

Architecture and Implementation of an Internet Platform for Activating Elderly People: Case Study

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Abstract: The issues related to elderly people are currently being studied by many disciplines, including biology, medicine, psychology and sociology. The problems that aging creates in societies are covered in different ways by scientists specializing in different fields. Social scientists focus on, inter alia, the social scope of activities carried out by elderly people. The said issues also fall in the areas of interest of professionals who create information systems and technologies dedicated to elderly people. Thus, what has been developed in order to meet their interests and to respond to a dynamic process of aging within societies is a concept of an ICT platform designed to increase the activity of elderly people. The platform is dedicated to members of local communities and it can be used to foster entrepreneurship, personal fulfillment and activation in the area of social life. The paper presents both the goals and the concept of such a platform as well as its information structure and model of implementation.

1 INTRODUCTION

For some time already we have been observing and also participating in changes of a socio-economic nature, which are taking place all over the world. What constitutes a catalyst for these changes are modern information and communication technologies (ICT). They contribute to significant transformations in almost all the areas of economic and social life. All of these phenomena together are known under the name of information society. In order to be an active and aware member of the said society one needs to possess proper competencies in the field of use of ICT. Yet, the lack of such competencies leads to digital exclusion (Tomczynska, 2017).

At the same time it is worthwhile to notice that demographic analyses of the population in Poland indicate that our society is aging very rapidly. What could be listed among the most important demographic changes occurring in the Polish society are the following phenomena (Statistics Poland, 2014):

- the reduction of number of Polish citizens (approximately by 4.5 million by 2050),
- by 2050 retired people will constitute almost 40% of the society (now: 21.5%),
- the average life expectancy is still growing, in 2050 it might reach the level of 82.1 years for men and 87.5 years for women,
- the median age of the population in 2013 was 39.1 but in 2050 it will be as high as 52.5,
- the demographic burden rate, which indicates the number of children (between 0 and 14 years of age) and of elderly people (at the age of 65 or more) per 100 people between 15 and 64 years of age, amounted to 58 people in 2013, and in 2050 it will be almost twice as high and, according to forecasts, it will amount to 105 people,
- the rate of prospective taking care of parents, which indicates the number of people at the age of 85 or more per 100 people between 50 and 64 years of age was 8 people in 2013, and it is estimated that in 2050 it will be 38 people.

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As a consequence of aging of the population, senior citizens are becoming one of the most numerous groups which are at the risk of digital exclusion. Therefore, in the process of building an information society, it is vital to undertake measures aimed at eliminating the said risk as well as stimulating and encouraging senior citizens to use ICT tools.

The purpose of this article is to present the influence of information technology on the transformation of the service model designed for people over the age of 50 and on their broadly understood professional and social activation. The article will also demonstrate the potential of ICT technologies on the market of services dedicated to elderly people. One of its goals is to present the concept of ActGo-Gate platform as a tool which activates elderly people, and it will particularly focus on its architecture and model of implementation in Polish conditions.

2 RESEARCH METHOD

This article constitutes an element of a series of publications written by the authors, in which they present the outcomes of the research activities conducted within the framework of an international consortium. The said consortium received a grant for financing a project as a result of the sixth international competition: Ambient Assisted Living (AAL) Joint Program. Within the framework of the AAL program, the authors' Alma Mater, namely Wrocław University of Economics, participated in the implementation of "Active Retiree and Golden Workers Gate" (ActGo-Gate) project. The project was aimed at creating an ICT platform designed to facilitate trade in services within its users' local communities, especially senior ones. It enables clients not only to search for, book and settle the services rendered but also to mutually offer such services (on a commercial or voluntary basis) one neighboring resident to another. The platform's objective is to increase the availability of various services as well as to increase the level of activation of senior citizens and to prevent their digital exclusion. The project was implemented with the active participation of representatives of local communities in Switzerland, Germany, and in Poland (Gryncewicz, Leszczynska, 2016).

