Socially Networked or Isolated? Differentiating Older Adults and the Role of Tablets and Television

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Abstract. Population is aging. With it comes social isolation which leads to drastic health degrading situations. Facebook has the potential to assist older adults in maintaining relationships. Still problems like unclear purposes, design complexity and privacy issues have contributed to a lower uptake. We conducted a study to understand how to draw Facebook closer to older adults, investigate the main difficulties and motivations towards its use and adoption, and inquire about the possibilities of using Tablet and Television as alternatives to the traditional PC for accessing this kind of services. Findings show correlations between self-belief in technical skills, motor limitations, and tablet use and the use of Facebook. It also shows that the complexity of Facebook's user interface limits its use by the older adults that use it and works as a barrier for its adoption by the seniors who still don't. We also identified distinct groups and distinct feelings about the use of Television as a vehicle for social interaction. We derived a set of recommendations to consider when designing solutions for tackling social isolation.

Keywords: Facebook · Older adults · Social isolation · Tablet · Television · Questionnaire

1 Introduction

Population all over the world is aging [9]. As people get old, several physical and social problems arise. One of the most concerning issues is social isolation, which typically "kicks in" at retirement age, and leads to drastic health degrading situations [15]. Satisfying social needs through participation in social networks is the only way to fight isolation. These serve a great number of functions, providing social and emotional support, information resources and ties to other people [28]. Social Network Services (SNS) are an on-line equivalent to off-line Social Networks. In the words of Burke, "SNS are designed to connect people with friends, family and other strong ties, as well as to efficiently keep in touch with a larger set of acquaintances and new ties, without having to share the same space" [2]. A growing body of evidence suggests there are many social and cognitive benefits for older adults that make use of these technologies to create content and actively participate in reciprocal information sharing with family and friends [17, 19]. However, although SNSs have the potential to assist older adults in maintaining relationships, uptake by this segment of the population is still low. Much of

the literature overlaps, with several emerging themes such as preconceptions about SNSs [13, 18], design complexity [13, 23], loss of a deeper way of communication [2, 14], and above all privacy [13, 14, 18, 23], being suggested as the main causes for the low participation. Additionally, even SNS developed specifically for older adults have not achieved popularity [4, 29], mainly because younger counterparts - the main reason for the use of SNSs in the first place [4] - are not interested in using these tailored solutions. Additionally, while traditional technology like the PC could compensate some of the age-related changes in older adults' physical, social and cognitive resources, enhancing their quality of life, they in many cases get disinterested and frustrated by too complex technology [21, 26].

Hence, the challenges are not only resolving interface problems related with well-known (and used by everyone) SNS like Facebook, but mostly providing technology that encourages older people to actively engage in technology-mediated communication and to use Facebook [7, 17]. New technologies like Tablet devices or older technology like Television (TV) can be ideal solutions for these goals: TV as a technology present "in every home" could help reduce the gap between old and new technology [17, 24], while Tablet devices built on top of mobile device advantages like simplicity and touch interaction, could help captivate older users [16, 27].

In this paper we begin with a review of the relevant literature that examined older adults' experiences and attitudes towards SNS. We also focus on how both Tablet and Television have been known to play a role in the interaction with this population. We then try to answer the main goal of this research which consists of how to draw older adults closer to Facebook, especially those who still do not make use of it. We designed and applied a questionnaire to be able to infer the current state of use of the most worldwide used SNS by older adults, the main difficulties and motivations towards its use and adoption, and the possibilities of using Tablet and Television as alternatives for accessing this kind of services. As contributions, we present the main findings and provide a discussion regarding not only the role these platforms can play in decreasing social isolation, but also the way older adults' confidence in their own abilities is fundamental in adopting and using new technology and for the purposes of social engagement.

2   Related Work

2.1   Older Adults and Social Network Services

Since 2005 it has been shown that the most obvious motive for older adults to join a SNS like Facebook is the need for integration and social interaction [1, 22]. Because older adults are typically more isolated than younger segments of the population, identifying with others and gaining a sense of belonging is essential for them; as well as finding a basis for social interaction by connecting with family, friends and society, and gaining insight into the circumstances of others. These findings have been supported by both earlier and more recent research: the preference to communicate with relatives involving social activities [25]; the enrollment in offline and online social networks as a way of dealing with the inevitable mental and physical deterioration after retirement [26];

the importance of staying connected with geographically remote grandchildren as a major motivation for the use of technology like SNS [18]; the confirmation that greater SNS use is associated with increased social capital and reduced loneliness [3]; and the association between the use of SNSs and health benefits, like a decrease of loneliness, an increase in social well-being, longevity and both mental and physical health [13].

