Developing the Cognitive Abilities of Elderly People with the Use of IT Technologies: Presentation of the Project Assumptions and Description of the Research Concept

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INTRODUCTION

The INNOVATOR Student Science Club brings together students of the Faculty of Organization and Management of the Silesian University of Technology, interested in the subject of broadly understood innovations in the field of, among others, transport, telemedicine, Industry 4.0 or Smart City. Due to the specifics of the Faculty at which they study, members of the Club are not limited in their research to the technical dimension of innovation, but also undertake considerations with their economic and – above all – social dimension. This approach favours the perception of the problem of human contact with innovative technologies and technical means not only in the social dimension. Therefore, members of the INNOVATOR Student Science Club made an attempt to examine the relationship between Internet technologies and a specific group, which is the elderly in society. Older people are often a social group with special needs who, because of their age or because of the circumstances in which they are, have to take additional measures to overcome the barrier to participate in various spheres of life on an equal basis with other people; including in the aspect of digital accessibility and information and communication (cf. Journal of Laws 2019 item 1696 Act of 19 July 2019 on ensuring accessibility for persons with special needs).

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The concept of the project "Developing the cognitive capabilities of the elderly through information technology" was created as a result of the work of members of the Club related to the COVID-19 pandemic and resulting from the need to help especially the people most affected by this pandemic. The starting point for this concept was the decision to focus work especially on supporting and activating seniors. It has been observed that such people often are or feel socially excluded, which results, among others, from a lack of familiarity with modern technology. The contemporary world is increasingly switching to digitization and networking in virtually all aspects of life of entire social groups and individuals. An example illustrating these phenomena are, among others, electronic payments, e-mail, e-prescriptions, online booking, etc.

On the one hand, technological progress brings new opportunities for social inclusion of older people and improvement of their standard of living, e.g. by improving mobility and facilitating communication with friends and family. However, the 'emergence new technologies', i.e. both the necessary skills and mental level of readiness, can exclude those who do not find their way in the age of digitization and the Internet. Older people who have not acquired the skills to use modern technologies are becoming increasingly aware of their deficiencies in this area, which is why they become alienated from modern society.

The authors of these project are convinced that the elderly can, with a little help, acquire and develop the necessary competences in the above-mentioned area, and will go a long way to help the elderly to keep up with the technological changes and as a consequence allow them to actively and fully participate in everyday social life.

The second part of this study presents a brief overview of published studies devoted to the issue of the presence of seniors in the world of the Internet. The third part presents the assumptions of the project, while the next part presents the concept of implementing this project. The study concludes with a chapter presenting the conclusions of the activities carried out so far and assumptions about the next planned research undertakings.

BRIEF REVIEW OF THE SUBJECT LITERATURE

Aging is inevitable in our world. This concerns all the living organisms on Earth, including every individual in human population. However, with the development of medicine, the improvement of living conditions and the growing area of social services, the average age of people began to increase significantly. This means that in the age range of society the number of people considered to be old is increasing. Way back in the 70s, the problem concerning the aging of individuals and the structure of society has become the subject of scientific research (Crawford 1973, Hough 1992). Over time, such research has developed, including the problem of longevity in relation to the aging process (Kirkwood and Holliday 1979), to finally address the problem that we can call 'quality of the

aging process' (e.g. the concept of successful aging presented in (Baltes and Carstensen 1996)).

Since the beginning of the 21st century, research focused on the position of older people (the elderly) and the society has started to address the prevention of negative effects, e.g. the prevention of social exclusion and loneliness among older people (in (Madan and Bodagh 2002) through extensive health promotion activities). At the same time, researchers highlighted the broader context of aging. For example, in the work (McHugh 2003) it is proposed to look at this area of the issue through three dimensions ('three faces of aging') which, according to the author of the quoted study, are society, image and place.

