Implicit factors related to Greek older adults' perceived usability of online technologies: An exploratory study

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ABSTRACT

Our experiences are neither independent of the tools we use nor of our perceptions. Culture can also affect people's conceptions upon a variety of issues, ranging from feelings of loneliness to technology usability. As for the latter, it seems that Greek older adults make use of web technologies much less than the majority of their peers in Europe. Based on the fact that psychosocial attributes can also affect technology usage, this exploratory quantitative research is an attempt to focus on the implicit factors related to Greek older adults' usability ratings of web technologies. For this aim, a web 2.0 storytelling prototype has been demonstrated to 112 participants and an online questionnaire was applied for data collection. According to findings, older adults' loneliness and future time perspective were associated with system usability, whereas their chronological age did not have any statistically significant relationship with usability. These outcomes, which are extensively discussed, contribute to the limited literature in the field by studying the interactions between older people's psychosocial attributes and their perceived usability of online technologies.

CCS CONCEPTS

• **Human-centered computing → Usability testing**.

KEYWORDS

Older Adults, Loneliness, Future Time Perspective, Chronological Age, Usability

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1 INTRODUCTION

Human actions are mediated by tools, which can be external (e.g. a hammer or a computer) or internal (e.g. concepts and plans) [30]. Nevertheless, the mediating nature of technology bears also drawbacks. Ihde [21] declared that technology usage is not neutral and depicted that for each enhancement the mediating technologies provide, there is also a concealed transformation of users' experience and perceived reality. Likewise, several internal factors can affect the experience, hence influencing the way people value, accept or reject technologies. Moreover, from Plato's cave allegory [18] and Indirect Realism [7], there is a continuous discussion going on about how our conceptions of the world are mediated by perception.

Human-Computer Interaction (HCI) constantly evolves. Starting from the First Wave and the science of cognition, through the Second Wave, and its focus on groups of users, it further advanced during the Third Wave to include issues of culture, emotions, experiences, and meaning-making [3, 4]. During that course, philosophical foundations have also been embedded in technology orientation and design, embracing users' needs for personal development. Existentialism, for instance, based on the axiom that every human is responsible for himself/herself, thus having almost unlimited potentials for self-actualization, has been proposed as a visionary framework for understanding individuals and their relationship with technology [23].

Self-actualization and personal development are also related to one's recollections. Older adults' personal memories help them build a sense of identity and continuity to the self [36]. Due to literature, identity construction and maintenance is further promoted by sharing memories with others, storytellers' narratives can vary across different cultures, and people constantly revise their life stories, which makes identity formation a life-long procedure [28]. Notably, healthy individuals sometimes recollect memories of events that never happened. This malfunction of our memory system perhaps addresses our needs related to the self as well as to our social interactions [31]. From a technological perspective, it has been proposed that memory recording interventions should promote users' creativity and active engagement instead of passively capturing segments of their activities for remembering [37]. Going a step further, digital platforms related to reminiscence and storytelling are apparently beneficial for older adults' well-being (e.g. [20, 29]).

During the last decades, older adults' population increases worldwide. It has been estimated that in 2050, the number of people aged 60 years and older will have doubled compared to the current demographics. At that time, Japan, Spain, Portugal, and Greece will be

the countries with the greatest proportions of older inhabitants [38]. However, digital technology usage by older people still remains low compared to younger generations and, also, Internet adoption by Greek older adults is one of the lowest within the European Union [16]. This digital inequality within society excludes technology non-users from essential resources considering information, communication, and personal growth.

Older adults' choice of not adopting new technologies is not always due to usability issues [25, 40]. During the last years, studies upon older adults and memories (e.g. [1, 27]), loneliness (e.g. [12]), and Socioemotional Selectivity Theory (e.g. [41]) have been common in the HCI field. Hence, in this exploratory study, we try to gain further insights into the implicit factors that might correlate with Greek older adults' usability conceptions of online technologies by focusing on a web 2.0 platform for reminiscing and storytelling.

2 RELATED LITERATURE AND RESEARCH HYPOTHESES

Socioemotional Selectivity Theory is a theoretical framework that provides valuable insights into human motives and preferences [26]. Due to this theory, a person's future time perspective (FTP), denoting the perceived time that has been left in life, has an effect on his/her choices. Individuals who feel that their future is open-ended tend to prioritize knowledge-based activities, whereas when they regard it as limited, they tend to prefer emotionally meaningful interactions. Chen and Chan [10] indicated that psychosocial attributes, such as fear of death or loneliness, may have an intrinsic effect on older adults' motives for technology usage.

