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**ASSESSMENT OF SMART TECHNOLOGIES IMPLEMENTATION
IN CHALLENGED PEOPLE LIFE IN TOMSK**

Marina A.Makienko (a), Igor B. Ardashkin (b), Alexander Y. Chmykhalo (c)*

* Corresponding author

(a) National Research Tomsk Polytechnic University, 634050 Tomsk, Russia, mma1252@tpu.ru, 8-913-852-44 23

(b) National Research Tomsk Polytechnic University, 634050 Tomsk, Russia, ibardashkin@tpu.ru

(c) National Research Tomsk Polytechnic University, 634050 Tomsk, Russia, sanichtom@inbox.ru

Abstract

The relevance of this work is caused by the fact that the technology assessment should contribute to sustainable global development, as well as help research and technology to remain socially-oriented. The interaction between science and society is extremely important for both sides: it is essential for scientists to have a motivation for their research, the final goal of emerging technologies application; and for society that consumes these technologies it should be clear how to use them efficiently and safely. Results present the first stage in the formation of social assessment of Smart-technologies, applied to the organization of challenged people life. The subject of the research is represented by challenged people, who should be fully integrated into social life. The authors pay special attention to the topic of the necessity to establish an appropriate environment in the context of realization of Smart-city concept. The main directions of the organization of Smart-city for challenged people are determined. The authors analyzed the possibilities of Smart-city formation in Tomsk (Russia) in order to establish accessible environment for challenged people. The barriers which hamper the creation of Smart-city are determined and classified according to the following criteria: Smart-Economy, Smart-technologies, Smart-management, and SmartGridSystems.

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1. Introduction

The relevance of the research topic may be formulated according to global and Russian trends in the demographic structure of population. Global trends, associated with changes in the social structure,



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display the increase in the number of people with special needs. It leads to the increase in contributions to various insurance funds and to the reduction in the amount of payments and social guarantees. It is possible to find the solution to this problem through the active participation of people with special needs in social life. The main types of social activity may be divided into labor activity, leisure activity and activities of daily living and family. The activating of various kinds of social activity is possible by means of modern technologies. Butan active introduction of technologies into human life and activities demands the understanding in the context of **technology assessment**.

Social **technology assessment** was formulated as political research aimed at better understanding of consequences of existing technology enhancement or new technology adoption with the focus on unplanned and unexpected consequences. The main aspects of social technology assessment, formulated by National scientific fund, include the following items (Grunwald, 2002):

1. Issue investigation;
2. System alternatives determination;
3. Possible impact identification;
4. Impact assessment;
5. Identification of a decision-making system;
6. Alternatives identification for a decision-making system;
7. Interested parties identification;
8. Macro system alternatives determination (determination of other ways in order to reach the intended goal);
9. Identification of exogenous variables or events, which potentially may affect items № 1-8;
10. Summing-up and recommendation formulation.

Expected results or consequences of successful social technology assessment:

- Project change in order to reduce losses (damage) and / or to increase benefits;
- Regulatory or control requirements determination;
- Determination of the technology surveillance program in the course of its operation;
- Stimulation of research and developmental works for:
 - More reliable determination of risks;
 - Prevention of expected negative effects;
 - Identification of alternative methods of technological objectives achievement
 - Identification of remedial measures for negative effects;
- Assessment of control need;
- Technologies development support in new areas;
- Determination of necessary institutional changes;
- Contribution made by all interested parties;
- Identification of new benefits;
- Determination of experiments on interference;
- Postponement of a project;
- Determination of partial or incremental implementation;
- Prevention of technology development.

2. Problem statement

The number of people with special needs in Russia was stable during the 2010s, accounting for 8-9% of total population. In absolute numbers, in Russia, the quantity of people with special needs in 2016 accounted for 12751 thousand of people (according to Federal State Statistics Service <http://www.gks.ru/>). Tomsk region is an area where the number of people with special needs is below the average. In Tomsk region, at the beginning of January, 2015, the number of people receiving pension according to their physical disability was 62,738 people or about 6% (Federal State Statistics Service).

The main reasons for disability in Tomsk region:

1. malignant neoplasms - 26 %
2. diseases of the circulatory system
3. ear diseases
4. mental disorders
5. musculoskeletal system diseases.