Since the end of the 90s, two distinct trends have appeared in studies on aging processes in relation to modern technology. One of them is directed primarily at the medical dimension of such processes and the use of broadly understood e-medicine (e.g. (Madan and Bodagh 2002, Chen and Schulz 2016)), while the second trend extensively addresses the issue of supporting the elderly, e.g. by using online counselling to support stress management, in particular: preventing breaks in regular exercise for the elderly (Hashimoto et al. 2006) or by including the Internet of Things in the process of analysing behaviour in caring for the elderly (Newcombe et al. 2018).

It is also worth mentioning that many authors put a kind of equality mark between the elderly and people with special needs (disabled?). This approach, although being doubtful in ethical terms, has its justification when considering specific examples of restrictions associated with old age and/or various disabilities or old age diseases. And so, in the available literature on the subject, you can find considerations on the use of the Internet and online advertisements addressed to disabled consumers (Burnett 2006) or solutions enabling adaptive and personalized delivery of multimedia content for disabled Internet television users (Anagnostopoulos et al. 2010). Descriptions of solutions are also published, dedicated to people suffering from certain diseases that hinder normal functioning in society. This type of study is well illustrated by a publication (Boulos et al. 2017) describing the concept of "LiveWell" dedicated to promoting a healthy lifestyle and well-being of patients with Parkinson's disease through social networks and ICT training.

We come here to very modern research and publications presenting various aspects of the relationship of older people with the world of the Internet (for instance the problem of finding themselves in online banking systems (Arenas-Gaitán, Peral-Peral, and Ramón-Jerónimo 2015)) or the world of social media (e.g. Kamel Boulos, Giustini, and Wheeler 2016) "Instagram and WhatsApp in Health and Healthcare: An Overview".

Finally we can find in the available literature works devoted to various aspects of the relationship between the elderly and the Internet. There are more general papers devoted to studying the behaviour and attitudes of the elderly towards the Internet (Eastman and Iyer 2004), and research on the possibilities of information and communication technologies to reduce social isolation of the

elderly (Chen and Schulz 2016) or works aimed directly at using the Internet to improve active aging (Ramón-Jerónimo, Peral-Peral, and Arenas-Gaitán 2013, Silva and Correia 2014, Niehaves and Plattfaut 2014, Llorente-Barroso, Viñarás-Abad, and Sánchez-Valle 2015).

The same group includes works on the use of specific theories or methods (e.g. a proposal to use the theory of acceptance of IS technologies to understand the digital age gap (Niehaves and Plattfaut 2014) or the use of the Internet of Things for the needs of intelligent healthcare homes for the elderly (Pal et al. 2018), as well as the concept of a videoconferencing system dedicated to the elderly (Savolainen et al. 2008). Interesting case studies are also available, e.g. for Lisbon in (Neves and Amaro 2012), for Brazil in (Albuquerque and Pinheiro 2011) or Poland in (Zalewska 2015, Żuk 2015). As a summary of the research carried out especially in Europe, we can consider the report of the European Commission "Innovation for Active & Healthy Ageing" (European Commission 2015).

Summing up the above review, it is worth pointing out other research works that address current and future topics related to the functioning of the elderly in the ICT world. A good example can be the study "Granny and the robots: ethical issues in robot care for the elderly" (Sharkey and Sharkey 2012) and   the work "From urban planning and emergency training to Pokémon Go: Applications of virtual reality GIS (VRGIS) and augmented reality GIS (ARGIS) in personal, public and environmental health" (Kamel Boulos et al. 2017).

Summing up the above review of literature sources, it can be stated that many papers are available devoted to the problems arising from the relationship between the aging process and technological progress. However, in these studies it is difficult to find proposals identical to the concept that is the subject of this study.

DESCRIPTION OF THE PROJECT ASSUMPTIONS

The project presented below is addresses to a defined group of users, which are elderly people, often lonely, rejected and those who may feel alienated from society due to the COVID-19 pandemic, as well as due to the low level of skills in using available digital tools. Our grandparents also need support because of the occurring financial limitations (lack of funds to pay for their basic needs), physical limitations (weaker eyesight and hearing) and because of prejudices and fear.

