

Older Adults Say Yes to Technology: How Digital Empowerment of this Audience Helps Reduce Loneliness

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Abstract: The HUGTV system (Helping Unite Generations through Television) was designed to help older adults stay connected with their families by combining TV notifications with voice commands, making communication easier and more accessible. To understand their perceptions of both technologies, 110 interviews were conducted between April 2022 and November 2023, with participants aged between 60 and 91. The results indicate that 84.5% of participants watch television on a daily basis, with 70% of the total considering it a companion.. The study also revealed that the proposed system was generally well received by this audience, especially the functionality of viewing photos and videos of family members on TV. The television proved to be a familiar and comfortable device for older adults, which reduces the levels of fear and anxiety related to new technologies and resources. Voice interaction, for example, were significantly accepted, especially among individuals with visual and motor limitations. The study concludes that older adults recognize the value of technology for communication and information, and TV, being a familiar device, offers a promising path for digital inclusion and the reduction of loneliness.

1 INTRODUCTION

“I’m too old to learn”; “Nobody has the patience to teach me”; “I don’t need to learn anything at this age”; “I’m not capable of learning anything anymore”. These phrases were uttered by older adults who had recently tried to learn something new (and shared with us during a series of interviews we did for this study). In general, they said that they face problems when they seeking knowledge, especially in technology. One of the main ones is ageism. *“Many people think I don’t want or know how to learn new things, but that’s not true. I say yes to technology. I want to use the same resources you use. I just need to be taught”*, said a 91-year-old participant.

Marques et al. (2020) define “ageism” as a widespread problem that significantly affects the well-being of older people. They identified that this phenomenon directly influences the social participation of seniors, both positively and negatively. While some feel more motivated to show

that they can carry out the proposed activities, others may close themselves off in isolation.

In the field of health, Martínez-Angulo et al. (2023) point out that ageism, especially when manifested by professionals in the field, motivates a negative self-perception related to the ageing process. Consequently, it can cause an imbalance in relationships and damage the dignity of older people.

On the other hand, the digital empowerment of older adults has proved to be a valuable way for tackling ageism (Chu et al., 2022) (Mannheim & Köttl, 2024). Since technology is the basis for carrying out many activities of daily life, it is essential to guarantee access and the necessary skills for older people to be able to use it. The United Nations (UN) even considers digital literacy to be an effective way of reducing the social isolation of older people (United Nations, 2023). Individuals with higher levels of digital literacy participate more in social activities, as they are able to access online resources, support networks and opportunities for community

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engagement, which are key characteristics for active ageing (Park & Chang, 2024).

This study was designed precisely in this context and seeks to identify the relevance of a system that stimulates and facilitates social interactions in the digital environment. This system is based on a proactive assistant integrated into the television that sends notifications suggesting social contacts.

In order to identify the perception of this audience, we asked 110 elderly people what they thought of the technologies that make up the system and whether they would be interested in using them on a daily basis. The results show that there is a great deal of openness among this audience. We have therefore organized this paper so that you can understand, firstly, the development stages of the study. Next, we detail the semi-structured interview phase, in which we spoke to 110 individuals aged between 60 and 91. Finally, there is a discussion of the results, conclusions and plans for future work.

2 HUGTV: THE PROPOSED SYSTEM

The HUGTV system - Helping Unite Generations through Television - consists of an application that sends notifications to the television and an integrated voice assistant, Alexa. To identify the combination of technologies most suitable and comfortable for older adults, we sought to understand their perceptions on the subject.

Initially, we conducted 20 semi-structured interviews and a focus group to identify the preferences and perceptions of this audience (the results of which are available at: Camargo et al., 2022).

We then developed a web application (named OverTV) that sends the notifications to the TV (a description of the entire development process is

available at: Encarnação et al., 2023) and we carried out field tests with 12 individuals aged between 58 and 85 years old for 44 days (results in: Camargo et al., 2023). The operation and composition of the prototype proposed from this study is described in figure 1.

At the same time, to gain a deeper understanding of seniors' perceptions on the subject, we decided to increase the number of interviews. As previously mentioned, we conducted 20 initially, followed by 90 more, bringing the total to 110 interviews. The results are detailed below.

