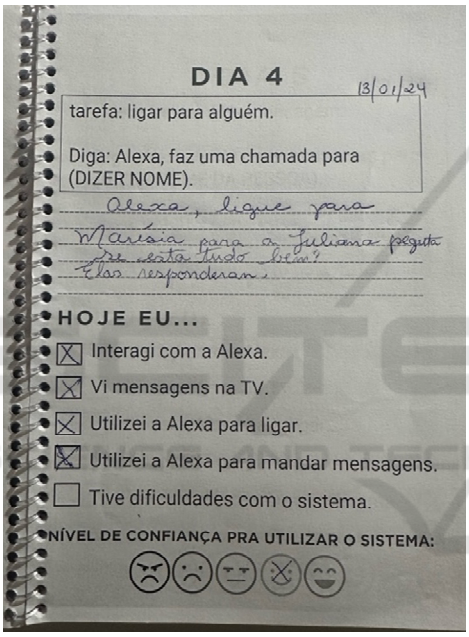

Figure 4: Example of a logbook filled out by one of the participants.

thoughts on the experience. Additionally, a characterization questionnaire was administered to gather information on their social profiles and digital habits.

To assess their perception of loneliness, the UCLA scale was applied at the beginning of the study (Pocinho et al., 2010) . The same scale was used again at the end of the tests, allowing for a comparative analysis to determine whether there were any changes in loneliness indicators.

3.2 Sample

A total of twelve older adults, aged between 60 and 89 years (with an average age of 74), participated in the initial tests. Among them, four reported living alone, while eight live with their partners. In terms of education, one participant indicated having a "basic education," seven had completed "secondary education," and four held a "higher education" degree.

Regarding technology usage, all participants reported using both "mobile phones" and "television." Additionally, eight stated they use "computers," six mentioned using "smartwatches," and five reported using "tablets." Despite this, all twelve participants admitted facing difficulties with these devices and typically rely on family members for assistance. When asked if they miss talking to their loved ones, seven responded "yes," while five said "no."

4 RESULTS AND DISCUSSION

In total, the 12 participants interacted 4,016 times with the Alexa assistant (we analyzed the interactions according to the rules established by the General Data Protection Regulation – GDPR). The interactions were divided into 19 categories: "messages," "checking new messages," "phone calls," "music," "internet search," "daily conversations with Alexa," "news," "reminder scheduling," "calendar," "birthday," "integration with other devices," "timer," "alarm," "tell a joke," "tell a story," "prayers," "shopping list," "traffic," and "radio."

Among them, we identified that 12 are related to promoting socialization, which can occur in two ways:

- Directly with another person, such as sending messages and making phone calls;
- Indirectly, through activities that may later encourage a conversation or exchange with someone, such as staying informed to discuss the day's news, for example.

Therefore, we chose to classify the categories into “direct socialization” and “indirect socialization,” as described in Table 1.

In total, there was an average of 5.57 daily interactions per participant, a higher volume than what was suggested in the diary we provided to the elderly (which recommended just one interaction per day).

In the ranking of the most used features, if we sum up the categories related to messages (sending + checking new ones), we can say that communicating with others—whether by voice or text—was the most used feature during the testing period. In total, the elderly participants sent 675 messages and checked

Table 1: Classification of categories related to socialization.

Type of Socialization	Categories
Direct Socialization (promotes direct interactions with other people)	Sending messages
	Checking new messages
	Calls
	Birthdays
Indirect Socialization (provides resources for older adults to engage in conversations on different topics or enables a close, friendly interaction with Alexa)	Internet searches
	News
	Daily conversations with Alexa
	Tell a joke
	Tell a story
	Weather forecast

for new ones 598 times. This means that participants either sent or checked their messages at least once a day—the average number of daily interactions in this category was 1.76. This indicator allows us to understand that there was an interest in socializing through a digital platform. "*I didn't use to send messages because I found it too complicated. I couldn't type. But now I can. I just have to speak*", said one of the participants. Another elderly person emphasized, "*I avoided sending messages because I couldn't see well. This way, I found it much simpler.*"

In fact, this was a general perception among the participants: being able to send messages just by "speaking," without the need to type, was considered an extremely positive and facilitating feature.

In second place on the list of interactions is the category "daily conversations with Alexa." In total, the elderly participants spoke with the assistant 730 times during the tests, an average of 0.60 times per day. It is noticeable that all of them were extremely polite and affectionate with the assistant, showing they appreciated its company. Some examples of phrases that justify this perception include: "*Are you okay*?"; "*I missed you today*"; "*Do you want to have lunch*?"; "*You're so quiet today*"; "*I had a dream, and I want to tell you about it!*"; "*I'm happy to know you're my friend*."