The main problems of challenged persons (according to World Health Organization <http://www.who.int/en/>) are:

- Inadequate policy measures and standards (the needs of challenged persons are not always taken into consideration, existing policy measures and standards are not put into practice).
- Negative attitude (prejudices that contribute to barriers formation). Lack of services. Challenged people are more vulnerable to the scarcity of services such as health care, rehabilitation, support and assistance.
- Problems of service supply. Poor coordination of services, inadequate staffing and low staff training can affect the quality, availability and adequacy of services for people with special needs.
- Lack of financing.
- Lack of access. Many buildings and transport systems and information are not accessible for everyone.
- Inadequate information and communication. There is little information in accessible formats, and needs of challenged people in the field of communication are not filled. Challenged people use information and communication technologies less than non-challenged people. In some cases, they may not have access even to basic products and services such as telephony, TV and the Internet.
- The lack of consultation and involvement in social life. The majority of challenged people do not participate in decision-making processes on issues that directly affect their lives.
- Lack of data and experience. The lack of exact and comparable information on challenged people.

These problems largely correlate with problems raised by Russian researchers. Among the urgent problems of Russian challenged people, we may name the following:

- employment (the number of unemployed challenged people of working age is 2.6 million people - nearly 80%);
- problems with medications for challenged people,
- lack of accessible environment for mobility,

- low disability benefits or low allowances for care of a challenged child,
- shortage of artificial limbs of good quality, wheelchairs and spare details for them, the absence of domestic production of techniques for challenged people.

3. Methods

During the course of the research the possibility of Smart-technologies implementation for life arrangement of challenged people in Tomsk was considered. The peculiarities of the region are represented by higher education institutions of regional and international level, the development of modern enterprises, running within the scope of innovative zone of Tomsk and the activity of scientific-research institute.

In this research the method of **technology assessment** was tested in the context of Russian reality. It is necessary to note that in Russia this method on this particular stage may be implemented with several limitations: it is not intended that public authorities will be involved in the making of final decision on the choice of one of possible options. (English part).

For an objective description of challenged people situation, the analysis of statistical data posted on the official site of the Health Department of Tomsk region (<https://zdrav.tomsk.ru/>) is used. The criteria for the assessment of Smart level in any city are determined by the methodology of Lombardi. This methodology includes 60 indicators, grouped into separate spheres: smart economy, smart people, smart management, smart environment, and smart life (Lombardi et al., 2012).

A variety of approaches to the understanding of social assessment components exist, for example, qualitative and quantitative methods of research. Within the framework of these approaches, different components of social technology assessment may be grouped. Within the context of this article, the authors focus their attention on the results of the research according to the first item «Issue investigation». According to the authors, this item presupposes the investigation of three components: situation assessment; the ways of purpose achievement; barriers, hampering the achievement of a purpose.

4. Results

The content of legislation on the solution of challenged people problems and offered opportunities:

In accordance with Russian legislation, the social support of challenged people includes (Albino, Berard, Dangelico, 2015):

- Accommodation provision (living rooms should be equipped with special tools and devices in accordance with the individual rehabilitation program of a challenged person)
- Social disability pension
- Monthly payments to challenged people
- A set of social services (medication and medical devices, vouchers for sanatorium-resort therapy, free transportation to the place of treatment)
- Social benefits to challenged people
- Compensation payments to challenged people
- Social home care

In 2012, Russia ratified the UN Convention on the Rights of challenged people (Federal Law №181-FL from 24.11 1995 «On social protection of challenged people in the Russian Federation»). In this regard, the program «Accessible environment in regions» was launched. As the part of the program, the following indicators and targets were formulated.

4.1 Barriers

The assessment of the possibilities of Smart-city formation in Tomsk in order to organize accessible environment for challenged people is determined by the method of Lombardi composed of 60 indicators (Lombardi et al., 2012) grouped into separate spheres: smart economy, smart people, smart management, smart environment, smart life, which in its turn are decomposed into more specific indicators.

At the initial stage of the research, in terms of Russia and in the context of this perspective, these indicators were decomposed as follows:

Smart Economy: a number of projects for the implementation of Smart-technologies, the availability of projects for challenged people, entrepreneurial initiative of Smart-technologies creation;

Smart people: the level of computer skills of an individual, the individual level of Internet system skills, the individual level of skills in terms of modern technologies usage;

Smart management: the existing e-government system; challenged people self-management, the civil society system;

Smart environment: the use of energy-saving and environmentally friendly technologies, renewable energy sources; (Smart environmental and energy initiatives (e.g. recycling, waste recuperation) - act as engines for ecologically benign strategies)(Technologies of opportunities);

Smart Life: the number of schools, universities, theaters, cinemas, museums and libraries, available for challenged people.

On the basis of these indicators analysis, it was possible to reveal the following barriers in the use of the Smart-city potential in organization of accessible environment for challenged people.