Within the framework of the Polish part of the project the potential of the domestic market has been examined in the area of the possibility of the practical application of this kind of ICT solution. While

conducting their research, the authors of the article are examining the possibility of activating elderly people and improving their quality of life by applying modern ICT solutions. For that purpose, economic, social and technological conditions have been identified and described (Gryncewicz et al., 2018) (Leszczynska et al., 2016) (Butryn et al., 2015), a model of implementation of an ICT solution in this field has been suggested (Kutera et al., 2016), and the aspects of implementation have been presented in the context of the non-functional (Kutera and Gryncewicz, 2016) (Maciaszek et al., 2016) and functional (Rot et al., 2017) requirements, defined after the analysis of the target group was conducted as part of pilot implementations in Switzerland and Germany. Extensive quantitative and qualitative research on senior citizens in Poland has also been carried out and the outcome of this research has been presented in (Kutera et al., 2017). The tangible effect of the Polish research works is a number of papers, which organize knowledge in the field of service economy and underpin a business model of professional activation of elderly people in Poland.

3 THE POTENTIAL OF INTERNET TECHNOLOGIES ON THE SERVICES MARKET IN THE CONTEXT OF ACTIVATING ELDERLY PEOPLE

What can be observed in contemporary developed economies is a dominating role of the services sector. It has an influence on the other sectors and on the lives of individual citizens. Research proves that in the recent years the services sector has generated the greater part of GDP and employed the highest percentage of workers.

Advances in science and technology and the creation of new information-communication technologies play a crucial role in the transformations of this sector due to the newly developed ways of providing traditional services and due to new original services, which did not exist before.

The Internet is increasingly being used to distribute such services. However, the number of offers there is immense, what leads to the situation in which the decision is complex to make for the consumers and it is very difficult to find a suitable service provider. What constitutes an additional barrier for senior citizens is the complexity of

websites on which the offer is presented. Furthermore, such websites are not prepared in a way which would enable elderly people to use them easily (Rot, Kutera and Gryniewicz, 2017). They lack the possibility to increase the font size or to use a voice guide, which could facilitate navigation. It is also difficult to check the credibility of a service provider. Many senior citizens also need training or support when they order a service via the Internet for the first time so that they could break the barrier of fear related to the usage of modern ICT solutions, to the lack of trust to the service provider or to the mere lack of knowledge (Gryniewicz et al., 2018). Another barrier faced by the popularization of e-services among senior citizens is leaving the negotiations and ordering process to the client, what, due to the complexity, often discourages the clients from accepting the offer. Furthermore, ordering a service directly from the provider's website results in the fact that the client enters into relations exclusively with this one provider.

What has been created in view of the foregoing observations is a project which increases the availability of services among the members of local communities. The purpose of the project and the concept of ActGo-Gate platform dedicated to the distribution of services addressed at people above the age of 50 years was, first of all, a broadly understood professional and social activation. The ICT platform developed for the project enables via the Internet the aggregation of service providers who are capable of meeting the widest possible spectrum of needs (e.g. in the area of care providing and medical services as well as of educational, administrative, transportation, information-communication, leisure, home remodelling, and housekeeping services). The platform activates senior citizens within the already existing communities (senior clubs, universities of the third age), it explores their natural need of self-organization and of rendering mutual assistance, it enables senior citizens to offer their own services in the form of casual employment and at the same time it provides them with a safe usage environment of the ICT platform. The platform has a unified interface, which meets the needs of elderly people.

The concept of the platform has been developed on the basis of research conducted in countries of Western Europe. However, the aforementioned demographical changes indicate that the concept of such a platform matches the development trend of the Polish society as characterized above and it responds to its needs.

4 ActGo-Gate PLATFORM AS A TOOL OF ACTIVATION OF SENIOR CITIZENS

The aim of the characterized ActGo-Gate platform is first of all to activate senior citizens. The fulfillment of the platform's tasks and goals formulated in this way corresponds to the specifics of platform's users. Within the framework of the platform there exist three main groups (see Fig. 1). The first one is composed of end users (consumers), i.e. elderly people who offer their services via the platform in the form of barter (time banks, voluntary work) or on a commercial basis (part time job or a job under a contract of mandate if a given task is to be performed).