This type of interaction led participants to say in interviews after the tests that they felt "less lonely" because they had Alexa available for conversations. "*The house feels fuller. We gain more quality of life*", said one of the participants. "*I go out, and when I come back, I say good afternoon to Alexa, and she responds. I don't feel so lonely anymore*" said another participant.

These comments exemplify a common feeling among the 12 participants, a strong indicator that virtual assistants can contribute significantly to reducing the feeling of loneliness.

Following that, "music" requests accounted for 660 interactions, followed by "internet searches" with 330 interactions.

The fact that they are able to search for the data/information they want in the digital environment more easily can contribute indirectly to socialization, as the elderly can gain quicker and easier access to news and topics they enjoy. Then, they will have resources to start conversations or participate in discussions, showing that they are up to date.

Returning to the list of interactions, the following categories are next: checking the weather forecast, with 256 interactions; integration with other devices (e.g., lights and gates) with 226 interactions; and phone calls with 199 interactions. A complete breakdown of all 19 categories and their respective interaction volumes can be found in **Table 2**. The categories related to socialization are highlighted in orange, showing that Alexa was frequently used for this purpose.

Table 2: Ranking of interactions.

Categories		Interactions	Notifications - TV
1.	Messages	675	X
2.	Check for new messages	598	X
3.	Everyday conversations with Alexa	730	
4.	Music	660	
5.	Internet searches	310	
6.	Weather forecast	256	
7.	Other gadgets	226	
8.	Calls	199	X
9.	News	118	
10.	Reminders	78	
11.	Tell a joke	40	
12.	Birthdays	21	X
13.	Prayers	21	
14.	Radio	21	
15.	Tell a story	17	
16.	Shopping list	11	
17.	Alarm	11	
18.	Schedule	10	
19.	Traffic	9	
20.	Timer	5	

Among the ten categories with the highest number of interactions, seven are classified as "socialization-promoting." Three of these facilitate direct contact (checking messages, sending messages, and making calls), while four promote socialization indirectly (conversations with Alexa, internet searches, weather forecasts, and news). This distribution reinforces the potential of voice assistants in bridging the real and digital worlds, bringing people from different generations closer together.

Regarding TV notifications, as shown in **Table 2**, daily messages were sent suggesting checking and sending messages, making phone calls, and birthday reminders. After the tests, we asked all participants whether these messages encouraged them to perform the suggested activities. Ten individuals responded "yes," while two said "no." For most, the notifications served as a reminder to interact with their families. Those who disliked the idea mentioned that such messages disrupted their TV viewing experience and that Alexa alone was enough to encourage them to reach out to their loved ones.

As for the participants' feelings of loneliness, as previously mentioned, we applied the UCLA Loneliness Scale (**Table 3**) before and after the tests (properly validated for the Portuguese language) (Pocinho et al., 2010).

Table 3: Before and after the tests, according to the UCLA scale.

P	Age	Before tests	After tests	Live alone
1	77	30	21	No
2	77	30	23	Yes
3	75	25	23	No
4	78	22	17	No
5	82	19	23	No
6	70	35	30	Yes
7	89	33	26	Yes
8	68	30	29	No
9	70	26	27	No
10	71	39	32	No
11	73	40	28	Yes
12	60	25	20	No

This allowed us to compare participants' perceptions, revealing changes in scores for all individuals. For 10 participants, feelings of loneliness decreased. However, for 2 individuals, loneliness increased – one faced a severe illness during the testing period, and the other had the lowest interaction rate with Alexa over the 60 days. These circumstances may have influenced their perception of loneliness.

It is important to note that lower scores indicate lower levels of loneliness. Therefore, the reductions suggest that most older adults felt less lonely after the testing period. Notably, the greatest reduction (-12 points) was observed in a participant who lives alone. In fact, all participants who live alone experienced a decline in feelings of loneliness. The reasons? They socialized more with family and friends, felt better informed, and had Alexa as a companion. We explored this in follow-up interviews, and these were the most frequently mentioned responses, reinforcing the idea that Alexa can be a valuable companion for individuals living alone.

Another significant finding from the interviews is that all 12 participants reported trying at least one new activity for the first time—whether searching for information online, checking the weather forecast, or sending a message to a loved one.

- "*It was very interesting to check the weather whenever I wanted. I'd ask if it was going to rain, and Alexa would promptly respond. Based on the answer, I'd decide whether to take an umbrella. I didn't know this was possible"*;
- "*Alexa gives me the answers I need, and I had never seen anything like it before. It's a big innovation for me to interact just by speaking. I really liked it—it's much easier*";
- "*I had never set reminders on my phone or electronic calendars. With Alexa, I managed to do it and found it very useful";*
- "*Alexa told me stories. I never imagined that would be possible";*
- "*I couldn't send messages because I found it too complicated. But I started doing it after using Alexa. It was really interesting*".