2.1 Procedure for Interviews with the Target Audience

The initial literature review of this study contributed to the creation of a questionnaire, which was then applied to 110 elderly people between April 2022 and November 2023. The sample was chosen for convenience, through referrals from acquaintances and with the support of two Portuguese senior universities (Universidade Senior de Cacia and Laboratório do Envelhecimento de Ílhavo). The interviews had four specific objectives:

- i) Characterize the audience;
- ii) Identify the relationship between older adults and technology, especially how they use it to access information and contact family members;
- iii) Understand TV consumption habits;
- iv) Identify the perception of this audience in relation to the use of notifications in the television ecosystem.

The questionnaire had 30 fixed questions, divided into four sections, according to the objectives mentioned here. Additional questions were asked as participants mentioned their experiences with electronic devices and other related issues.

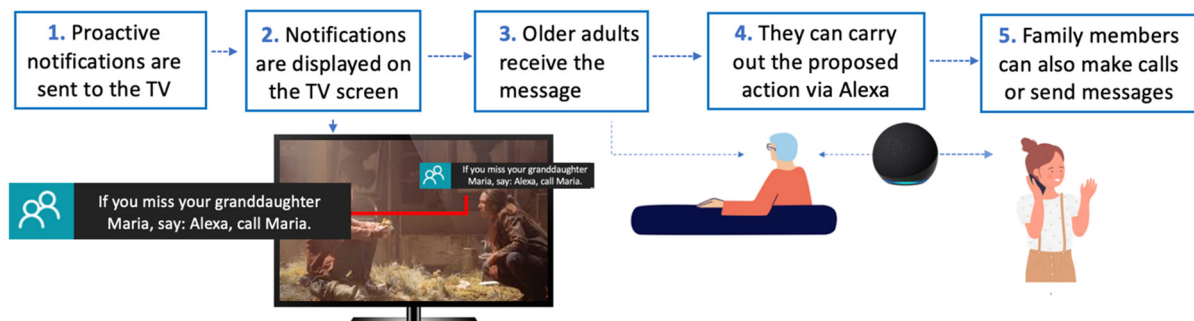


Figure 1: Communication flow of the HUGTV prototype.

The interviews were hybrid (face-to-face, by telephone or videoconference) and lasted an average of 40 minutes.

2.1.1 Sample Characterization

110 people aged between 60 and 91 took part in the study, with an average age of 68. The majority (41.8% - 46 participants) were aged between 66 and 71. In terms of gender, 50.9% (56 people) identified themselves as female and 49.1% (54 people) as male. In terms of nationality, 60% are Portuguese (66 people) and 40% Brazilian (44 people).



Figure 2: Interview sessions with participants.

With regard to households, 77.3% (85 people) live with someone and 22.7% (25 people) live alone. About physical limitations, 65% (71 people) said they had no difficulties whatsoever, 25% (28 people) said they had visual difficulties, 5% (5 people) hearing difficulties and 5% (6 people) motor difficulties.

On the use of technological resources in everyday life, all the participants said that they use at least one technological device. The television is used by 100% (110 people), followed by the cell phone with 99.1% (109 people). Other devices used by this audience are: computer (69.1% - 76 people), Smart TV (52.7% - 58 people), personal assistants (23.6% - 26 people), tablets (20% - 22 people) and smart watches (15.5% - 17 people).

Regarding social networks (Facebook and Instagram), 73.6% (81 people) have a profile on at least one of them, while 26.4% (29 people) don't use these platforms. To obtain information, 81.8% (90 people) use television, 70% (77 people) use cell phones, and 46.4% (51 people) prefer newspapers and magazines.

Regarding the way they communicate, it should be noted that most of the elderly people consulted prefer text messages to phone calls to communicate with family and friends - 84.5% of the participants said they commonly use text messages. Other means used by those interviewed are audio calls on a cell phone (79.1%), audio messages (73.6%), video calls (70.9%) and landline calls (27.3%) (**figure 3**).