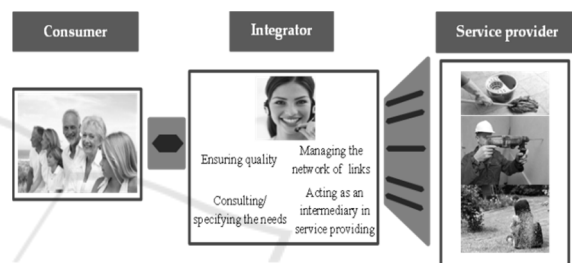


Figure 1: Groups of ActGo-Gate platform's users.

The second group is formed by service providers and employers who via the platform offer the ability of employment on a commercial or voluntary basis. The third user group is the integrator, whose task is, as the term indicates, to ensure integration between end users and service providers or employers. The integrator performs the function of intermediary, who faces the task of supporting elderly people in their usage of the platform (technical support, ongoing helpline) and who provides them with initial training in this area. The integrator also negotiates the prices of work/services and deals with their settlements in the entire community of users.

The concept of the platform is based on the model of integration of service providers and service recipients via an ICT solution with the participation of an intermediary, whose task is to coordinate the communication between the parties concerned and to secure the transactions from the organizational and financial perspective.

The functional structure of the system is composed of three modules (Leimeister, 2012). The first one is *Serve the Community Module* which activates the local community through offering and trading informal services of support to other community members. This refers to time banks or the

e-banking system for alternative methods of payment, which consist on the mutual exchange of support (“barter of services” – local exchange trading system). Next module is *Flexible Occupation Module* which focuses on local service providers and mature workers or active retired people who are willing to offer their services for consideration to the local community members or who are willing to start a part-time job. Third module – *Get Involved with Organizations Module* – integrates the local community members around social projects and which activates them in this field on a voluntary basis.

The described modules, together with the core platform, provide the users with a broad range of possibilities related to undertaking professional activity and enhancing social participation. Their architecture will be deeply discussed in the next section.

5 THE ARCHITECTURE OF THE ICT SOLUTION

The architecture of the ActGo-Gate platform involves 4 key components (Figure 2):

- Gate Application (AGG),
- Appointment Coordination System (ACS),
- Recruiting Service System (RSS),
- User Management and Identity System (UMIS).

Gate Application (AGG) constitutes a point of contact for all the user groups. It determines the appearance and behaviour of the responsive interfaces dedicated to end users, service providers and employers. Within its framework, the activities of particular users and the transactions executed via all the components of the platform are synchronized. AGG makes its Application Programming Interface (API) available and it uses the client's APIs in order to ensure full synchronicity of data and to provide the access to all the functions of the system. As far as the functional dimension is concerned, the most important task is to provide a tool for searching through the offers and for the management of the user's own ads with the application of navigation paths simplified to a maximum and with the clear, readable interface, which is adjusted to the perception of elderly people.

Clients (ACS and RSS) are the systems constituting autonomous Internet services, which deal

with specific forms of services and which provide necessary functionalities such as the appointment coordination (in the case of ACS) or recruitment (in the case of RSS). As mentioned above, they have their own APIs, which provide the current data and functionalities required by AGG. Clients have inbuilt email notification (and, additionally, text message notification in the case of ACS), which, in both cases, was extended by sending notifications to AGG. In particular, Clients provide the functional modules of the platform with functionalities. These functional modules are:

