ActiveBrain: Online Social Platform for Active and Healthy Ageing

Margarida Silva*, Secundino Correia*

*Imagina®, Estrada de Assafarge, nº6, 3040-718 Coimbra, Portugal

Abstract

The web and telecommunications brought beneficial changes to people's daily lives. However, the advancement of digital world is overwhelming, disrupted by a digital divide from the perspective of internet access. The elderly are particularly affected because they are not familiar with, do not have the skills or do not have access. Hence arises the need to understand if and how technology and social networking can enhance their lives and promote active ageing. This article discusses the challenges of developing an online platform that cover three areas: brain training, stories sharing and elderly support.

Keywords: ActiveBrain, active and healthy ageing, social networks, multi-platform, cognitive training

1. Introduction

Given the need to change paradigms and adjust to the new trends in emerging technologies, Imagina® brand working in the areas of inclusion and education, has an on-going research and development project called TOPQX (Everyone Can Learn Anytime, and Anywhere) [1]. This project aims to bring together a set of theoretical and empirical resources through different methodological strategies, forming a scientific basis from which one can discuss and suggest new solutions, tailored to the needs and interests of end users. TOPQX project includes ActiveBrain, a social online cognitive training platform for senior population in order to exercise their mental abilities and keep active their social life. Extending its use to PC, smartphone and tablet devices, it seeks to promote greater involvement of the elderly in society, preserving their health and promoting greater control over their own lives. This project aims to respond to populations with different characteristics and needs, so it is necessary, from the methodological point of view, provide different strategies and
approaches to work according to the segment of the population to which it is addressed.

The design of technologies to support mental health intervention is a recent research topic, especially in the area of human-computer interaction [2, 3]. However, before moving to the development of such a platform, it is crucial to evaluate the problems and understand the relevance of such a project directed to the senior population. So our aim is to understand the requirements due when designing in the field of mental health. Facing the wide scale advances in technology and its innovations, a deepened study is necessary when designing a solution to an ageing population. While, the elderly are the fastest growing population in the world [4], they are considered to represent a section of society that has been bypassed by the Information Technology (IT) revolution due to insufficient literacy or familiarity with IT [5]. However this trend is changing, the elderly are more receptive to learn, stay informed and connected [6]. Moreover the Internet is becoming ubiquitous due to the proliferation of mobile devices. Given the state of the research and literature in this area [6] this study was motivated by the need to investigate the relevance of digital social networking by elders.

2. State of the Art

Europe is an ageing society [7]. The increased life expectancy reflects itself in a growing ageing phenomenon in the developed societies, with particular emphasis on socio-demographic structure of industrialized countries [8]. What happens is that, usually, we associate the ageing phenomena only with the chronological and biological aspects related with the years advance. But beyond the strictly biological component we need to consider the ageing process as a dynamic balance between physical, psychological and social issues [9]. Therefore, a multidimensional approach is required in order to provide an intervention directed to an active and healthy ageing, promoting the "capacity for an adaptive response to the challenges related to the age advancing"[9].

The gradual decline of cognitive capabilities is inherent to the physiological process of normal ageing and therefore, arises as a natural consequence of chronological age advancing, and is not automatically an obstacle for normal functioning [10]. This decline, also known as a transient state for dementia, is characterized by very subtle changes in cognitive functions, especially of memory, called mild cognitive impairment (MCI) [11]. In addition to "normal" cognitive decline ageing, age is a risk factor for the emergence of an increasing number of patients with dementia, particularly with Alzheimer's disease (AD) [8]. These facts lead to a greater focus on the improvement of active ageing as a challenge to the development of specific rehabilitation programs [8]. By these reasons we need to take into account a greater concern for understanding the real needs of the elderly, especially because these are sometimes a neglected group, with regard to the development of technological products. The conscientiousness of considering the trends of an ageing society and at the same time ensure a dynamic and interactive level of social interaction that goes beyond the physiological constraints and geographical mobility is essential in the context of conversation and entertainment for social relations. On one hand we want to promote inclusion when developing a platform aligned with the progress of technology, the grow of the social web, the increasing mobility of mobile devices and the lowering cost of ubiquitous computing, on the other we struggle with the difficulty of technology adoption by this age group because they are considered a hardy to change group with low computer knowledge. Poverty, low levels of education, lack of computer support from family for online communication, lack of the incomes to invest in a computer and no access to the Internet are, certainly, barriers we have to overcome in order to promote the adoption of such a platform. The slow rising of Web adoption by the elderly and the anxiety (challenges and frustration) due to the novelty of the use of technology are some of risks of this project. The Internet interactivity and its impact on the inclusion of senior population seems to be yet largely ignored. However a shifting is in the way and the concept of the elderly itself is changing too. In fact seniors are increasingly present in different segments of society and therefore a new vision of senescence is required with emphasis on two issues of great consequence, proactivity promotion through cognitive rehabilitation and social interaction. It is in this sense that technologies can be a catalyst, promoting a mindset shift that will pressure the use of social networking by older people,
which in turn will have repercussions on the quality of life and on the way they use social networks as a tool to interact with their loved ones [6]. This eventually will contribute to a more active life, taking care of themselves, gaining autonomy, assuming responsibility and developing a greater sense of well-being.