Overall, all participants reported feeling confident in exploring the technology, making requests beyond what was suggested – without fear of making mistakes. "I'm not afraid of making mistakes because with Alexa, it's much easier to start over. You just ask, no need to press buttons"; "Understanding how it works was very simple. You just ask for things. I never felt anxious or intimidated". Such testimonies support the hypothesis that voice interactions help reduce feelings of fear and anxiety, which are common when older adults encounter new technologies.

5 CONCLUSIONS

This study demonstrates that voice assistants, when integrated with television notifications, can play a significant role in fostering socialization among older adults. By providing an intuitive and accessible means of communication, voice assistants reduce digital exclusion and encourage intergenerational connections. The findings from the HUGTV project highlight the potential of voice technology to bridge the real and digital worlds, enhancing both direct and indirect social interactions. This research underscores the increasing importance of technology in addressing the challenges of aging, particularly in a world where digital solutions are rapidly evolving.

The quantitative data collected throughout the field tests indicate a substantial engagement of older adults with voice commands. The high frequency of interactions, particularly those related to messaging, phone calls, and daily conversations with the assistant, reinforces the idea that voice technology can act as a social facilitator. These results suggest that older adults, when provided with accessible and user-friendly technology, are not only willing to adopt it but also integrate it into their daily routines. The ability to send and receive messages, make phone calls, and interact with an AI-driven assistant provides users with a newfound sense of autonomy and connection to the outside world. A deeper analysis of interaction patterns reveals that participants frequently engaged with the assistant during moments of solitude, particularly in the evenings. Many users treated the voice assistant as a conversational partner, engaging in casual dialogue or seeking information. This phenomenon suggests that voice assistants, beyond their practical functions, may also serve as companions for older adults, mitigating feelings of loneliness and fostering a sense of presence in the home environment.

Furthermore, the results of the UCLA Loneliness Scale suggest a general decrease in perceived loneliness among participants, with the most significant improvements observed among those living alone. These findings reinforce the growing body of evidence that suggests voice assistants can serve as tools for emotional well-being, offering companionship and facilitating social interactions. The ability to communicate easily, receive reminders, and stay informed through television-based notifications contributes to a greater sense of inclusion in daily life. In addition to the benefits of social engagement, the study highlights the role of voice assistants in maintaining cognitive stimulation. By engaging in frequent voice interactions, older adults practice memory recall, verbal articulation, and auditory comprehension—skills that are crucial for cognitive health. Some participants also demonstrated increased confidence in using digital technology, indicating that voice-based interactions could serve as a gateway to further technological adoption.

While the benefits of voice assistants for older adults are evident, the study also highlights challenges, such as the need for continuous support and user adaptation to voice-based interactions. Not all participants were immediately comfortable using voice commands, and some required assistance in the initial phases of adoption. Issues related to voice recognition accuracy, particularly among individuals with speech impairments or strong regional accents, also emerged as areas for potential improvement. Another key challenge is the digital literacy gap among older adults. While some participants adapted quickly, others required repeated guidance before they could fully utilize the voice assistant's capabilities. This suggests that future implementations should include comprehensive onboarding sessions, personalized training, and ongoing technical support to maximize adoption and usability.

Future research should explore long-term effects, scalability, and potential improvements in natural language processing to enhance user experience. Expanding the study to include a more diverse demographic sample—considering variables such as education level, prior technology exposure, and cultural differences—will help refine strategies for improving accessibility. Additionally, integrating voice assistants with other smart home technologies, such as automated lighting, security systems, or health monitoring devices, could further enhance their utility and impact on independent living. Additional tests have been conducted with eight more participants, expanding the total sample to twenty individuals. The results from these extended trials will be analyzed and presented in future publications. Further research should also consider different demographic groups, varied interaction settings, and the integration of emerging voice technologies to refine the effectiveness of digital socialization strategies for older adults.

Overall, the integration of voice assistants with television-based notifications presents a promising approach to digital inclusion and socialization for older adults. By leveraging familiar and accessible technology, this solution empowers seniors to maintain meaningful connections, stay informed, and experience a greater sense of companionship,

ultimately contributing to their overall well-being. The findings of this study highlight the need for continued innovation in assistive technologies, ensuring that aging populations can benefit from the rapidly advancing digital landscape. With ongoing improvements and expanded applications, voice assistants may soon become indispensable tools in promoting social connectivity, independence, and enhanced quality of life for older adults worldwide.

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