However, in spite of the mentioned advantages, older adults are still keeping distance from these type of services as they largely overlook their needs in several distinct domains: the difficulty in grasping the purpose of SNSs and the impact of adverse media stories [13], the problems with privacy controls [13, 14, 17, 18, 23], the need for varying degrees of reciprocity and ways of expressing deeper communication [13, 14], the need for better designed grouping functionalities [13], the necessity of focusing interaction around strong-tie relationships (like family members and close friends) [2, 14, 23], interface aspects related with complexity and technical terms and symbols [23] and the need for supporting adaptation or alternative ways of interaction [2, 17].

2.2   Tablet Devices and Older Adults

The use of Tablet devices by being "eyes-free, button-free, and silent" was first seen as a way to facilitate interaction, and increase accessibility for older adults. Especially if the interaction is designed to match patterns and symbols they are familiar with, and their execution is tolerant to motor impairments an older user might display [16, 27]. They also constitute an ideal platform for older adults when dealing with numeric entry tasks, not forcing users to divide their attention between the input device and screen content [5], and they offer high flexibility making it possible to adapt to distinct users' needs and preferences like the ones present in the old aged population [10].

Hence, the design of new ways of interaction based on Tablet devices, can result in valuable contributions for the older segment of the population. More specifically, when working as a bridge for the adoption of Internet-based services like social applications and services capable of tackling social isolation. Examples of these were: Lindley et al. PersonCard concept [19] which allowed for lightweight information to be sent and displayed within an older adult's home using a photo frame enhanced with touch-screen functionalities (much like a Tablet device); Lindley et al. situated messaging device called Wayve [20] which was based on the same principles and made use of a device even similar to a Tablet; the Building Bridges project [11], a 12-inch touch screen device in a custom-made stand (the same principles as a Tablet) and a built-in phone handset, which was built with the goal of providing opportunistic social interaction among old adults who did not know each other before and which resulted in a very simplified use and in new social interactions (even outside the system); the Emnesh [29] which took advantage of the Internet connectivity and iPad features like an in-built camera and a virtual keyboard, for both capturing, exchanging and controlling photographs and messages around the screen and enabled older users to build rapport and find common interests; and Cornejo et al. ambient SNS called Tlatoque [7] based on a multi-touch screen resembling a tablet, which communicated to Facebook to expose photographs in the user's home enabling a more natural interaction with the social information and contributing to enriching in-person encounters.

2.3   Television and Older Adults

Recently, digital TV as a media consumption platform has increasingly turned from a simple receiver and presenter of broadcast signals, to an interactive and personalized media terminal, with access to Internet-based services. TV panels currently on the market offer embedded digital processing platforms (connected TV), which have the potential to turn the TV into an application platform and service terminal. At the same time, it is recognized that older adults still face problems when using this kind of TV-based services mainly because of functional limitations related with age-impairments [19], with typical barriers raised by digital menus and Electronic Program Guides (EPGs) [8], and mainly because of the lack of provision of accessible user interfaces [6].

Still, the development of connected TV and its relation with common Information and Communication Technologies (ICT) applications like social media applications could make a big difference for older adults' living quality and help fight issues related with social isolation. Example of this can be found in work from Karahasanovic et al. who investigated user requirements related to consumption and co-creation of content in new media. They showed that a TV with additional functionality might offer a solution for older adults who are afraid of computers, because it takes less time to turn on and is much simpler to work on [17]. Additional examples can also be found in Meeteetse, a social well-being system based on place attachment which established a connection between homes and a local community and made use of several TV screens [1]; and the Photostroller, a device designed for use by residents of a care home for older people, which showed a continuous slide-show of photographs and made use of a sort-of old Television screen which could move around the house [12].

2.4   Discussion

There is a vast amount of related work concerning Facebook and older adults, and more specifically concerning the issues which make this service less easy to use for this segment of the population. However, limited research has focused in what distinguishes older adults who make use of Facebook from older adults who have not yet adopted it. The understanding of these differences can provide valuable knowledge concerning the motivations to use this SNS. At the same time the understanding of issues which negatively influence both, could help identify more broad design problems which do not consider third-age problems. In this paper we build from previous research and try to understand what those differences are with the goal of finding ways to bring Facebook closer to the older population.

Moreover, the understanding of the benefits that the interaction with Tablet devices can bring to the older population, and the way it has been used for keeping older adults in contact with their family, are good indicators that it can also be useful as a bridge for accessing Facebook. However, no previous work has focused on the validation of that possibility. Additionally, and concerning TV, the expansion of SmartTVs and the opportunities they can provide in terms of getting Internet services - like Facebook - closer to older adults have also not yet been explored in detail. Taking into

consideration the way older adults use TV almost every day, the possibility of using Facebook to keep in contact with family and close friends on a daily basis, represents a valuable opportunity that should be explored. Taking into consideration previous indicators, in this paper we also focus on how older adults would perceive the possibility of using these two alternative ways of interaction for keeping in touch and accessing typical content and features like the ones present in Facebook.