The main goal of the project is to construct a specific IT tool which will provide the technical content, carefully selected and important from the point of view of the development of societies. Examples can be related to the evolution of the smart city. This tool will bring value to older people by providing the knowledge they need. It will also become an instrument to study their preferences and needs. In order for seniors to fully absorb and use new knowledge, it will also be necessary to develop their cognitive abilities. This development will be

supported by dedicated cognitive methods, e.g. logical games, which affect the level of reasoning and are popular in Nursing Homes.

To choose the appropriate media for technical content, the possibilities of developing cognitive functions of seniors will be explored using the Internet. In addition, an evaluation of the effectiveness of this content being provided by the designed tool will be carried out. The information necessary to create easily acquired content will be obtained by analysing the literature on the needs of the elderly, examining existing solutions in this area and analysing surveys. Survey questionnaires will be distributed in Nursing Homes, Retirement Homes, online forums for the elderly and through direct contacts.

Technical content will be transmitted via the website and video conferencing in the form of lectures, discussions and talks in which the targeted population will be able to actively participate. Topics regarding the development of urban infrastructure and the use of modern technologies in the process of interpersonal communication will be explained. Memory and cognitive skills will be shaped through a collection of educational and logical games. The gradual implementation of content in the field of using current technological solutions and communication via the Internet into the worldview of the elderly aims to eliminate the negative effects of their isolation and its impact to these people, which are caused by a pandemic. Active participation of this class of people in the presented content is assumed.

Project implementation focuses on providing the elderly population with current knowledge about current terminology in the field of digitization and modern technologies. The target group that will undergo training will acquire competencies to facilitate their performance of daily tasks after the course, such as dealing with officials, postal or correspondence matters or using many other services. Due to learning about new solutions, these people will not have to go out to meet their needs, because they will be able to do it from their own home using a smartphone or computer. In the age of pandemic, this will significantly reduce the risk of contact with potential COVID-19 carriers. Thanks to the acquisition of the abovementioned competences in the field of digitization, the quality of life of older people will improve significantly. The so-called "intergenerational barrier" and the negative effects of pandemic isolation will be significantly reduced. In addition, one of the stages of the project is to develop a website on which logical games (appropriately selected and consulted with persons who are authorities in this field) will be placed, through which older people will be able to train their mind. It is anticipated that this will result in the suppression of dementia or other diseases characteristic for old age.

The project is a manifestation of social entrepreneurship. The assumed results are characterized by innovation, thanks to the idea of implementing advanced information technologies with cognitive techniques, widely developed in the context of the concept of Industry 4.0 or Industry 5.0, in the processes of shaping and improving the cognitive abilities of people with special needs, which are the elderly. The tool that will be created and that will be an intuitive to use Internet

platform with functional and technical specifications adapted to the needs of the elderly, will on the one hand provide these people with innovative technical knowledge corresponding to current trends in the technological development of society, and on the other hand provide a tool for improving cognitive skills through embedded cognitive didactic technologies. Therefore, this tool will bring value to these people, in the form of learning how to use technical solutions that are currently unavailable to them due to numerous barriers, including resistance to modern technologies (so-called technophobia (Isaacs 2012, Nimrod 2018)), and will also become an instrument to study the preferences and cognitive needs of people in different age groups. Due to the possibility of synchronous and asynchronous connection with other platform users, the tool will also allow to minimize the "generation barrier" between the group of older recipients and the rest of the society (Lüders and Brandtzæg 2017) and to eliminate the psychological negative effects of isolation caused by the pandemic.

By examining the possibilities of developing cognitive abilities of older people through surveys, questionnaire surveys and analysing the existing literature on this topic, it will be possible to improve the aforementioned tool and explore how to create content for older people so that it can be easily assimilated. The project has a defined group of users, and its implementation will be carried out using modern technologies. The new knowledge used, which contains technical content, requires developed cognitive skills, and these will be supported by dedicated cognitive methods, e.g. through logical games posted on the platform. The assumptions for applying the solution resulting from the project in practice are consistent with Poland's desire to equalize opportunities for people with special needs and the Accessibility Council policy. Popularizing the science of technical novelties will result in greater openness to emerging technologies that replace existing traditional methods, e.g. e-prescriptions. Increasing awareness of the dangers arising from the use of the Internet and lectures about protection of Internet connections will help protect older people from Internet scammers. The acquired ability to use modern technological goods, i.e. the Internet, will expand the scope of information flow from the world (not limiting the sources to radio or television) and allow for selective and critical approach to information.