- *Serve the Community Module*, which is provided by ACS and which offers the ICT support for the mutual exchange of services performed by the citizens for the citizens, including the barter trade of services. It also supports service providers in the process of matchmaking consumers with service performers due to the partial automation of tasks, in particular autodispatching of appointments. The intermediary, who has their own Personal Consumer Address Book, orders the services on behalf of other users.
- *Flexible Occupation Module*, which is provided by ACS and which allows the services to be provided by elderly people on a commercial basis in a form of a part-time employment. The module facilitates finding people who need help through browsing demands, which can be defined as descriptions of the character of the assistance needed. The response to the demand generates another appointment, which can be managed according to the planned process of the demand-driven appointment coordination. The support in the matchmaking provided by the intermediary is available because of the possibility of acting to the benefit of other users, i.e. in the field of order placement and appointment coordination.
- *Get Involved with Organizations Module*, which is provided by RSS and through which it is possible to offer services on a voluntary basis. Volunteers can apply to given volunteering projects and the system supports the organization which carries on a given project by conducting the recruitment process and by selecting the most adequate candidates. The system also provides the volunteers with technological and factual support in the field of creating their CVs and it actively supports the process of selecting offers suitable for a given volunteer.

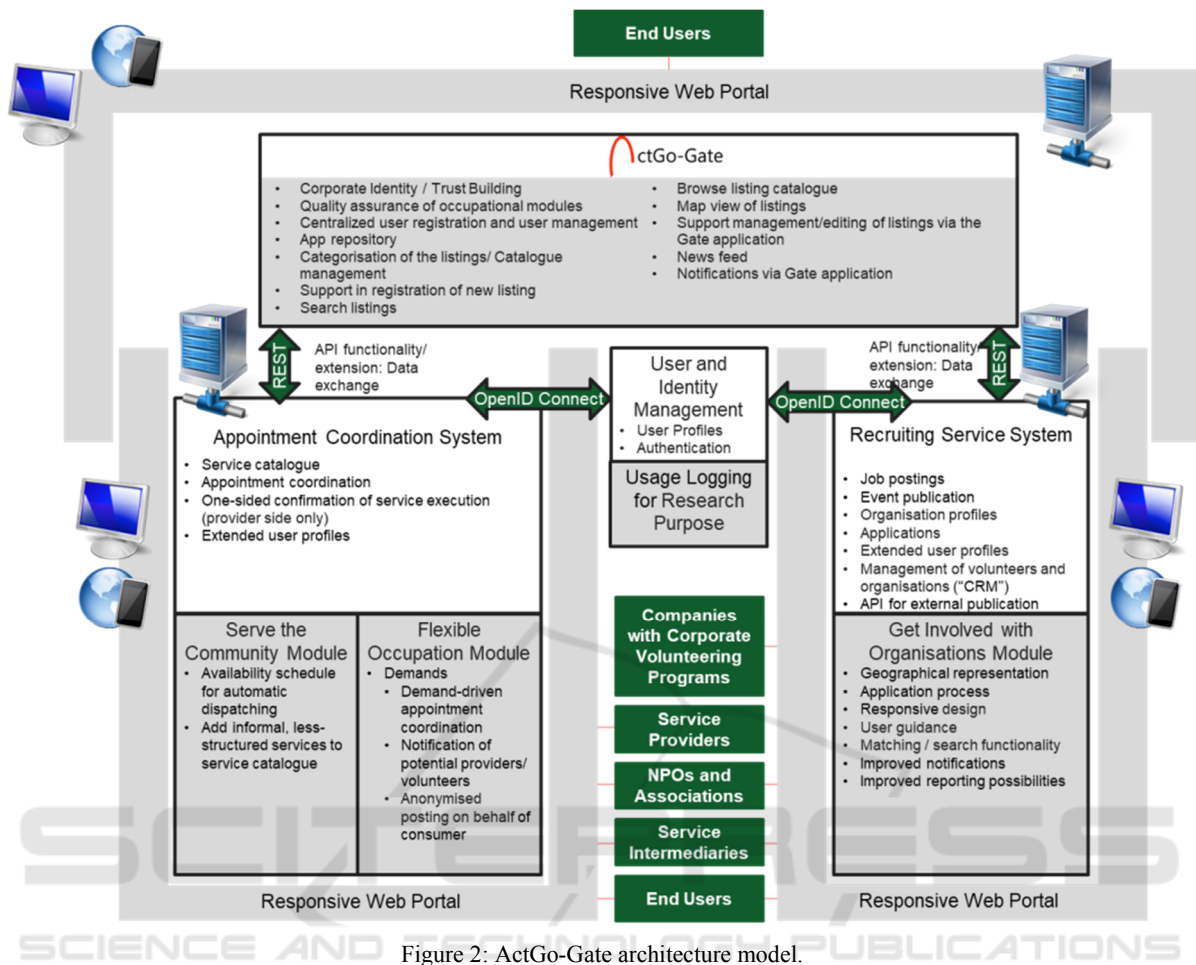


Figure 2: ActGo-Gate architecture model.

The User Management and Identity System (UMIS) provides ICT tools which facilitate users registration, collecting and processing their data, and user authentication, i.e. providing information on the identity of the users. The latter function is performed due to the application of the OpenID Connect authentication protocol. What constitutes an unquestionable advantage of this technology is a considerable degree of separation of the user data and of the processes related to the management thereof from the other ICT systems, what results in the data security improvement. Furthermore, because of such a solution, the entire platform is very interoperable and therefore it is easily extendable by new clients, whose task is to provide complementary services to the platform's current offer.