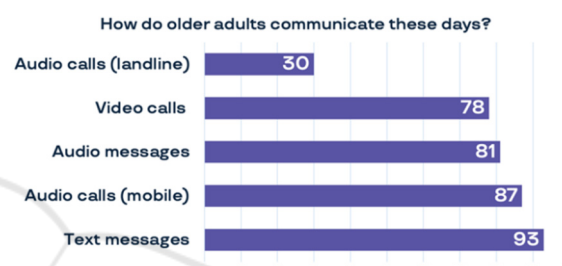


Figure 3: Resources that older adults use to communicate.

Preferences vary by age: people aged 60 to 71, for example, prefer text messages, while those aged 72 to 77 prefer audio calls on their cell phones. Specifically with regard to cell phones, used by a large part of the sample, 71.8% (79 people) said they had no difficulties making calls or sending messages. On the other hand, 20.9% (23) said that they sometimes face difficulties, and 7.3% (8) reported frequent setbacks. These two groups usually ask for help from close family members, especially children and grandchildren, when they don't know how to use or solve a problem with the device.

Cross-referencing the variables shows that difficulties are greater among older participants (**figure 4**). As age increases, the volume of responses "I have no difficulties making calls and sending messages" drops.

Difficulties sending messages by cell phone * Age Crosstabulation								
Statistics% of Total		Age						Total
		60-65 years	66-71 years	72-77 years	78-83 years	84-89 years	90-95 years	
Difficulties sending messages by cell phone	No	26.4%	35.5%	7.3%	2.7%			71.8%
	Yes	2.7%	0.9%	1.8%	0.9%		0.9%	7.3%
	Sometimes	3.6%	5.5%	7.3%	2.7%	1.8%		20.9%
Total		32.7%	41.8%	16.4%	6.4%	1.8%	0.9%	100.0%

Figure 4: Difficulties sending messages by cell phone (by age).

3 RESULTS AND DISCUSSION

After characterizing the audience and identifying their habits with regard to the use of technology, we moved on to the third phase of the questionnaire: identifying how this audience relates to television, one of the central elements of this study.

We therefore asked older adults if they watch television every day: 84.5% of the participants (93 people) watch TV every day, while 15.5% (17) don't have this daily habit, but watch it frequently. On average, the individuals consulted spend 3.9 hours a day watching TV. The most watched content is: news (88 people mentioned this type of content), films (66 people), series and documentaries (63), sport (46), soap operas (34), entertainment programs (27) and religious content (20). Films, series and documentaries are generally watched on streaming services such as Netflix, showing that TV consumption is changing among older adults, especially for those who are tech-savvy or have family support.

Regarding TV as a possible companion, 41.8% (46 individuals) corroborated it, saying that “yes, it is a companion”, 30% (33) that “it is not a companion”, and 28.2% (31) said that it is “at some times of the day”. Adding together those who consider it a companion, either always or at certain times, 70% believe that the device helps in some way to reduce loneliness. In this context, it was possible to identify that the older participants in the sample (87, 88 and 91 years old – represented in **table 1**) have a greater emotional attachment to the TV, especially because they live alone and have less facility with other electronic devices. Some said they “wouldn't know what their lives would be like without the device”.

Younger people (up to 70 years old) perceive TV as “a distraction and source of information”, without as much of an emotional connection.

When analyzing “households”, it was observed that more people who live alone consider TV to be a companion compared to those who live with others. Among the participants who live alone, 68% (17 people) said that television “is a companion”, 20% (5 people) said that “it is not a companion”, and 12% (3 people) mentioned that “it is a companion at certain times of the day”. Among those who live with others, 34% (29 people) consider “television as companion”, 33% (28 people) “don't see it as a companion”, and 33% (28 people) say that “it is a companion at some times of the day”. This last option was chosen by the majority of the group, mainly because those who live with other people usually watch TV to distract themselves when they are alone at home.

Table 1: Older study participants' opinions on television.