3. Methodology

This article focuses on the problem and the solution of our research, following an analysis of explicit and implicit problems, both physical and emotional, in order to integrate them in a better understanding the contexts related to the current needs of the ageing. After identifying a set of key issues related to entertainment, social activities, usage and adoption of new social media, this research aims to construct a platform for interaction, conversation and entertainment that make the bridge between an active ageing and an active social life. In this scenario to outfit the objectives of this study, we choose two instruments to collect distinct information: a market analysis - benchmarking - and an inquiry. These resources have enabled us to obtain qualitative and quantitative data and a set of relevant information based on the knowledge and the awareness of experts who work directly with the target population.

Besides we adopted another methodology, called Design Science. This approach has as its main focus the generation of knowledge while searching for solutions to real world problems, hence the mention to the design, in reference to the techniques, procedures, fundamentals and tools employed by design professionals in their field [12]. This methodology is based on seven assumptions [13]:

1. Design as an artifact;
2. Relevance of the problem;
3. Evaluation of the design;
4. Research contributions;
5. Meticulousness of research;
6. Efficient use of resources;
7. Communication of results.

The choice of the Design Science methodology for this project is related to the following features:

1. The research presents an applied problem, which aims to generate knowledge directed to the solution of specific problems;
2. The nature of the platform is multidisciplinary and is situated in an area of tension between theory and practice [14].

However, the research can also be described as qualitative and exploratory [15], since it aims to generate greater understanding of the research object - gathering information by the design science approach - describing the nature of such an approach and how to achieve, evaluate and present the research guided by this approach.

3.1. Benchmarking

The contributes of the benchmarking study, led us to better understand what is now available and what is the effectiveness and the impact of a cognitive training program in the life quality of this group. We studied a vast group of platforms similar to the one we intended to develop. This study was based on a content analysis of the available platforms, seeking to identify the qualitative features present in them and trying to understand their relevance. We tried also to identify features generally present, but with different implementation, learning about how to better design and implement them. We realized that to launch a new product we need to go beyond this benchmarking, looking for better alternatives, enhancing up important features and adding new flavors like a social sense of proximity and belonging.
3.2. Inquiry

In parallel, the technique of survey by questionnaire, served as a research tool in order to collect other information that would be useful for specifying the ActiveBrain, broadening the vision of the project team when confronted with a set of technicians and specialists of the field. Through the questionnaire we gather information incorporating the views of the target group of this survey, enabling us to improve the platform specification. From around 900 surveys sent, we obtained valid answers from 60 respondents. The majority of respondents were between 25 to 34 years. 80% of respondents revealed a profession different from our expectations, like nurses and rehabilitation engineers.

All respondents using the proposed Liker scale considered very important to train all the cognitive areas that have been appointed: memory, speed of thinking, attention, executive function, concentration, language skills, spatial vision and auditory memory. They also revealed a common use of cognitive training when exercising their patients. The majority found that doing games, logic solving exercises and an active social life were the most effective methods to stimulate cognitive areas.

Regarding the mode of access, 83% preferred to get this platform for online access.
4. Investigation

With the project we pretend to launch the scientific, technological and market foundations for a sustainable development of an online platform that can support active and healthy ageing. The platform should work online and offline in different operating systems and different mobile devices, promoting greater involvement of the senior population in society, greater control and quality of life and a significant reduction in associated costs with chronic diseases and ageing. Known the above outlined scenario and the high cost of health permanent care services, the emergence of digital solutions for this population is more and more justified. So the research focuses on the following axes: brain training, stories sharing and support to the elderly. These three main axes are associated with the ageing process and the changes it implies in many spheres, including the executive functions. Below we present the three main axes of this research.