It should be emphasized that the architectural construction of the core platform makes it possible to offer services/work with the interface unified for all its users (Rot et al., 2017). Furthermore, from the user's perspective professional and informal services are visible as one integrated, unified portfolio.

The platform is available via such devices as tablets or smartphones. It provides elderly people with an easy and quick access to described functionalities and modules. The interface which is offered as part of this component is ergonomic, i.e. it is tailored to the needs and perception of elderly people and it provides a wide range of customization possibilities, thus it adapts to the user's individual preferences. The mentioned technology is used to document, confirm, and authorize the activities conducted by the end user on ActGo-Gate platform, e.g. through fingerprint recognition.

The responsive web portal integrates the aforementioned components of ActGo-Gate platform into one point of contact for all the user groups. It determines the appearance of the interfaces of the mobile clients for end users as well as for service providers and employers. The portal enables the synchronization of activities of particular users and of transactions realized through all the platform components. What also takes place with the application of the portal is the integration of the

already used systems of service providers and employers (Lopacinski, et al., 2018).

6 THE MODEL OF IMPLEMENTATION OF THE ICT PLATFORM ACTIVATING SENIOR CITIZENS IN THE POLISH CONDITIONS

The concept of a business model of activating elderly people with the application of an electronic platform includes (Leszczynska, Lopacinski, Gryncewicz, 2017):

- The main roles of the stakeholders engaged in the activation of elderly people.
- Key relations between the roles, including the activities conducted by one party to the benefit of another, and also all the cash flows which enable proper functioning of the model under market conditions.

Figure 3. presents a graphical representation of the model.

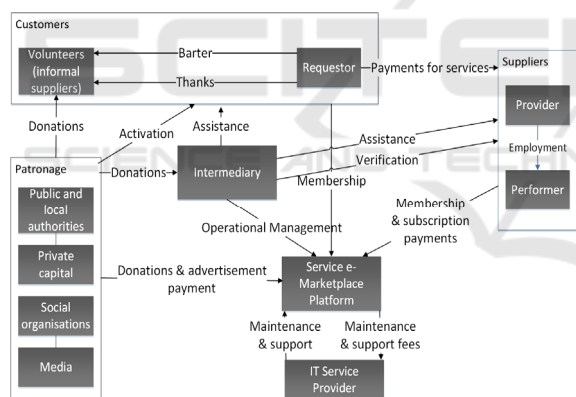


Figure 3: ActGo-Gate platform business model.

