Do I Need IT? Russian Pensioners' Engagement with Information and Communication Technologies

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Abstract. Digitalization of industry and everyday life leads to the need for wider adoption of information and communication technology (ICT) skills. Although today's education does focus on IT competences, they were largely inaccessible for the people who are now nearing the retirement age or older. Correspondingly, only about 1/3 of people from this demographic group report the mastery of even basic IT skills, which suggests that the notorious age-related digital gap still persists. Meanwhile, competence in IT is required for both more successful and flexible employment (which is particularly important in the light of the pension reform ongoing in Russia) and for continuous usage of computerized cognitive training (CCT) programs. In our paper we study IT competences in pensioners and people approaching the retirement age and report the results of two surveys that we ran with a total of 295 elder participants. Our results suggest that in the socially active group of seniors the reported computer usage is comparable with more traditional household and dacha-related activities. In the general population, however, people aged 50 and over show relatively little interest towards improvement of their IT skills. We outline some measures for greater engagement of pensioners with ICT, which can ultimately contribute to long-term improvement of their cognitive functions and preventing age-related dementia.

Keywords: Human Resources, Social-Economic Status, Cognitive Status.

Introduction

The gap between different generations' knowledge and skills remains significant even as the world is supposedly becoming "flat". With age, it becomes more challenging for people to accept novel things, to remain flexible, to reject methods and techniques that used to be effective in the past. Meanwhile, the number of retired people in Russia is increasing: prior to the pension reform in 2019, the average growth was 1% per year and the total number was approaching 50 million people. Correspondingly, the studies of employment and work activities in elder people are gaining extra momentum in advanced countries, as life expectancy and the share of seniors in the population are increasing in all of them.

Information and Communication Technologies (ICT) are widely recognized as effective means for supporting physical well-being in elder people, but the cognitive aspect should not be underestimated also. Some researchers see ICT as the instrument for broadening the horizons, acquiring new skills and seeking new interests [1, 2]. The others emphasize the need in overcoming technical difficulties and accessibility of various forms of network interaction (e.g. e-communication for medicine, education, etc.) [3, 4]. There is actually ongoing discussion whether the impact of ICT on elder people's health is ultimately positive, as the negative effects include for instance increased stress [5-6].

In any case, the ubiquitous development of ICT led to the diffusion of the related IT competences, in both work activities and at home. But age is generally negatively correlated with ICT competence level, although the latter is also affected by the culture, education, IT infrastructure, economic environment, and other factors. Greater adaptation of elder people to the new technologies would let them maintain their work abilities (which are increasingly vital in the light of the pension reform in Russia) and improve the general quality of life. Moreover, computerized training can help in saving cognitive functions and preventing age-related dementia: numerous data related to the cognitive training of information selection speed, various components of attention, memory, and their comprehensive enhancement programs suggest not only short-terms effects of training, but also long-term improvements. The latter are accompanied by the structural and functional changes in the cortex and hippocampus, as well as changes in the activity of the mediator systems of the brain, which leads to adjustments not only in the cognitive, but also in the emotional state [7-9]. The leading role of behavioral and social factors is highlighted by the findings about positive effect of cognitive training combined with aerobic training of physical activity [10]. The protective effect of such training is also supported by the data of genetic, bio-chemical and Magnetic Resonance Imaging analyses.

Still, despite the noted positive effect of the computerized cognitive training (CCT), only 10-12% of elder people are prone to systematically exercising its program [11, 12]. It seems that the situation could be improved by changing the social norms of prestigious behavior and development of web resources dedicated to cognitive stimulation, customized for effectiveness for personal features of users of different ages. So, our article is dedicated to the study of IT competences in pensioners and people approaching the retirement age, with respect to the barriers for wider ICT usage. This involves the following contributions (the sample in our studies were the elder people residing in the Siberian Federal district, mostly in the city of Novosibirsk):

- assessment of elder people's adoption and interest towards IT-related skills and activities;
- identification of elder people's habits in personal usage of IT;
- identification of the relation between the level of IT competences adoption and career history for pensioners and those who approach the retirement age;
- testing the hypothesis that self-satisfaction with IT skills is high in elder people.

The rest of the paper is organized as follows. In Section 2 we overview existing research works related to IT competences in general and how the elder people use or can better use them for their benefit. In Section 3, we describe the methodology of two surveys that we ran with a total of 295 Russian people of pre-retirement and retirement age, while in Section 4 we present the surveys' results. In the Conclusions we summarize our findings and make proposals for the further work aimed on wider engagement of elder people with today's ubiquitous ICT.