4.1. Cognitive Training

Neuropsychological rehabilitation, cognitive stimulation and cognitive training emerge as therapeutic practices should involve the inclusion of motivational, social, physical and psychological aspects [16]. The research development on this axis was guided and substantiated by these theoretical assumptions.

The cognitive training component is based on a set of games and other types of activities planned for and focused on cognitive deficit areas stimulation. Hence special aspects arise in regard to the mental and physical abilities, which should be taken into account when developing games for seniors, not requiring fast and disturbed reactions [17]. Neuropsychological assessment should be present and include a comprehensive analysis, considering the clinical context in order to define a profile that outlines the process of intervention based on the preserved and affected capabilities of the individual [18].

It is important to take into account the neural plasticity level that remains even in old age. And this means, the ability of the brain to reorganize its neural circuitry after injury, trying different ways of performing an activity [19]. "The brain has a singular plasticity" [20] thus presuppose that there is a cognitive reserve, where the training and stimulation of preserved skills may induce plasticity of the nervous system [21]. The training should be directed and adapted according to the capabilities and needs of the user, should go together with the gaming performance and integrate the user's knowledge and past experience. This can be done by the suggestion of the professional who follows the patient, or by the platform itself embedding on it evaluation mechanisms leading to suggestions, passing through a virtual assistant who will work as a coach. One of the challenges is how to include relatives, friends, or caregivers, so that the user will not play alone or with the machine, but can also have the opportunity to socially interact while playing.

More recently, some researchers have started to investigate the social impact of online games [22]. Steinkuehler and Williams said that “relationships and associated behaviors function to expose the individual to a diversity of worldviews and are highly prevalent and noticeable in online games” [23]. In this sense, online games are a kind of communication tool on the Internet, because the social relationships in the game world function as an extension to, and a supplement of, preexisting offline interactions [22]. However, exposure to online games is different from exposure to other media. A television viewer cannot influence what happens or what is being shown on TV [22]. A game player, however, plays an active part in the game [22]. Specifically, he is able to choose a particular type of game to play, as well as to choose a particular character role and to take a unique strategy for living in the fantasy world. Hence, the game content is driven in part by the coding of the game designers and in part by the actions of the gamers [22]. Steinkuehler and Williams claimed that “online games appeared to function best as “third places” for informal sociability [22] (“first place” referring to home and “second place” to workplace) [22], where people are able to establish and maintain social ties by playing
with strangers and making new friends” [22]. The weak ties established may help to broaden gamers’ horizons or worldviews, and may also offer new information resources and new opportunities [22].

4.2. Stories Sharing

This component aims to stimulate and counterweigh the socialization needs of the elderly, by sharing stories, memories, oral traditions, or conversations. By this way we intend to stimulate memory and other brain functions adding a sense of belonging and self-satisfying when using the platform. Telling stories is part of the human condition, and we think that, through the use of life stories, memory can be stimulated [24]. Telling a story of our life is, both social and cultural, context driven. In fact the story that comes to us is a set of social relations that occurred at a particular time of one's life. The stories sharing through social online networking has the potential to enrich the lives of the elderly by providing them with an easy way to stay in touch with friends and family [6]. It is a process of social interaction, which can be understood as a window through which we can look and see the worlds that are enclosed in them [24].

4.3. Support to the elderly

Traditionally, therapeutic interventions are based on a face to face dialogue between therapists and patients [2]. The use of technology in mental health interventions focuses primarily on the use of electronic mail, online information and electronic questionnaires for the assessment, diagnosis and monitoring of results [25]. Also are being used online discussion groups, forums and e-mail lists to facilitate group therapies and provide online support and psycho-educational information [25].