What constitutes the central part of this model is an electronic platform for services market, which is provided by the ICT services provider, i.e. the software provider in the Software-as-a-Service (SaaS) model (Maciaszek et al., 2016). This entity is responsible for the preparation and configuration of the platform, the ongoing technical support and maintaining the system within the framework of their server infrastructure. Importantly, the platform is an integrated solution due to the fact that it offers an easy and non-invasive integration to external Internet services (known as client services) directed at providing information on employment possibilities

and service offerings. The platform aggregates data from many client services. It provides key functionalities related to browsing, ordering, coordinating dates, rendering, and verifying services. Service providers render necessary professional services to elderly people. The platform brings them tangible benefits resulting from the access to ICT tools for managing their commercial activities and to a large group of potential consumers of their services. Service providers pay for the usage of the platform in the form of a subscription or commission fee. Within the framework of this group, service providers represent those who manage organizations which render services, who are in charge of defining the services and the conditions of their supply, managing the staff, as well as of allocating the tasks between the suppliers of services. The latter are responsible for rendering services for a given ordering party. The ordering parties and voluntary workers constitute a group of clients who are original users of a platform in the discussed business model. They are usually elderly people, or people working to the benefit of elderly people in a particular field, e.g. adult children who provide care for their elderly parents. The ordering party attempts to acquire a service which responds best to their needs as to its subject-matter and which will be rendered in a given place and time. The time will be defined in the process of coordinating dates in cooperation with the other party (with the service provider). Voluntary workers search for the possibility of engaging themselves in a voluntary project or of rendering a one-time service free of charge for the ordering party, who first defines their need for a given type of work/task. It is worthwhile to mention that the roles of voluntary worker and of ordering party can be performed interchangeably by the same person, depending on circumstances. If the state of health of an elderly person constitutes an impediment to their ability to carry out a certain type of work, they can use services provided by professionals or voluntary workers. At the same time, this elderly person can provide voluntary services which are suitable from the perspective of their health to other elderly people. Such an approach explores the natural need of self-organization and of rendering mutual assistance, which the elderly people have, and which was identified as a result of the qualitative research (aforementioned in “research method” section of this paper).

The party which plays a crucial role in this model is the intermediary. Its key task is to create a safe environment of using the ICT platform for senior citizens. Furthermore, the intermediary is in charge of

organizing the market through supporting the clients and service providers with each transaction. It provides the users with the technical and substantive support during their attempts to order a service on their own. It is also responsible for carrying out the duties of the parties to a given transaction. In the second case, the intermediary, while acting on behalf of the client, orders a service via the platform and negotiates the dates of its rendition, or defines the need for the service and selects the best voluntary service supplier. The function of intermediary can be performed by the already existing communities and organizations which activate senior citizens, e.g. universities of the third age. What is indispensable in order to make it possible, is the financing coming from public and private sources. Apart from the income from the subscription fees, the financing can be obtained from a group of patrons, such as state and self-government authorities or private sponsors, whose statutory objectives correspond to the objectives of the discussed business model, i.e. their aim is to focus on the professional activation of senior citizens. This group, complemented by the media and non-governmental social organizations, plays a significant role in the area of activation and promotion, which is performed with a partial participation of the intermediary.

A business model developed in this way concentrates on the subject of the market connected with the platform, directed at activating elderly people in the area of their professional life.

7 CONCLUSIONS

Supplying the market with an advanced platform integrating providers of services dedicated to people over 50 years of age and employers who are willing to hire the representatives of this age group in the form of a part-time job on a commercial or voluntary basis on one hand, and the recipients of those services/tasks, i.e. people who are over 50 years old on the other, constitutes a comprehensive response to the needs of the indicated age group. The introduction into the model of the intermediary, who provides elderly people with the assistance in the area of price negotiations, settlements, and verification of service providers and employers, solves the problem of senior citizens' mistrust of the service providers unknown to them and eliminates the problem of dishonest users. Additionally, the platform enables end users concerned to communicate with one another (chats, blogs, videos, phone calls) and to exchange opinions on services/tasks in order to

reduce their inner anxiety, fear, or concern related to the new and unknown.

New forms of distribution of services might improve the quality of life of elderly people quite significantly through alleviating the burden of everyday chores and via social activation due to the assistance in the usage of a wide range of social-cultural services and due to providing senior citizens with the possibility to render services to other people.

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