1   Related Work

1.1   IT Competences in Digital Economy

Our literature review of related works suggests high interests of researchers towards the influence of digitalization on work career, employment and population's health. Joseph Quinn and his co-authors notice that the current demographic and economic changes have significantly increased risks of the future pensioners that causes workers in the USA to remain professionally employed until later age than before [13]. Berkelaar & Buzzanell have introduced the generalizing concept of *digital career capital*, which is implicitly monitored by employers and becomes progressively more important in human capital in general [14]. About a decade ago yet another related term was introduced (see e.g. in [15]): *digital competence*, which represents more broad conception of knowledge and work skills. In its elementary level, modern workers must be able to use computers, mobile devices, work with software and apps in their professional domain, and use the Internet.

Approaching from the other side, Frey & Osborne considered how workplaces are subject to computerization and forecasted its forthcoming impact on the labor market in the USA [16]. Particularly they focused on the analysis of risk for the number of jobs and the relation between probability of a job computerization, the wages, and the education level. OECD's publication "Skills for a Digital World" (2016) considers the close interconnectedness of the processes in the digital economy, including in the aspects of skills, training and labor. It was also repeatedly noted that the digital environment and workplaces, which are not bound to a particular time and space, require new competences and qualifications.

At the same time, the digital environment becomes integral part of the developing health care and social security. Thus, IT needs to be mastered by broad strata of future workers of different professions, not just the ones related to the actual ICT domain. According to the well-established approach by Jens Rasmussen (1983), the human performance models can be divided into *Skills*, *Rules* and *Knowledge*, depending on if routine or novel tasks are performed by workers [17]. The *knowledge* model is recognized the most demanded in the context of the digitalization of economy and the communications. Let us illustrate some professions in Russia that imply different levels of mastery of ICT and the corresponding different performance models (Table 1).

Table 1. Examples of professions with different manifestation of IT competences
(in the Russian labor market)

N	IT competence level	Examples of professions	Performance models
1	Medium or high ICT mastery	Accountant, engineer, scientist, programmer, system administrator, financial analyst, broker	Knowledge
2	Some elements of ICT mastery	Operator, seller, teacher, educator, consultant	Rules
3	Does not imply mastery of ICT	Handyman, loader, driver	Skills

1.2 ICT and the Elder People

The analysis of the age structure of ICT professionals in Russia in 2018 suggested that among the high qualification specialists 7.0% were older than 50, and 0.8% were aged 60-72. In the medium qualification level a) technicians: 11.8% were older than 50, and 1.6% were aged 60-72, b) electronics specialists: 30.2% older than 50, and 6.9% aged 60-72. Of the qualified ICT "blue collars", 29.0% were older than 50, while 6.1% were aged 60-72 [18].

In today's environment, mostly high level of IT competences is required to implement the *Knowledge* performance model. This situation started in 2000s, while previously the set of competences for the *Knowledge* model was different, and the model itself was not in such high demand. Accordingly, people of pre-retirement and retirement age who are still employed have difficulties in responding to the labor market requirements and update their competences. The results of a study of Russian researchers aged 50-70 by G.L. Volkova suggest that in this demographics the most popular form of advanced trainings is specialty courses, while the second most popular form is computer courses. For the researchers aged 30-49, computer courses were already in the third place, while for the ones younger than 29 they were the least popular form [19]. Thus the demand for updating computer skills and IT competences in general is the highest in the people of pre-retirement and retirement age.

In 2018, researchers from the Institute for Statistical Studies and Economics of Knowledge of the HSE conducted a study of households with regard to the Internet skills [20]. In it, they introduced an integrated indicator of various actions on the network, which included:

1. Being a part of social networks
2. Sending/receiving emails
3. Phone and video chats online
4. Searching for information about goods and services
5. Uploading personal files to websites, social networks, cloud storages for public access
6. Searching for information related to health or medical care services
7. Performing financial transactions
8. Buying/selling goods and services on the Internet

9. Downloading software
10. Online learning

With respect to the performed actions, four levels of Internet skills were identified: basic (1-2 actions), intermediate (3-4 actions), high (5-6 actions) and advanced (7-10 actions). According to the survey (2018), 33% of the participants had basic level, while 32% had intermediate level. The results that were obtained for the people of pre-retirement age are presented in Fig. 1. For male participants the share was notably higher, while with age it decreased, and on overall less than 36% possessed at least basic skills among the pensioners.
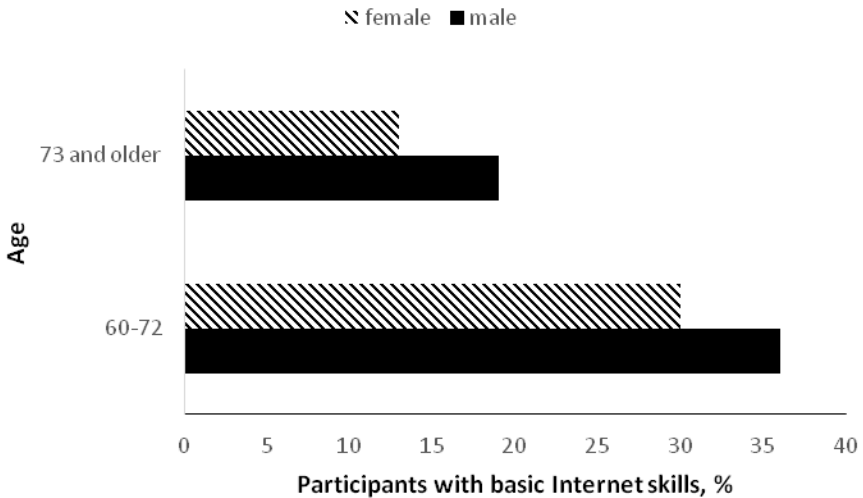