The project allows many people (who would otherwise not be able to afford care services) to have access to care around the clock. Familiarizing older people with IT tools will save their time and money because they will not have to allocate additional funds, e.g. for transfers, because they will successfully use online payments. In addition to the ability to use electronic equipment, the Internet platform, using a selected collection of logical and educational games, will stimulate the memory of older people and shape their cognitive skills, becoming a kind of cognitive therapy tool. Cognitive therapy exercises engage and train various brain areas necessary for daily functioning. Cognitive functions that can be improved with such therapy include memory, information processing, reflexes, spatial orientation, attention or reasoning.

Among the identified barriers that may occur during the implementation of the project, we mention the lack of interest from older people in the content presented and the phobia against modern technologies. Therefore, in order to convince our older generation to use modern technologies, the presented content must meet their daily life needs and satisfy their passions and interests, as well as facilitate access to them and guarantee their assimilation. Analysing the everyday needs of these people, the website will contain materials of interest from their perspective, e.g. recipe collections. Eyesight deteriorates with age, which can significantly reduce number of people who like to read. As part of improving accessibility, the content will be presented in two forms: written and audio, and books will be available as e-books. The problem with reaching the recipients, resulting from the lack of supply of mass media (i.e. the Internet), should be solved on the side of the younger generation (children, grandchildren of these people), which was encouraged by advertisements published via social media (social-media (Chou, Lai, and Liu 2013)). Also encouraging seniors to use specific computer games (exergames (Brox et al. 2011)) would help to reach these people with new technology that would be perceived as friendly. In addition, they should be made aware that over time some obstacles may arise in coping with daily activities. Without the ability to use modern technologies, they may prove to be more and more difficult.

DESCRIPTION OF THE PROJECT IMPLEMENTATION CONCEPT

The project has been initially divided into seven stages. Every one of these stages is assumed to end with 'milestones' that represent the key result to be achieved in the successive stages. The milestones that are the most important moments during the implementation of the entire project have been set. It is assumed the introduced project will contain:

Stages
1. Analysis of literature on the subject in terms of the needs of the elderly.
2. A survey conducted among these people to find out their preferences, carried out by a questionnaire survey conducted in Nursing Homes, Retirement Homes, online forums for the elderly and through direct contacts.
3. Examination of existing solutions in this area.
4. Creating an Internet platform adapted to the needs of the elderly.
5. Attempt to transfer technical content via the Internet.
6. Assessing the degree of interest of recipients and conducting a survey in order to receive feedback on the quality of the service provided.
7. Possible refining of the transmitted content in visual and substantive terms.

Milestones
1. Acquiring relevant literature and results of literature research.
2. Results of the survey and questionnaire.

3. Results of analysis of existing solutions.
4. Prepared lectures, a collection of logical games, constructed website.
5. Characteristics of the tool's parameters functionality.
6. Acquiring the interested group of recipients.

In order to implement the discussed project in an effective and efficient manner, it is necessary to broadly analyse selected literature, both Polish and foreign, regarding the needs of older people and their activation in the era of Industry 4.0. At this stage, the people involved in the project will be required to become thoroughly acquainted with the subject of social exclusion of the sick and elderly, new research and publications related to their situation in the age of the COVID-19 pandemic, as well as innovative methods of activating seniors and multi-faceted development of their cognitive skills.

The next step is to build a special questionnaire that, as part of the public consultation, will enable a survey of people belonging to the target group of the project. In order to know the preferences of older people, questionnaires will be distributed in Nursing Homes, Retirement Homes, online forums for the elderly and through direct contacts. All answers will be collected and thoroughly studied. An important step will be an attempt to extract from the data received information that will affect the adaptation of the designed tool to the needs, interests and suggestions of the respondents.