3 Methodology

The main goal behind this work is to find ways on how to draw Facebook closer to the older segment of the population so they can take advantage of its features as a means of fighting social isolation. To be able to do that, we must first understand the relationship between older adults and SNSs, and the technology that might support SNS dissemination. Consequently, the main research question (RQ1) underlying this research will be concerned with what distinguishes Facebook users and non-users (across the older population). We want to check if older adults not using Facebook have the desire to use it, and try to understand the main reasons behind its non-adoption or limited use. We also want to understand the differences between these older adults and the ones which use Facebook, considering their education, gender, age-range, age-related limitations and the way they believe in themselves concerning the use of technology. We want to understand if these factors can influence the adoption and use of a SNS like Facebook. Additionally, we want to consider two more research questions: (RQ2) could TV or (RQ3) Tablet devices be good alternatives for older adults to access Facebook or Facebook related features. To answer these questions we need to characterize both platforms in terms of their current use, and understand if SNSs are one of the reasons for their use, and, if not, if interacting with Facebook could be something that older adults consider when thinking about this platforms.

We considered collecting richer data from interviews or focus groups, or pooling a larger number of sources with user surveys. Even though richer data would be helpful for more in-depth characterization of some of the topics to be addressed, we opted to conduct a larger user survey and leave other instruments to later in the project's lifecycle. For the user survey, we prepared a questionnaire, which we made available online to an international audience, with three translations: English, Portuguese and Spanish. It was announced in several mailing lists, with focus on healthcare and research. The online survey was available for a period of four months. Additionally, the questionnaire was administered in person at three senior institutions (two senior universities and one retirement home).

3.1 Participants

141 participants (64 male, 77 female) answered the questionnaire. 129 questionnaires were answered online, while 12 were answered by administering it in person. All participants were volunteers and more than 55 years old. We did not restrict participants to more than 60 or 65 years of age, as we also wanted to reflect the importance of

individuals which will be considered older adults in the next five years. Age was not asked directly, participants selected the appropriate age range from 6 different categories which spanned from "less than 60" to "more than 80". Table 1 shows how participants spanned over those categories. Anonymity was kept at all times, with each user being identified exclusively by an id number. All data was saved in a secure repository.

Table 1. Participants' age range distribution.

Age categories	Frequency	Percentage
Less than 60	46	32.6
Between 60 and 64	29	20.6
Between 65 and 70	33	23.4
Between 71 and 75	14	9.9
Between 76 and 80	7	5.0
More than 80	12	8.5
Total	141	100.0

3.2   Questionnaire

First, profiling questions concerning age, gender, education, household composition, the way participants see themselves concerning the use of technology, and regarding difficulties and impairments, were asked. Second, participants were asked about Facebook awareness, how frequently they make use of it, or how much times they have tried it. These questions were followed by Likert scale questions where participants had to classify their agreement (on a scale from 1 (strongly disagree) to 5 (strongly agree)) with possible reasons why they use or why they would like to use Facebook. Sentences were related with getting information about what's going on in the world, family and friends, making new friendships, privacy issues, usability and satisfaction.

Questions related with both Television and Tablet were asked next. For the first platform no questions related with awareness or frequency of use were asked, as it was assumed that every user had a television (one user in fact questioned this option, and noticed she neither had nor wanted to have one). Likert scale questions (with the same scale as above) were asked regarding reasons why participants use Television and how easy it is for them to interact with this traditional technology, followed by matters related with their familiarity with smart-TVs or access to Internet through Television, and concerning their willingness to use this platform as a way of accessing Facebook or related social activities and content.

For the Tablet questions, a similar approach to the one followed regarding Facebook was adopted. Some questions related with Tablet awareness and use, and about frequency of use were first asked and used to filter the remainder of the questionnaire. Then, participants answered to a series of Likert scale questions where they were asked to classify their agreement with the reasons why they use or why they would like to use Tablet devices. Finally, multiple choice questions were asked where participants would choose activities and applications they typically perform in Tablet devices.

On a last note, although specific questionnaires for accessing technological expertise and other skills' characterizing instruments already exist we decided against using such instruments due to (1) the increase it would represent in what constitutes already a long questionnaire; (2) most of them being based on self-reported data nonetheless.

4 Findings

4.1 Technologic Expertise and Age Related Limitations

Concerning the use of technology, we inquired users about their self-characterization regarding technical expertise and the technologies widely available in the market. More than half of the participants (58 %) considered themselves as being capable of using typically available technology and only about one fourth considered to have some difficulties interacting with technology.

Concerning the matter of age-related limitations each participant answered from their own perspective selecting the type and severity of impairments they feel to have. About one third considered not having any impairment, while 45 % considered to have only one type, with about 10 % having two types, 9 % having three different types of impairments and a total of 5 participants (3.5 %) having the whole range of hearing, vision, motor and cognitive impairments. Additionally, in terms of severity of the limitations, 53 % of the participants considered to have only minor impairments, leaving only about 14 % considering to have more severe limitations. Lastly, and concerning the type of impairments, the most frequent ones were related with vision, with more than half (51 %) of participants considering to have this kind of difficulties. Additionally, 20 % considered to have hearing difficulties, about 15 % considered to have motor limitations and 15 % considered to have cognitive difficulties as a result of the ageing process.