The use of computer-based tools offer the opportunity to reformulate this interaction [2] and can be seen as an advantage, becoming a new dialogue component, raising the possibilities of therapeutic interaction. Increasing the access to the therapy (bridging the gap between therapists and patients), promoting self-motivation, self-monitoring and self-commitment into the process of therapy, but also the collection, analysis and visualization of information are some of the advantages we can refer [26]. Given the high cost of care for people with permanent limitations, the onset of monitoring solutions for various physiological data and its flow is, increasingly, justified. Support for the elderly, through the idea of a continued support for chronic disease / dementia, has as main objective to meet the needs of a particular context, by monitoring patients, promoting collaborative efforts and strengthening positive attitudes, can be decisive for obtaining good results [25]. One of the main benefits is the costs reduction in the health care associated with chronic diseases and ageing itself, through constant monitoring and narrow tracking by the medical team (doctor - patient).

“Studies demonstrate the potential of cognitive-behavioral programs to reduce the costs of mental health interventions, increase in scale, the number of patients that a therapist can treat and make the treatment more convenient for patients” [2].

To improve this aspect, the ubiquitous computing paradigm represents an opportunity in the context of medical applications [27]. Another major advantage of the use of mobile devices is the ability to monitor and obtain data from patients in real time, which makes the quality of the collected information more accurate than data based on a retrospective by patients [28]. This is also an important factor that allows to get objective feedback on how the treatment is affecting the patient.

5. Conclusion

This platform besides being intended for the user is also aimed to the therapist, especially to enable therapists a better and easier access to therapy scenarios that can support the rehabilitation, by adapting the games to the different specificities. The integration of online games increases the patients commitment with the therapy
process, crucial to foster patient relationship with the therapist and family and improve the effectiveness of their rehabilitation. By creating more connections seniors get a more positive vision of them, increase their productivity and feel more empowered. However, when talking about ageing is important to take into account the cognitive processes that are associated with thinking and especially all the social issues. Obviously these factors will affect and influence how we think about the design, by professionals who are not related to mental health. For this reason, the design of such systems must necessarily pass by the collaboration of mental health professionals. Nevertheless, this type of participatory, iterative and user-centered design creates difficulties when designing these systems. In fact, when a person has become comfortable with a particular software/technology, this software/technology has become outdated [29]. This explains in part the low interest and leaving by these people. With the expansion of the Internet and social networks, also increases the number of people who uses technology to stay connected with their loved, by means of a new form of communication that was not available in previous generations. With the expansion of the Internet and social networks like Facebook, more and more people are using these technologies to maintain their interpersonal communications. The research points towards the fact that social networks will be probably quite important for older people to remain socially connected with others and have closer relationships. Social networks have thus the potential to enrich the lives of seniors by providing them with an easy way to keep in touch with their families. The fact of staying connected with their relatives can help to overcome obstacles, encouraging them to use the technologies and social networks [6].

Acknowledgements
This project is co-funded by Imagina and Programa Operacional Regional do Centro: CENTRO-07-0202-FEDER-022839.