It will also be obligatory to examine existing solutions in the field of improving the quality of life of elderly population, i.e. familiarize with already implemented projects to improve their situation, find and learn about applications, tools and advanced techniques created to improve their everyday functioning. This stage is also a suggestion by the project group of a tool that can be used to transfer technical content. Members will focus on designing the solution, ensuring its transparency and clarity so that this class of people will not have problems with its operation. In addition, the topics of lectures and technical talks will be edited on the basis of previously collected information. It is planned to create a list of books and articles that can catch the attention of these people and awaken their interests.

In the next step, it will be important to focus on reaching seniors and encouraging them to take part in the project. The project group will be looking for the opportunity to advertise their project on social media and social networks to encourage younger generations to involve their parents and grandparents in the activation of new technologies. Intended activities also include transferring the project to facilities for seniors and direct promotion of competence development in the field of skilful use of modern technologies.

The next stage will be an attempt to provide all content via the Internet. It is assumed that the elderly will actively participate in conversations, games and activities. The goal is also to establish a relationship with them that will overcome the feeling of alienation, help shape prosocial attitudes and that will be a positive factor in the learning process.

The platform has also economic benefits. It will contact organizations and enterprises dealing in the sale of articles for the elderly, intended for daily care and rehabilitation, which would be interested in cooperation and the possibility of placing ads of their products on the designed platform. In addition, when the platform is refined, it can be sold as a finished product to private Care Homes under a subscription or time license, due to the possibility of making your own data updates and continuous development of the presented content.

SUMMARY AND CONCLUSIONS

The project and the proposed tool have a big chance of success among the target group, because they perfectly fit into the current situation of seniors, who on the one hand are limited by the negative effects of the COVID-19 pandemic, and on the other are not yet able to use new technological advances. Social exclusion can be easily overcome if the elderly are not left alone, but if we approach them with the initiative of a simple but not monothematic transfer of new knowledge.

The implementation of the project is not only beneficial for a small group of seniors, but also for the whole society. It is a way of raising awareness and sensitizing to the needs of older people, who may have been pushed aside in the era of digitization and pandemics. Industry 4.0, apart from the industrial revolution, must also bring help by levelling opportunities and eliminating barriers for those who do not have current technical knowledge and adequate abilities to use electronic devices. The pandemic showed a low level of use of new technologies among older people, and a large number of people were virtually cut off from the world. The project in question is not just an idea. In the light of recent events such actions must be taken, because the interference of technology in the lives of societies is constantly increasing.

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Abstract: The progress of digitization and the development of new technologies undoubtedly bring many benefits. However, they can also create or deepen problems related to the social exclusion of certain groups of people, such as the elderly, for whom modern technology is still largely unavailable, and even arouses a sense of uncertainty and fear (the so-called technophobia). The consequences of such a phenomenon become particularly evident in the situation of social isolation, whose unprecedented dimension is currently observed in the so-called COVID-19 pandemic era. In particular, the occurrence of the phenomenon of social exclusion combined with a pandemic situation has contributed to the development of the assumptions of the project entitled "Developing the cognitive capabilities of older people through information technology." This project was developed by the INNOVATOR Student Science Club at the Faculty of Organization and Management of the Silesian University of Technology, and its goal is to develop a tool to support the acquisition of competences by seniors in the field of technological content, operation of electronic devices and the implementation of daily and routine activities using the Internet, e.g. shopping via the Internet or using tele advice services. The proposed tool is also to support the stimulation of the development of cognitive abilities of seniors using e.g. logical games. In the course of project implementation, a survey will be conducted in selected Nursing Homes, Retirement Homes, online forums for the elderly and through direct contact, the results of which will allow to learn the needs and possibilities of developing the abilities of the examined people, and assess the effectiveness of the designed tool in the process of transferring content and shaping competences. An element encouraging seniors to participate in the planned research will be their active participation in lectures and/or talks, workshops and discussions. The assumed result of the project will be to reduce the negative effects of isolation of seniors, improve their communication with their loved ones and reduce the generation gap. A complementary research task will be to develop a way to assess project results in qualitative and, where possible, quantitative dimensions.

Keywords: Internet, COVID-19, society, seniors, exclusion