Fig. 1. Share of the elderly survey participants with basic internet skills (Russia, 2018) [2]

The results of a somewhat similar survey of pensioners in the USA suggest that the age-related *digital gap* that persisted already a decade ago (see e.g. in [21]), still endures. The level of ICT mastery was found to be affected by the levels of education, income, and the social-economic status [22]. Meanwhile, ICT for the elder people potentially imply the following benefits:

- Instrument for obtaining knowledge and learning new skills, which contribute to better cognitive status and the quality of life,
- The means for barrier-free communication, both social and with various organizations;
- The mechanism for maintaining and improving health status.

1.3 Effect of Cognitive Training Programs in the Elderly

Organizational difficulties and the increasing expenses associated with population ageing in developed countries support the relevance of preventing age-related devel-

opment of cognitive dysfunctions [23, 24]. The use of internet technologies is learn-ing for children and young adults is a given and is beyond doubt, although some prob-lems related to computer addiction and the changes in the structure of thinking, espe-cially speech functions and social communication, are noted [25]. The effectiveness of cognitive training for the elder people is still being discussed, particularly in the aspect of transmission of the results to succeeding in everyday activities [26, 27]. Still, the positive effect of the training for mental health and functional status of the brain has been proven in both psychometric and neurophysiological research works (e.g. [27, 28]).

ICT skills in elder age are prerequisite for using the computerized training of atten-tion and memory, which is lately extensively used for activating cognitive reserves of the brain in the context of atrophy of neurons that grows with aging and the resulting violation of the brain's functional systems [8, 23, 30-32]. For that end, both dedicated software and various types of computer games are employed. The systematic training allows to improve the speed of motor reaction and visual discrimination, the functions of working memory and attention, as well as to increase the efficiency of more com-plex planning and strategic thinking operations [33-35]. Several hours of the training have been found to improve the above indicators and even intelligence in general. Neurophysiological research has shown the compensatory development of structures and functions of different areas of the frontal cortex as a result of working memory training [36]. It is noted that already 10-hours computerized training in thinking flexi-bility for the people aged over 65 caused improvement in solving various cognitive tasks, including ones that were not presented in the training, as well as prevented the decrease in the quality of life 5 years later [37]. Still, better results are noted from longer training [38, 39], for which both the trainee's mastery of IT skills and interest towards the training and the software's usability are essential.

However, despite the many psychometric and neurophysiologic proofs of the cog-nitive training's utility for recovering speed characteristics of mind and memory in the older age, this technology so far does not see ubiquitous usage, due to several psychological and organizational factors. For instance, we previously found in our survey of elder women attending computer courses in People's Faculty of Novosi-birsk State Technical University (NSTU) that the priority of cognitive activity was low in the motivational inductors profile [11]. Only 20% of the elderly students took part in the cognitive training program that we implemented in the dedicated online software, and only 8% of the pensioners completed 20 sessions or more. Insufficiently vigorous usage of the proposed online technology can be associated with age-related weakening of the activity initiation functions due to age-related changes in brain structures, especially the prefrontal areas of the cortex [12, 23, 40, 41], as well as with low levels of IT skills that we also discovered in the survey with that group of older students.

So, a large body of inter-disciplinary research supports the increasing importance of IT competences in shaping the digital career capital, in the usage of digital envi-ronment, preservation of mental health and functional ability of the brain, which is particularly important for elder people. However, our overview of the related data for Russia suggests that people in pre-retirement and retirement age do not possess suffi-

cient knowledge and skills in IT. To analyze the degree of IT adoption for this demographic group in the non-capital city of Novosibirsk, we ran two survey studies, which we describe in the subsequent Section of our paper.

2   The Surveys Methodology

First of all, there is currently a certain controversy regarding retirement and pre-retirement age in Russia. The pension reform has started in 2019 and is expected to be implemented until 2028, gradually increasing the default retirement age as shown in Table 2. The concept of pre-retirement age was officially introduced in the Federal Law 350-FZ "On amendments to certain legislative acts of the Russian Federation related to the appointment and payment of pensions" in 2018. Particularly, the citizens who have reached the pre-retirement age are subject to certain tax exemptions and social security measures. The planned dynamics of the pre-retirement age that follows the changes in the retirement age in the period of the pension reform is also presented in Table 2.