4.2 Facebook

Regarding Facebook, almost everyone (97 %) is aware of what it is, and about 67 % makes use of it with about 40 % doing it every day (which represents 62 % of the ones which use Facebook). Additionally, only one fifth of the participants never experienced it. Still in terms of Facebook usage, 50 % of in-person respondents were users, while this number grew to 69 % for online respondents. While expectably bigger, it did not cause any significant differences in the findings.

When questioned about the reasons behind the use of this SNS (Table 2), participants gave the most relevance to keeping in contact with family and close friends. This is in-line with related work which focused on the importance of family in the use of Facebook [2, 14, 18, 25]. Additionally, they also give an almost equivalent relevance to keeping in contact with friends. This result contrasts previous findings, where older adults did not attribute this degree of importance to all friends. Moreover, they are more or less neutral regarding the use of Facebook as a means for accessing information about what is going on in the world, and tend to reject the use of Facebook as a

platform for making new friends. This confirms findings from previous studies on the main reasons for older adults to use this type of platform [3, 13, 18, 23].

Table 2. Willingness to use Facebook.

I use Facebook to…	Know what's going on in the world	Know about my relatives and close friends	Know what's going with all my friends	Make new friendships
Mean	2.68	3.56	3.26	1.63
Median	3.00	4.00	3.00	1.00
Mode	1	4	4	1

When posing the same questions to participants who do not use Facebook all possible reasons for using the platform in the future were rejected (averages between 1.96 and 1.82 and modes of 1). This shows that the majority of older adults who do not make use of Facebook do not see any advantage on doing so, which in turn can indicate that the majority of non-users, even if they had heard about Facebook, lack real knowledge about what it can offer. This is also supported by the fact that from the 30 % of participants which are non-users of Facebook, only one third had actually experimented the SNS. Therefore, until older adults become acquainted with the possibilities of Facebook they will most probably reject its utility.

When confronting Facebook users with the problems which contribute the most for its limited use, participants appointed privacy issues (Mean = 3.18, Median = 3.00 and Mode = 5) as the major factor. At the same time, they also rejected not liking Facebook (Mean = 2.23, Median = 2.00 and Mode = 1) or not knowing how to use it (Mean = 1.69, Median = 1.00 and Mode = 1) as reasons for not taking full advantage of it.

In the same way, when asking non-users of Facebook about the same reasons, privacy was even more strongly appointed as the main barrier for making use of it (Mean = 3.73, Median = 4.00 and Mode = 5). However, in the case of these participants, the pre-conceived idea of not liking Facebook is also appointed as having a direct influence in not adopting it as a social tool (Mean = 3.39, Median = 3.00 and Mode = 3). All these results are also in-line with previous related work on these matters, as privacy issues related both with the way privacy settings are designed and the controversial stories about invasion of privacy are known to influence Facebook use and adoption.

Differences Between Facebook Users and Non-users. The understanding of the differences between Facebook users and non-users when considering older adults was one of the major goals of this study. From the findings regarding Facebook use we got some insights regarding the way older adults see this tool and regarding the general problems that lead to its limited use or adoption. However, more insights are needed regarding what makes an older adult, a Facebook user. One of those insights takes into consideration the possible influence of older adults' self-belief in their capabilities on the use of Facebook. We tested for a possible correlation between the way participants classify themselves in terms of technical expertise and the use of the SNS (Table 3).

Performing a Pearson's correlation test we found a negative correlation ($r = -0.243$, $p = 0.004$) between both variables. This means that there is a relation between the way participants believe in their capabilities and the use of Facebook.

Table 3. Facebook use vs. Technical expertise

Technical expertise classification	Facebook non-user	Facebook user
I use any typical technology available nowadays	4	30
I'm comfortable working with some technology	19	30
I have minor issues dealing with technology	6	13
I have some difficulties with technology	14	20
I have a lot of difficulties with technology	4	1
Total	47	94

Because self-belief could be influenced by the limitations that each person has, and because some influences between limitations and the use of Facebook can be expected, we also checked for possible correlations on this. However, no correlation was found regarding the number of limitations a participant reported and the use of technology. No correlations were also found regarding the severity of each ones' limitations and they tend to use Facebook less. This relation between motor limitations and Facebook use can have several interpretations, especially concerning the technology older adults make use to access the SNS.

Taking into consideration the possible influence of education, or the possibility that older adults with more or less studies have distinct probabilities of using Facebook, we also performed a Pearson's correlation test on these variables. However not only no statistical significance was found, but the biggest percentage of Facebook users (78 %) were older adults with the 12th grade (middle of the education scale), while about 65 % of participants with the 9th grade, a graduate degree and a Masters/PhD were Facebook users. Therefore, education seems not to have a relevant role on influencing the use of Facebook.