The barriers may be grouped as follows:

According to Smart-Economy criterion: In Russia, the projects on Smart-home creation and the use of Smart-technologies in medical care are being implemented ("smart hospital ward"); there are initiatives on Smart-technologies development (software «Technologies of opportunities», regular conference «Things of Internet»). But it is necessary to point out the following principal problem: the income of challenged people (from 4215 to 16000 rubles) does not promote the use of the Smart-technologies system. For example, the creation of «smart studio apartment» will cost from \$1665 to \$17,434 (from 116,550 to 1,220,380 rubles.).The prices do not include the conversion of an apartment in order to meet the needs of people with reduced mobility and services for them. Taking into account one-time expenditures for the installation of Smart Grid technologies components, it can be argued that for ordinary consumer the usage of these technologies is not available without additional help (Toft, Schuitema, Thogersen, 2014).

4.2 Barrier: economic availability of Smart-technologies

According to smart-people criterion: according to the research carried out by Yandex company ("Development of the Internet in Russian regions"), 68% of the population aged over 12 years regularly

use the Internet. The increment in the number of users is due to the spread of the mobile internet among people under the age of 35 years and due to the increase of users of older age groups. In Russia and in Tomsk, in particular, free computer courses for seniors are regularly held.

Nevertheless, nearly one third of the Russians do not use the Internet, and accordingly, Smart-technologies are not available for them. The category of people who do not use the Internet includes mostly people over 64 years who do not have higher education, senior citizens; people with limited employment and low-income people.

4.3 Barrier: computer literacy, economic availability of Smart-technologies

According to Smart-management criterion: Russia has a system of e-government (<https://www.gosuslugi.ru/>), whereby it is possible to get a significant set of public services, for example, in the following areas: family and children; passport, registration, visa; transportation and driving; education; taxes and finances; health, medication, medicine; pensions, allowances, benefits; licenses, certificates, etc.

But in the organization of life of challenged people, this system allows only disability declaration, but does not abolish personal visits to government services. In addition, in Russia in general and in Tomsk, in particular, there are no health monitoring systems allowing transmitting and collecting data on health of challenged people (Ardashkin et al., 2015).

Barriers: The lack of health monitoring systems allowing transmitting and collecting data on health of challenged people. There is a need for personal visits of governmental service agencies. As for various communities in Tomsk, there is a significant number of nationwide organizations (All-Russian Society of Challenged People, All-Russian Association of Blind people, and All-Russian Association of Deaf people) and local organizations (Regional public organization of invalids of local wars, the Russian Red Cross, Tomsk regional department, etc.). In addition, there is a variety of charitable and philanthropic foundations, which render assistance to specific groups of people, such as children's "Ordinary Miracle" Charity Foundation, a non-governmental public organization "The Flame", etc.

4.4 No barriers

Smart-environment criterion: Smart Grid Systems implementation requires corresponding political and legal instruments regulating capabilities and responsibility of a supplier, a user, and service structures. In addition, the appropriate technological infrastructure is necessary; at least, the network infrastructure of the local power system, infrastructure that promotes the use of renewable energy sources of relevant mindset (Chmykhalo, Khaliulina, & Abushaeva, 2015; Chmykhalo, & Khaliulina, Mikhailova, 2017).

In Tomsk, there is state program "Energy Efficiency in Tomsk region» (Ivanova, & Mertins, 2015). The objectives of this program are: 1. The increase in the use of local renewable resources in Tomsk region economy (achieving the criterion - to keep their volume up to 9.64 % -by 2020). 2. The improvement of energy supply and network organizations efficiency in Tomsk region (achievement criterion - to reduce fuel consumption for thermal power generation o.e. / kWh from 301.9 in 2015 to 301.4 in 2020). 3. The development of gas supply.4. The increase in energy efficiency in the transport sector.5. The coordination of the energy saving reform in Tomsk region (efficiency criterion - the amount of attracted extra-budgetary funds - 3.61 million for the period from 2015 to 2010).

It is possible to name the following barriers:

- economic availability of Smart-technologies;
- computer literacy;
- the lack of health monitoring systems allowing transmitting and collecting data on the health of challenged people;
- the need for personal visits of governmental service agencies, which is usually presented as a barrier for challenged people;
- the lack of epyprogram, aimed at worldview attitudes formation of Smart-environment basis;
- the lack of interest on the part of private and governmental organizations in Smart-environment development.

5. Conclusions

These results present the first stage in the formation of social assessment of Smart-technologies, applying to the organization of challenged people life. The authors define the two main directions of development of this topic: the analysis of further points making up the social assessment of technology and the investigation of the educational component, allowing formation of an appropriate mindset of future engineers.

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