Loneliness is an issue that often troubles older populations. It has been generally described as an unpleasant state which is caused by people's asymmetry between their desirable social relationships and the relationships they perceive that they have. Also, there are cultural differences in perceived loneliness among Europeans [15]. Although there are contradictory findings in the literature regarding the effect of loneliness on motivation, it has been argued that loneliness affects the person's will to complete tasks [34]. Furthermore, according to O'Luanaigh et al. [33], loneliness is associated with older people's cognition deficits, considering visual memory and psychomotor processing. As it seems, emotions act as cognitive drivers under the context of initial technology use [9] and perceived loneliness, among other psychosocial and emotional variables, is related to different web 2.0 usage patterns [13].

Chronological age is also related to cognition deficits. Working memory effectiveness and processing speed, among others, are negatively affected by higher age [35]. In addition, there are also visual, hearing, and haptic impairments related to older peoples' physical states and manipulating digital technologies usually depends on users' aforementioned abilities [19]. Additionally, there are different usage patterns of online tool use related to users' age [13, 17]. However, according to the literature, age is not only a construction defined on the basis of time, but also a social construct that reflects the norms, the expectations, and the roles of each individual in the community that he/she lives in [14].

Considering usability, a concept that involves cognitive processes, there is a significant number of methods that have been proposed for its evaluation. A popular tool for collecting users' subjective assessment of product usability is the System Usability Scale (SUS), developed by Brooke [6]. It comprises of ten statements that sum up to a single number that denotes participant's view upon a technology. Nevertheless, culture also affects usability [39] and according to Bangor, Kortum, and Miller [2], there is a variety of factors that could further influence people's usability ratings, such as the type of the interface being evaluated or the age of the users.

Perceived barriers related to usability often impact technology adoption by older adults [13]. Since Greek older adults use the Internet much less compared to the vast majority of their peers in Europe [16], in the current exploratory study we try to focus on three factors (chronological age, loneliness, FTP) that may correlate with Greek older people's perceived usability of online technologies. To the best of our knowledge, there is no similar research in literature. The hypotheses are:

H1. Older adults' chronological age has a negative relationship with perceived usability.

H2. Older adults' loneliness has a negative relationship with perceived usability.

H3. Older adults' future time perspective has a positive relationship with perceived usability.

3 METHODOLOGY

3.1 Sampling and data collection tool

The participants were recruited through snowball sampling. An online questionnaire was designed and distributed for data collection and covered four categories: (a) demographics, (b) usability, (c) loneliness, and (d) future time perspective. The Greek translation of the SUS [24] was implemented for the usability category and the Greek translation of the UCLA Loneliness Scale [22] was embedded for the loneliness category. Regarding the FTP construct, Carstensen and Lang's [8] scale was translated into Greek and further reviewed by three English literature experts for this study. The tool was checked by an academic expert on questionnaire surveys and was pre-tested on five older adults, which were not included in the final sample.

3.2 Procedure

The survey was online for 3 months, starting in April 2019. Each respondent who entered the survey was informed about the project through a written introduction. Then a step-by-step presentation of the platform took place. In every step, the demonstration included texts and static images describing the platform interface, as well as screen recordings of the platform manipulation. The participants could control the presentation by repeating specific parts of it or moving backward or forward until they were completely aware of how to use the platform. At the end of the presentation, they were prompted to answer the questionnaire. Similar methodologies, combining the evaluation of a product using SUS after its demonstration, have been also followed in other studies (e.g. [5, 32]).

Technology should address end-users' needs and, as it seems, sharing online personal memories can be a beneficial and meaningful activity for older adults. Thus, the web technology that was evaluated in the current study is a prototype of a digital storytelling platform that has been previously constructed using participatory

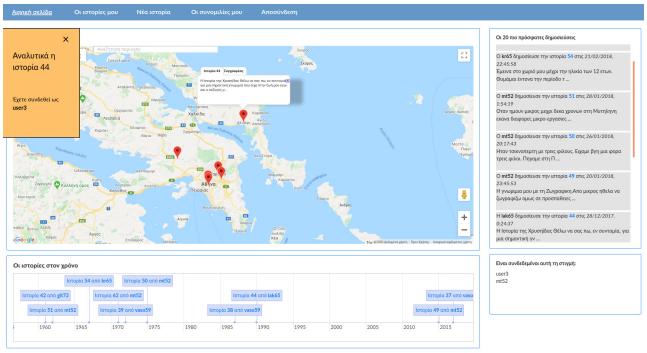

Figure 1: Initial page of the digital storytelling platform.

design methods with five Greek older adults [1]. With this platform, users can write and edit their stories, as well as read and comment on others' narratives (Figure 1).