Considering that past studies showed differences between distinct genders regarding the use of SNS, supporting that female were more predisposed than male for the use of this kind of services, we also checked for possible differences in this study. However, not only we did not find significant differences favoring the female gender but in fact we observed a slight difference favoring man (69 % uses Facebook against 65 % of woman). Still this difference is also non-significant.

Lastly, we also inquired about the possible influence of living alone or accompanied, or how the number of people with who the user lives with influences the use of Facebook (Table 4). Based on the results obtained by cross checking both variables we performed a Pearson's correlation test and found a significant correlation ($r = 0.233$, $p = 0.006$). This shows that the more people a user lives with, higher the probability of using Facebook.

Distinct Groups. During the analysis we found some distinct groups of users which can provide additional findings regarding the differences between users and non-users.

Table 4. Facebook use vs. Number of people the participant lives with.

	Facebook non-user	Facebook user
Alone	14	18
One other	22	35
2 to 3 other	10	25
4 to 5 other	1	13
More than 5	0	3
Total	47	94

First, following previous findings concerning older adults who live alone, we checked for differences between the ones who live alone and do not use Facebook (group 1) and the ones who, in the same conditions use the SNS (group 2): the first difference concerns the use of Tablets with only 15 % of the participants in group 1 using one, while 56 % of the participants in the second group use one; secondly, about 28 % of participants in the first group consider themselves capable of using any typical technology without difficulties, while this percentage raises to 60 % in group 2; thirdly, and concerning age, all participants in the first group are older than 71 years of age, with about 43 % being older than 80. This value decreases significantly in the second group, with only one fourth (26 %) being older than 71 and 2.6 % having more than 80 years of age. These numbers suggest the use of Tablet devices, the way participants consider themselves capable of using technology and age, as factors which can influence the use of Facebook, especially when living alone. If the first factor is for the first time suggested by these findings, the second factor is a confirmation of previous findings of this paper, and the third one shows that, if we consider isolation as a sum of living alone and also not connecting to others using Facebook, the most isolated users are also the most aged ones.

Additionally, when comparing these differences with the differences found between older adults who live accompanied and make use of Facebook and the ones that in the same conditions do not, we find that the use of Tablet is not influenced by being alone or accompanied, while the other two factors are more critical the less company the older adult has. Therefore, the oldest older adults are also the ones who believe less in their capabilities concerning technology and that leads them to not make use of Facebook.

Finally, we checked for differences concerning the reasons appointed for not using Facebook and the way they vary with older adults' self-belief in their technical capabilities. Relevant results were found for two of these reasons: the first regarding "I do not use Facebook because of privacy issues" where the value remained constant regardless of the technical expertise of the participants, which suggests that privacy issues are not related with technical skills and are a transversal problem to the whole older adult population; and secondly the concordance with the sentence "I do not make use of Facebook because I don't know how to use it" increased as older adults consider themselves less technologically skilled. This suggests that Facebook does not look simple enough to be used by anyone, and that the way it is designed leaves less-skilled or less-brave users out, or simply frightens these older adults.

4.3   Television

Concerning the use of television, and when asked about the main reasons that characterize its mainstream use by the older population (Fig. 1), almost everyone agreed on it being easy to use (mean of 4.56), and on the importance of watching their favorite programs and shows (4.14) and getting information about what is going on in the world (4.12). This shows the importance of using TV both as a means of accessing new information and as a vehicle of entertainment. These uses are not well aligned with Facebook's main purposes, which focus on communication with family and friends. In fact, when asked about the possibility of using Television for distinct purposes of the ones they are used to, only about 26 % of the participants showed interest in using it for accessing the Internet or to get information about family and close friends, and a fewer percentage (about 16 %) implicitly showed interest in accessing Facebook. Additionally, and concerning the latter, about 57 % were against it.
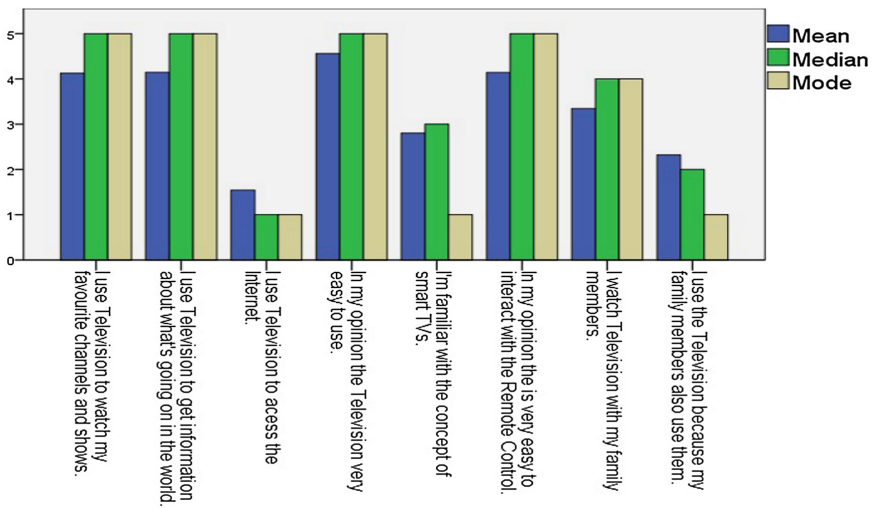

Fig. 1. Reasons behind the use of television (Color figure online).