P	Age	Comments
66	87	<i>Television is great company. I leave the TV on all day so I can feel that someone is around. I don't know what I'd do without it because I spend a lot of time on my own, especially during the week. It's very good to be able to rely on the TV for entertainment, to stay well informed and to find out about things in general.</i>
70	88	<i>I like to watch a lot of things on TV. I watch a lot of soap operas. I have a habit of leaving the TV on all day because I like having noise in the house.</i>
71	91	<i>TV is great company. I honestly don't know what my life would be without it. I spend a lot of time alone and the programming helps to distract me, to see the day go faster. In fact, without television everything would be boring. I love having it around and I leave it on almost all day.</i>

We also carried out Pearson's correlation test and found that there was no correlation between the indicators “age” and “TV as a companion”. However, there is a positive correlation, albeit weak, between the “type of household” and “TV as a companion” ($r = 0.352^{**}$, $p < 0.05$) (**figure 5**).

Correlations				
		Age	TV as a companion	Family household
Age	Pearson Correlation	1	.072	.352**
	Sig. (2-tailed)		.457	<.001
	N	110	110	110
TV as a companion	Pearson Correlation	.072	1	-.104
	Sig. (2-tailed)	.457		.279
	N	110	110	110
Family household	Pearson Correlation	.352**	-.104	1
	Sig. (2-tailed)	<.001	.279	
	N	110	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 5: Correlation of the indicators: age, family household and tv as a companion.

These data show that the way older adults live (alone or with someone else) influences the type of relationship they have with television.

3.1 Prototype

After understanding the sample's relationship with TV, we moved on to the fourth phase of the questionnaire. The aim was to assess the acceptance of notifications on TV and the possibility of multimodal interaction (namely what they think about using voice commands).

We wanted to find out if participants saw value in this feature and whether they would be interested in using it. To provide context, we showed an explanatory video⁴ – particularly for those with lower digital literacy – depicting a simulated interaction between a grandmother and her granddaughter. We then asked participants to rate the usefulness of a system that sends notifications to the TV, like the one shown in the explanatory video. The answer options we gave them were: “not at all useful”, “not very useful”, “reasonably useful”, “useful” and “very useful”. **Figure 6** shows that opinions are divided. While 26.3% (29 people) find the solution “not at all useful”, 33.5% (37 people) consider it “useful” or “very useful”. **Table 2** shows examples of positive and negative reactions to notifications.

Table 2: Examples of positive and negative comments about notifications

P	Age	Comments
Positive		
2	70	<i>I'd like to use it because it's so easy to interact with.</i>
4	63	<i>It would be great to interact without having to type. I would definitely use it.</i>
71	91	<i>It would be much easier to answer by speaking because the letters are very small and I can't type very well.</i>
70	88	<i>I think it's easier to talk than to type, not least because I often can't see and have to put on glasses to send messages.</i>
17	74	<i>It would save a lot of time.</i>
24	68	<i>I like the idea and I think that maybe TV will become more interactive this way.</i>
20	68	<i>I really like this option for older adults because it's easier and more practical.</i>
73	63	<i>I think this possibility is even cooler. As the years go by, we'll have limitations and anything that simplifies things will be welcome.</i>
40	64	<i>I liked using it for its practicality and “hands-free”.</i>
27	62	<i>Without a doubt, it would be a great convenience.</i>
16	74	<i>It would save a lot more time typing.</i>

Negative		
3	63	<i>I think it would get in the way. Each type of communication has its place and including notifications on television could make everything more confusing.</i>
102	77	<i>It would get in the way especially if the positioning of the message conflicted with the content being displayed on the TV.</i>
45	60	<i>I can lose focus on the content I'm watching.</i>
62	77	<i>There are already suitable tools for sending and receiving notifications. I don't think using the TV for that is a good idea. When I'm in front of the TV, I just want to watch shows, series, and movies.</i>
68	60	<i>I would disable notifications.</i>
96	69	<i>Television is for watching, I don't consider other types of information. I prefer not to have access to it.</i>
18	69	<i>I don't think it's very useful because often the TV is on, but I'm not watching anything. I could miss an important message.</i>

We also ran Pearson's correlation test in this area and the result showed a positive, weak and significant correlation ($r = 0.294^{**}$, $p < 0.05$) between “family household” and “level of perceived usefulness”. This indicates that the perceived usefulness of the mechanism is related to whether the elderly live alone or not.