4 RESULTS

4.1 Descriptive statistics

The final sample comprised of 112 older adults (42% male, 58% female) whose age ranged from 60 to 80 years (mean: 66.96, SD: 4.98). Regarding the highest level of formal education received, data showed that 10 (9%) had rounded Primary Education, 6 (5%) and 15 (13%) had graduated from Lower and Upper Secondary Education respectively, 32 (29%) had a vocational training certificate, and 47 (42%) had at least one University degree. As for the hardware they use to access the Internet, 46 (41%) respondents mentioned the desktop pc, 65 (58%) the laptop, 56 (50%) the tablet, and 89 (79%) the smartphone. Their loneliness scores were between 21 and 64 (initial scale range: 20-80, mean: 36.96, SD: 8.77) and their scores on the FTP scale were between 10 and 67 (initial scale range: 10-70, mean: 37.43, SD: 14.20). As for the SUS scores, they ranged from 0 to 100 (initial scale range: 0-100, mean: 57.34, SD: 21.69).

4.2 Correlations between variables

According to the Shapiro-Wilk test, participants' age, as well as loneliness and FTP scores, were not normally distributed (Table 1). Hence, the correlations between the variables were analyzed using a non-parametric test, Spearman's rank correlation coefficient [11].

Table 1: Shapiro-Wilk normality test

Variable	Type	Statistic	Sig.
Age	Scale	.941	.000
Loneliness	Ordinal	.974	.030
FTP	Ordinal	.968	.009
Usability	Ordinal	.980	.098

According to findings, there was a statistically valid negative relationship between loneliness and usability (r=-.234, p<.01) and a positive relationship between FTP and usability (r=.329, p<.001) (Table 2). However, no valid correlation was observed between age and usability (r=-.125, n.s.).

Table 2: Variables' correlations with Usability (SUS)

Variable	Correlation Coefficient	Sig. (1-tailed)
Age	-.125	.094
Loneliness	-.234	.007
FTP	.329	.000

5 DISCUSSION

Due to the results, users' chronological age does not affect their perceived usability, which contradicts Bangor et al.'s [2] findings. This outcome opposes the stereotype that new technologies and older people do not get along and is congruent with Hauk et al.'s [19] suggestions that age-effects are activated only for technologies that do not respond to older people's needs. Another possible explanation for the aforementioned contradiction could be the cultural differences between the research samples, which is a factor that often affects usability [39].

Loneliness correlates with older users' SUS scores, denoting that the lonelier the user is, the lower his/her score is on perceived usability. Although from a different perspective, this relationship is consistent and extends Cenfetelli's [9] findings regarding the role of emotions on technology usage, as well as Díaz-Prieto and García-Sánchez's [13] findings regarding older adults' feelings of loneliness and web 2.0 usage patterns.

As for the FTP and its relationship with usability, the confirmation of the analogous hypothesis seems to extend Socioemotional Selectivity Theory. In particular, the subjective estimation of time left in someone's life is positively associated not only with his/her motives towards knowledge-based activities but also with the results of knowledge-based processes, such as perceived usability and ease of use estimation of technology. Also, despite the connection that often appears in the literature between FTP and chronological age [26], in the current study on Greek older adults only FTP was related to their SUS scores.

In general, the outcomes of this study focus on the significance of the relationship between users' psychosocial perceptions and usability. Analogous prompts have been suggested within the multidisciplinary field of Gerontechnology [10], as well as in the broader discipline of HCI [3, 4].

6 LIMITATIONS AND FUTURE WORK

This research has some limitations due to its exploratory nature. First, this project focused on a specific technology and, also, the participants did not use the technology itself. Second, the sample was limited and non-parametric. Third, there was no feedback from older people who do not use web technologies. As a result, the findings cannot be generalized to the broader population, but can be used for further research: (i) Carry out usability measurements on different web tools and with older users that have previously used each technology, (ii) gather a broader sample under probability sampling, and (iii) collect qualitative and quantitative feedback from non-users. An experiment that could lead to safe conclusions upon causality is also suggested.

7 CONCLUSION

Older adults' population constantly grows. However, technology adoption still lacks compared to younger generations and, notably, Greek older adults are one of the least connected to the Internet groups, compared to the vast majority of their European peers. As it seems, different cultures and psychosocial attributes can affect users' perceptions upon several issues, ranging from feelings of loneliness to technology usability. Thus, the aim of this project was to explore the potential relationship between (i) Greek older adults' age, feelings of loneliness, and future time perspective and (ii) their perceived usability of a web application, in order to gain further insights into the elements that might affect technology adoption and usage. For this purpose, a digital storytelling prototype has been demonstrated to 112 participants and an online structured questionnaire was implemented for data collection. According to the results, participants' feelings of loneliness and future time perspective correlate with their perceived usability. On the contrary, no significant relationship was found between chronological age and usability. These results could help scholars, designers, stakeholders, and caregivers better understand the implicit interactions between older adults and web 2.0 tools, in order to promote the privileges derived from the acceptance and use of these innovations.

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