Although these preliminary findings could be interpreted as an indication that TV may not be an appropriate alternative for reducing the gap between Facebook and older adults, additional findings can somehow rebut this. For example, we have to take into consideration that participants are not familiarized either with the concept of smart-TVs, or accessing the Internet through TV and, as we have seen earlier, it is common that by not having experienced new ways of using the television they refuse using it for anything else than what they are already used to. Additionally, there are also differences regarding the acceptance of these new ways of using TV when comparing Facebook users and non-adopters, with the mode increasing by one value. This also supports the previous argument, showing that the most knowledge older adults have about technology the most receptive they will be about adopting it, or at least, experimenting it.

4.4 Tablet

About 87 % of the participants are aware of what is a Tablet, however only 37 % makes use of one, and a similar percentage (35 %) never tried one. Of the ones who use a Tablet about 67 % uses it every day (which represents one fourth of all participants).

When talking about the reasons behind the use of tablet devices (Fig. 2) the possibility of using it anywhere and the simplicity behind its use were the ones which collected more concordance from the participants. Additionally, also relevant was the fact that the use of certain applications was the third most supported reason (only 25 % of participants disagreed with it) for using a Tablet. Moreover, we looked specifically at the applications users reported to use and verified a close relation with SNSs and Facebook: about 67 % said to use the Tablet to access SNSs, and about three fourths (73 %) said to use Facebook. This is a first indication that suggests a relation between the use of Tablets and access to Facebook. Still, regarding reasons for using the Tablet, sentences related with communication with family and friends tended to be classified as neutral, and participants were also divided concerning the price of the device. All factors related with the use of Tablet devices as a result of influences related with it being talked on the news or used by family and close friends were rejected by the older adults involved in the study.
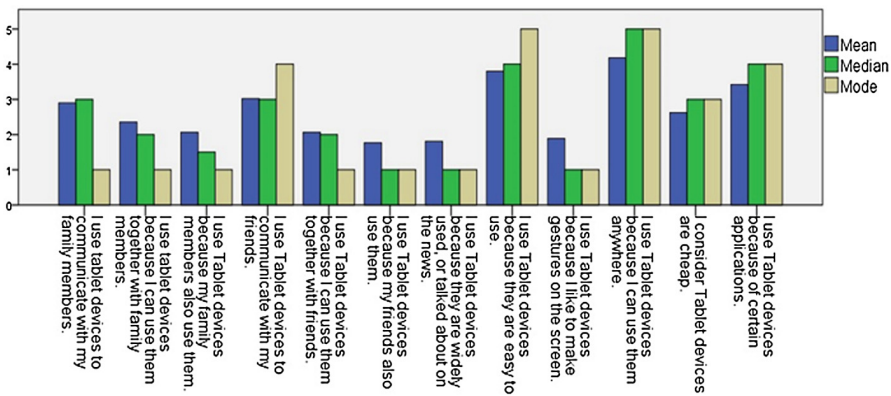

Fig. 2. Reasons behind the use of tablet (Color figure online).

When asking participants who do not make use of Tablets if the same statements would be reasons for wanting to use the device, the same order of preference between statements was verified, however with much lower concordance values. As a result only the possibility of making use of the tablet anywhere was supported by the majority (mean of 3.46 and mode of 5), with easiness of use, and the ability of using certain applications having means a little lower than neutral (2.90 and 2.80 respectively), and with communication with family and friends a bit lower (2.65 and 2.49). Additionally, and just like the ones who already make use of tablets, also the non-users rejected the sentences related with the influence of family and friends on the willingness to use the device.

Taking into consideration participants that make use of Facebook and participants who do not, we found differences regarding the way the first ones see tablet more like a communication device for connecting with family (mean of 3.06 and median of 3 while non-users tend to reject the statement with a mean of 2.33 and a median of 2) and friends (mean of 3.27 and median of 3 while non-users tend to reject the statement with a mean of 2.17 and a median of 2). This could mean that participants that are already familiar with SNS interactions and capabilities see the Tablet as a viable way of mediating those kind of interactions while participants who are not familiar with online social interactions like the ones available through Facebook, do not see that potential in the tablet. This is also in line with other previous findings concerning the use of Television for accessing SNSs or for means of keeping in touch, and the way older adults reject using technology for purposes they are not familiar with.