Therefore, people who live alone see more utility in the notifications shown on TV. We also tested the correlation between the indicators “watches TV every day” and “perceived usefulness of notifications”. We found a positive, weak and significant correlation ($r = 0.195^{*}$, $p < 0.05$). This means that the more people watch TV every day, the greater the usefulness they attribute to the notifications.

Regarding the system's ability to bring older adults closer to their family and friends, opinions were divided: 69.9% (67) said that it “does not” and 39.1% (43) said that it “does”. Pearson's correlation test showed a positive, weak and significant correlation ($r = 0.232^{*}$) between the indicators “family household” and “potential of TV notifications to bring people together”. This indicates that the absence of company is related to the perception that these messages can connect generations.

⁴ Available here: <https://youtu.be/FtrNTbn5dp0>.

PERCEIVED USEFULNESS OF TV NOTIFICATIONS

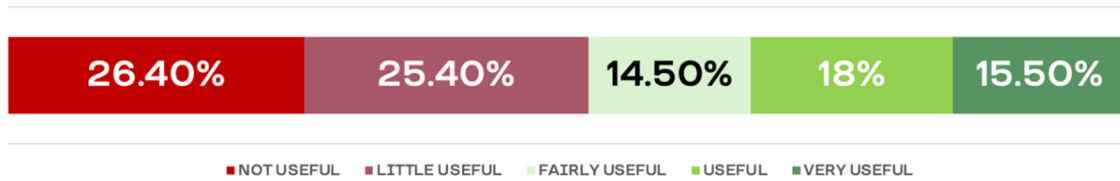


Figure 6: Examples of positive and negative reactions to notifications.

We also sought to understand whether participants would be interested in seeing photos and videos of family members on TV, sent via messages that could be opened whenever they wanted: 73.6% (81) considered the functionality “interesting” and 26.4% (29) “did not consider it interesting”. Pearson's correlation test showed a positive, weak and significant correlation ($r = 0.226^*$, $p < 0.05$) between “family household” and “would like to receive photos and videos on TV”. This indicates that the desire to receive photos and videos on TV is influenced by whether or not they live alone.

Correlations			
		Family Households	I'd like to receive photos/videos on TV
Family Households	Pearson Correlation	1	.226*
	Sig. (2-tailed)		.018
	N	110	110
I'd like to receive photos/videos on TV	Pearson Correlation	.226*	1
	Sig. (2-tailed)	.018	
	N	110	110

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 7: Family households x videos/photos.

At the next point in the interviews, we verbally presented a possible scenario to the participants: the system sends a notification to the TV when the cell phone rings, making it easier to identify phone calls. Opinions were divided on this possibility: 30.9% (34 people) considered the functionality “not at all useful”, 17.30% considered it “not very useful”, 14.50% “reasonably useful”, 21% “useful”, and 16.3% “very useful”.

After the TV notification example, we presented other functionality options for older adults to evaluate the relevance of each one. The features proposed were: “photos and videos of family members”, “ringing cell phone alerts”, “news updates”, “weather forecast”, “medication reminders”, “birthday reminders”, “tasks and activities calendar” and “social media updates”. Each option was explained with practical examples.

The most accepted options were: “photos and videos of family members” (73.6%), “news updates” (60%) and “weather forecast” (42.7%). The least

accepted were: “calendar of tasks and activities” (20.9%) and “social media updates” (30.9%). All the features presented and their respective percentages of acceptance by the participants are specified in **Table 3**.

Table 3: Participants' acceptance of the features presented.

Type of notifications	Would you like to receive it?	
	Yes	No
Photos and videos of family/friends	73.60%	26.40%
Ringling cell phone alerts	38.20%	61.80%
News updates	60%	40%
Weather forecast updates	42.70%	57.30%
Taking medication	40.90%	59.10%
Birthday reminders	39.10%	60.90%
Calendar	20.90%	69.10%
Social media updates	30.90%	69.10%

The results show that there is no consensus on the proposed functionalities, suggesting that a customizable solution would be ideal. In addition, receiving photos and videos from family members, being the most desired option, highlights the TV's potential as an intermediary for social relationships, indicating good acceptance among older adults for social purposes.