References
1. Cnotinfot (2012). TOPQX: Todos Podem Aprender em Qualquer Hora e em Qualquer Lugar (Projeto), Coimbra. Accessed in May 2, 2013 in: www.cnotinfot.pt/topqx
2. Coyle, D., Doherty, G., Matthews, M., & Sharry, J. (2007). Computers in talk-based mental health interventions. Interacting with Computers, 19(4), pp. 545-562.
3. Coyle, D., Doherty, G., Sharry, J., 2010. PlayWrite: end-user adaptable games to support adolescent mental health. CHI EA ’10: Proceedings of the 28th of the international conference extended abstracts on Human factors in computing systems.
4. Wright J.H., & Wright A.S. (1997). Computer-assisted psychotherapy. Journal of Psychotherapy Practice and Research, pp 315-29.
5. Ogawa, M., Inagaki, H., & Gondo, Y. (2006) Usage of IT and electronic devices, and its structure, for community-dwelling elderly. In Computers Helping People with Special Needs. Springer Berlin/Heidelberg, 752-758.
6. Ariyachandra, T. Crable E., Brodzinski J. (2009). Seniors Perceptions of the web social networking. Issues in Information Systems. Volume X (2), pp 332.
7. Zarifis G. Disadvantaged seniors in Europe. Main Identifiers: a desk research approach. Accessed in March 10, 2013 in: http://projectpaladin.eu/wp-content/uploads/2010/11/7c.pdf.
8. Cardoso C Junho 2012. Avaliação da eficácia de um programa de treino cognitivo com a consola Wii TM Nintendo TM em pessoas com doença de alzheimer: estudo de caso múltiplo. Dissertação de Mestrado em Psicologia. Universidade Católica do Porto.
9. Verissimo M Morais A Botelho M Pinto A Rosa M Oliveira C Estudo do Perfil do Envelhecimento em Portugal. Faculdade de Medicina da Universidade de Coimbra. GERPI, 2008.
10. Moreira P & Oliveira C (2005). A fisiopatologia da doença de Alzheimer e de outras demências. In A. Caldas & Mendonça A (Eds). A doença de Alzheimer e outras demências em Portugal. Lisboa: Lidel.
11. Marques-Teixeira J (2011). Demência e outros Défices Cognitivos Nos Cuidados de Saúde Primários. (1) Linda-a-Velha: VVKA.
12. Sordi, J., Meirele, M., Sanches, C. (2010), Design Science: Uma Abordagem Inexplorada por Pesquisadores Brasileiros em Gestão de Sistemas de Informação. XXXIV Encontro da ANPAD. Rio de Janeiro.
13. Hevner, A., March, s., Park, J. (2004), Design Science in Information Systems Research, Vol. 28 No. 1, pp. 75-105.
14. THOMAS, O., 2007. “Reference Model Management”. In: Fettke, P., Loos, P., (eds) Reference Modeling for Business Systems
15. Yin R. K. (2005) (ed). *Introducing the world of education. A case study reader*. Thousand Oaks: Sage Publications.
16. Boccardi M & Frisoni G (2006). Cognitive rehabilitation for severe dementia: critical observations for better use of existing knowledge. *Mechanisms of ageing and development*, 127, 166-172.
17. Taylor, A. (2011). Social Media as a Tool for Inclusion. Accessed in May 1, 2013 in: http://homeless.samhsa.gov/ResourceFiles/Taylor_Social%20Media_feb2011%20(1)_1_2.pdf.
18. Guerreiro M (2005). Terapêutica não farmacológica da demência. In: Lidel - EdiçõesTécnicas L, editor. *A Doença de Alzheimer e outras demências em Portugal*. Lisboa. p. 121-48.
19. Cela J & Herreras E (2005). *Rehabilitación Neuropsicológica*. Papeles del Psicólogo, 90, 1-8.
20. Neri A Fortes A Batistoni S Yassuda M (2006).*Treino de Memória no Idoso Saudável: Benefícios e Mecanismos*. Universidade Estadual de Campinas, Brasil.
21. Lima J (2006). Envelhecimento, demência e doença de Alzheimer: o que a psicologia tem a ver com isso? *Revista de Ciências Humanas*, 40, 469-489.
22. Zhong Z. (2009). Third-Person Perceptions and Online Games: A Comparison of Perceived Antisocial and Prosocial Game Effects. Accessed in April 20, 2013 in: http://onlinelibrary.wiley.com/doi/10.1111/j.1083-6101.2009.01441.x/full.
23. Steinkuehler, C. A., & Williams, D. (2006). Where everybody knows your (screen) name: Online games as “third places”. *Journal of Computer-Mediated Communication*, 11(4). Accessed in May 2, 2013 in: http://jcmc.indiana.edu/vol11/issue4/steinkuehler.html.
24. Gomes C. *Constução Social da Memória Autobiográfica e Histórias de Vida*. Accessed in MArch10, 2013 in: http://www.fpce.up.pt/iiijornadashistoriasvida/pdf/2_Construcao%20social%20da%20memoria.pdf.
25. Pereira R. (2011). Picoterapia com dispositivos móveis. Dissertação de Mestrado em Engenharia Informática, Especialização em Sistemas de Informação na Faculdade de Ciências da Universidade de Lisboa.
26. Kiel, J.M. (2005, March). The digital divide: Internet and e-mail use by the elderly. *Informatics for Health and Social Care*, 30(1), 19-23. Retrieved from http://www.Informaworld.com/smpp/content~content=a713736882~db=all.
27. Gonçalves P. (2008). Monitorização Remota de Pacientes em Ambulatório. Dissertação de Mestrado em Computação Móvel na Universidade Fernando Pessoa
28. Newman, M.G. (2004). Technology in psychotherapy: An introduction. *Journal of Clinical Psychology*.
29. Dobransky, K., Hargittai, E. (2006). *The disability Divide in Internet Access and Use*. Information, Communication & Society, Vol.9 (3)