Considering the previous indications related with the use of Tablet devices for accessing Facebook and having in mind a possible influence of the use of the device and the adoption of the technology, we performed a cross-check analysis between Tablet use and Facebook use. In this analysis although we observed no relation between using a Tablet and being aware of what Facebook is (100 % of users which make use of a Tablet are aware of what Facebook is, while in the case of non-users this percentage is around 95 %) we found that 85 % of Tablet users make use of Facebook, while only 56 % of participants who do not use a Tablet use this SNS. In this case, a Pearson's correlation test found a positive correlation between the use of Tablet devices and Facebook ($r = 0.291$, $p < 0.001$). This suggests that by using Tablet devices participants are closer to using Facebook.

Lastly, and considering the previous findings which showed the existence of a correlation between the severity of motor limitations and the use of Facebook, we also expected to find differences regarding the use of Tablet devices as motor limitations increase in severity. However, in this case, and although differences exist with percentages of tablet users decreasing with the increase in severity, a Pearson correlation test showed no statistical significance.

5   Discussion

The major point of discussion of this paper concerns the understanding of what makes an older adult a Facebook user and the differences when compared with non-users (RQ1). Building from this, it is important to discuss solutions to approximate Facebook to older adults who do not make use of it, so they can take advantage of its features as a means of fighting social isolation.

The first relevant finding showed the **importance of older adults' self-belief, or how by considering themselves capable of interacting with technology or being confident in their technical skills, older adults are more likely to use Facebook**. In this context, and knowing that less skilled users see Facebook as a more complex service (or interface) than users who believe in their technical capabilities, the effort should be on simplifying the user interface or the way older adults have access to it. This is even further supported by the fact that, not only non-adopters, but also Facebook users consider, for example, privacy settings as the major factor for its limited

use, which shows that the way the interface is designed is not even tailored for them. Additionally, it is also necessary to promote this simplicity so that older adults can give the SNS a second chance. Secondly, limitations have shown no influence in the use of Facebook with the exception for the way motor limitations evolve. **Older adults with tremors, trouble moving arms, difficulties grasping a mouse, or positioning and controlling a cursor, tend to use Facebook (or the technology which permits accessing Facebook) less than users with just a small portion of these problems, and much less than users with none**. One possible reason for this, and also slightly indicated by the results, is that older adults with these issues cannot make use of Tablet devices in the same way as older adults with no motor limitations, and consequently they also have less opportunities to use Facebook. Other reason is related with the use of the more traditional ways of accessing Facebook through a computer, where limitations on the use of a mouse results in inability to use the whole service. Concerning these limitations, solutions should focus on making alternative modalities of interaction available, particularly voice, other type of gestures, or a combination of both. Or in providing adaptation mechanisms capable of attenuating the differences. Moreover, the smaller the number of people there is in a household the least probable is for an older adult to use Facebook, i.e., **the more isolated (at least physically) older adults are, the less they use Facebook**. Therefore the way the SNS is currently designed does not seem to target socially isolated users, but the maintenance of existing and technological savvy social ties. As it is, the use of Facebook approximates more to a tool for expressing existing social connections - as valid as a phone call, exchanging messages or even being face to face, than a tool for regaining contact with family members and friends.

Taking all these findings into consideration, the main differences between older adults who use Facebook and older adults who do not make use of Facebook, are mainly related with the number of people they live with, the severity of motor limitations they have and the way they believe in themselves concerning the use of technology.

Additionally, answers to the second (RQ2) and third (RQ3) research questions were also obtained with this questionnaire.

In what concerns TV (RQ2) the fact that it is used by older adults for opposite purposes of Facebook, that is, mainly for entertainment, might discourage its role in targeting social isolation. This might be aggravated by older adults' tendency for, not only rejecting the use of technology they do not know for purposes they know well (like the use of Facebook for keeping in contact with family and friends), but also rejecting the use of technology they know well for purposes they are not familiar with (like the use of Television as a bridge for that Facebook access). However, **for older adults aged more than 80 years old who live alone and are generally not familiar with Facebook in its traditional form, integrating Facebook features in a simplified form on the TV might help**. Additionally, while solutions are not experienced by older adults we cannot know for sure, and with the rise of smart TVs it might be only a matter of time until Facebook reaches the big screen. When this happens, older adults should be considered the main use case for this transition.

Findings showed **benefits on using a Tablet device especially in terms of adoption (high perceptions regarding ease of use) and long-term use**

(higher numbers of Facebook users among Tablet users in single person households, those that are, potentially, more isolated). Therefore, Tablet might in fact facilitate the access to a tool like Facebook, by either being more simple to interact than the original computer or because the mobile interface is more simple than the desktop one, or even by other factors such as the possibility of using it anywhere. Additionally, the use of Tablet devices for activities related with connecting with family and friends also seems even more relevant when older adults already have an idea of what is Facebook. This makes Tablets a good vehicle and a good entrance point for respectively experienced users and non-adopters, of Facebook.