Regarding possible difficulties of use, 29.1% (32 people) said they would probably have some initial problem, while 70.9% (78 people) said they would have no difficulties. Those who would have no difficulties justified this by their familiarity with the television, feeling at ease managing the new mechanism. Once again, we applied Pearson's correlation test, this time to identify correlations between the groups who said they would have difficulties with mobile notifications and those who said they would have problems with TV notifications. The result of this test showed a positive, weak and significant correlation ($r = 0.261^{**}$; $p < 0.05$)

between “has difficulties using notifications on cell phone” and “believes they would have difficulties with notifications on TV”. This indicates that those who already have difficulties with notifications on their cell phones tend to have difficulties on TV as well. This finding may provide a rationale for enhancing notification mechanisms through personalization to align with the characteristics of this target audience (Almeida, et. al., 2015). Also in this context, we asked whether the participants would like a tutorial on how to use it. The majority (76.4%) said yes, and 23.6% said no.

In the final part of the questionnaire, we assessed the acceptance of voice commands, since the proposed system has this component. We verbally presented the participants with a sample notification simulating voice interaction. Of the 110 individuals, 87.3% would like to interact by voice, while 12.7% would not. Comments in favor included the ease and speed of interaction, while those against were from people who didn't want to receive messages on TV. Some examples are systematized in **table 4**.

Table 4: Comments on the use of voice commands.

P	Age	Comments
2	70	<i>I'd like to use it because it's so easy to interact with.</i>
4	63	<i>It would be great to interact without having to type. I would definitely use it.</i>
71	91	<i>It would be much easier to answer by speaking because the letters are very small and I can't type very well.</i>
70	88	<i>I think it's easier to talk than to type, not least because I often can't see and have to put on glasses to send messages.</i>
17	74	<i>It would save a lot of time.</i>
24	68	<i>I like the idea and I think that maybe TV will become more interactive this way.</i>
20	68	<i>I really like this option for older adults because it's easier and more practical.</i>
73	63	<i>I think this possibility is even cooler. As the years go by, we'll have limitations and anything that simplifies things will be welcome.</i>

40	64	<i>I liked using it for its practicality and “hands-free”.</i>
27	62	<i>Without a doubt, it would be a great convenience.</i>
16	74	<i>It would save a lot more time typing.</i>

The comments show that voice commands are well accepted by older adults, mainly because of the ease and agility they offer. They are also good options for people with visual and/or motor limitations.

4 CONCLUSIONS AND FUTURE WORK

The digital habits of the older adults interviewed for this study show that there are still difficulties when it comes to using electronic devices, but there is also an understanding of the need - and importance - of these mechanisms for interacting and accessing information. Many of the individuals consulted, however, still give up using some resources due to a lack of instructions, highlighting the need for tutorials and prior training.

The group also demonstrated that television, one of the central elements of this study, is very present in their lives. This is an important indication that a system based on this type of technology could be promising among the elderly. In this respect, it is important to note that older citizens have an emotional connection with the device, while younger people see it more as a source of information. In any case, TV is still central to the lives of those interviewed, even with the increased use of cell phones.

With regard to notifications, the interviewees recognize the usefulness of the mechanism, especially when they see the possibility of using it in the context of television to interact with their family and friends. The type of message most accepted by the interviewees, in general, was the possibility of viewing photos and videos of family members, indicating that TV can mediate relationships and facilitate access to social network content. It is also important to note that viewing content made by family and friends is very well accepted due to the comfort offered by the larger screen.

There was also significant acceptance of the use of voice commands, features classified by seniors as practical and easy to use.

Considering the results presented here, therefore, it is understood that older adults “say yes to

technology”. In other words, they understand that digital resources are important in their routines, especially for contacting family and friends. To avoid problems in terms of difficulties of use, they believe that television is a good way to go, as they already know the device and feel comfortable with it. In this way, they feel more digitally empowered and more willing to talk to people via the internet, a way of reducing the social isolation and loneliness they frequently face.

These interviews were extremely important for structuring and assessing the relevance of the system. HUGTV was then field-tested by 20 individuals and their families for 60 days. The results of these experiments will be published in future papers.

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