Finally, no relevant differences were found between online respondents and in-person respondents, with exception for a higher percentage of Facebook users on the first group than in the second. Still, and as a major limitation, the results of this study can more confidently be applied for more technology-experienced than less technology-experienced older adults.

5.1   Tackling Isolation Through Design

From the findings obtained through this study we also compiled a list of design directions that should be considered when designing not only for inclusion but more importantly when targeting social isolation, which is critically present in the older segment of the population.

Focus on Functionalities for Keeping in Contact. Issues related with social isolation should be the main target of a SNS like Facebook when considering older adults, especially by providing opportunities and functionalities to keep in contact with family and friends. This is not only supported by previous related work but also appointed in this study as the main reason for using Facebook. Additionally, and contrary to what has been defended in the past, these functionalities should focus not only on family and close friends, but also on other friends specially for the purpose of providing users with more interaction possibilities with already existing contacts and for making possible the revival of old connections.

Simplify Facebook's Interface. Facebook's user interface does not look easy to older adults who "defy" technology fears and make use of it, or to older adults who consider not having the necessary amount of skills to experiment it. Explanations for this can be related with the way the user interface looks non-intuitive, with the way privacy settings are designed, with it having too many features which older adults do not grasp the concept, or with the fact that it is offered to the older segment of the population without considering their different needs and limitations. Facebook's user interface is not an interface that fits all, because it introduces new concepts in a non-intuitive manner which requires learning. This study supports previous findings on this with participants appointing the complexity of Facebook user interface as a reason for not using the application, and supports previous indications that to be used by the majority of the older population, Facebook should be redesigned having simplicity in mind, as this is the only way of supporting learning through experimentation. Reducing the number of functionalities to only the more relevant ones, pushing the most used

functionalities to a simpler and more prominent menu (or to more central areas), increasing the size of menus, and showing less information on each screen, are all examples (showed in previous research) of what could make Facebook simpler.

Tackle Privacy Issues. We have seen once more in this paper that both Facebook users and older adults who still not make use of the tool, have, in privacy issues, the main cause for a limited use of the SNS. Additionally, we have several indications from these findings that these privacy issues are independent of their self-belief in technology. This means that privacy settings are not simple enough for the ones who already use Facebook and frighten the ones who still do not. One possible solution would be to redesign privacy settings to be less open as a default, keeping any post private or open only to a restricted set of contacts (family members or contacts approved manually by the user) as well as making possible for the user to gradually expand these settings (and including more contacts).

Use Adaptation Mechanisms. This study shows that age-related impairments related with motor limitations are not the only factors which lead to differences in the use of Facebook. The differences concerning preferences and habits of the older population - e.g. the self-belief in their technology skills - also play a differentiation role as valid as any other. To get around these differences, both Facebook and the devices through which Facebook is accessed, should offer mechanisms which tailor both presentation and interaction to each user characteristics. And although older adults are the ones in more need of these type of mechanisms, they should support the use of the SNS by both skilled and less-skilled, younger and older, confident and less-confident, and traditional and less-traditional users. Examples of these adaptations (and valid ways of compensating for both limitations and preferences) are features like reducing the sensibility of touch operations for scrolling up and down and zooming in and out, increasing the size of selectable items, or increasing the space between interface items. Additionally, the provision of several modalities of interaction like supporting speech-based interactions instead of touch-based ones, or supporting audio and haptic feedback (or even both at the same time) could also play a decisive role on the adoption of SNSs by older adults.

Use Technologies Closer to the User. Tablet and TV are seen by older adults in a distinct manner. Depending on how isolated and aged the individual is, and how easily he/she deals with technology, one or other have a potential to bridge the gap to Facebook use. Still, the technology should embrace the older adult and not the other way around. Tablet should be the main vehicle for targeting Facebook adoption by the generality of older adults, while TV should work as a secondary vehicle and target adoption by the oldest (and more isolated) older adults. While in the first case (Tablet) the use is already associated with Facebook, in the second case (TV) the solution might be introducing Facebook features without giving the idea that users are using a new service, but rather that they are only expanding the use of a technology they are already familiar with.

6   Conclusion

Facebook has the opportunity of tackling older adults' social isolation. However several difficulties related with the way the service is designed have been presented in recent years which show that this opportunity is not being explored. In this study we inquired older adults about habits and concerns related with the most used SNS, and understood differences between users and non-users of the service. We also explored older adults' receptiveness to the possibility of using alternative technology like Tablets and TV, to facilitate Facebook adoption. Findings showed how believing in their own technical skills, and having different degrees of motor limitations can make a difference, showed differences between older old adults and younger old adults in terms of social context, and evidenced how users which make use of a Tablet are more probable to also make use of Facebook. They also show a strong necessity for simplifying the design of the SNS. Based on the findings we derived a set of recommendations which should be considered when designing solutions to tackle social isolation.

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