Table 2. The dynamics of retirement and pre-retirement age in Russia
in the period of the pension reform (2019-2028)

	Period									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Retirement age:										
females	56	57	58	59	60	60	60	60	60	60
males	61	62	63	64	65	65	65	65	65	65
Pre-retirement age:										
females	51	52	53	54	55	55	55	55	55	55
males	56	57	58	59	60	60	60	60	60	60

In our surveys, we considered the participants who have reached the age of 55 to be of retirement age, while the ones who have reached 50 to be of pre-retirement age. The main method used in our work was a questionnaire, distributed personally or over Internet.

In the first survey, we studied activities in pensioners who were students of the People's Faculty of NSTU (which is also called "the third age college") in 2018-2019. The total number of the students taking part in the survey was 203 (184 females, 19 males), and their age ranged from 55 to 78 years (mean = 66, SD = 5.1).

Our second survey studied IT skills and interest towards them in elder people and was mostly distributed over the Internet in 2015-2019. The total number of respondents was 92, all of them aged over 50 and residing in the Siberian Federal District of Russian Federation. The self-reported age distribution of the participants is presented in Table 4.

3   Results

3.1   Survey 1: The Pensioners' Activities

Of the participants that reported the demographics, 66% had higher education, 2% had incomplete higher education, 5% had full secondary education and 27% had secondary special education. Most of them had or used to have occupation as administrative workers (32 people), engineers (27), economists and accountants (21), medical workers (14), teachers (12). The rest 97 participants have self-specified various other professions.

Only 60 subjects turned in the fully completed questionnaires, with their self-reported activities estimated on a scale from 1 (lowest degree) to 5 (highest degree). The resulting data are presented in Table 3.

Table 3. Results of the survey of the pensioners' activities

Activities	Mean	SD	Median	Min	Max
Cooking	3.64	1.09	4.00	0.00	5.00
Home plants	3.47	1.32	4.00	0.00	5.00
Walking	3.13	0.79	3.00	2.00	5.00
Gardening around the house	2.72	1.43	3.00	0.00	5.00
Sea holidays	2.72	1.15	3.00	0.00	5.00
Picnic	2.07	0.90	2.00	0.00	4.00
Camping trips	1.52	0.77	1.00	0.00	4.00
Fishing	1.38	0.85	1.00	0.00	4.00
At the dacha:					
Growing plants	3.76	1.43	4.00	0.00	5.00
Gardening	3.75	1.35	4.00	0.00	5.00
Recreation	3.02	1.35	3.00	0.00	5.00
Struggle for the harvest	2.95	1.38	3.00	0.00	5.00
Cognitive activities:					
Reading	3.78	1.08	4.00	0.00	5.00
Watching TV	3.62	1.04	4.00	0.00	5.00
Using computer	3.60	1.03	4.00	1.00	5.00
Singing / drawing	3.28	1.29	3.50	1.00	5.00
Going to theater	3.25	1.00	3.00	0.00	5.00
Physical activities:					
Physical exercises	3.55	1.05	4.00	1.00	5.00
Dancing	2.51	1.28	2.00	0.00	5.00
Going to sauna	2.38	1.29	2.00	0.00	5.00
Game sports	1.53	0.93	1.00	0.00	4.00

Presumably, high popularity of cooking and summer cottage (dacha) facilities and the low ratings for fishing are due to the dominance of women in the sample and indicate the preservation of stereotypical female roles among pensioners. Elsewhere, we can note the overall balanced distribution in activities, which include work both at home and at dacha, cognitive and physical activities.

The comparable ratings of reading, TV and computers suggest that most of the pensioners had actually mastered the IT and use the resources of the Internet. Correspondingly, CCT to support the cognitive functions and prevent age-related dementia should be available for elder demographics. On the other hand, the sample in the People's Faculty is not representative of the whole population, since only socially active pensioners seeking new information and new forms of communications enroll there. The share of such active group in the whole population of female pensioners in Russia can be estimated as 13-30% [20].

3.2   Survey 2: The Pensioners' IT Skills

The age distribution of the 92 participants who took part in the survey is presented in Table 4. As for the education, in the group of pre-retirement age responders 19.7% graduated in a major related to ICT (economic cybernetics, mathematics and informatics, applied mathematics, computer operator, etc.). In the elder age group, this share is lower (see in Table 5), since at the time of their study computer skills were not so widely demanded and were not taught in the education system. Moreover, those who had IT-related major did not always work in this field. On the other hand, since at a certain moment the demand for ICT specialists significantly exceeded supply, some respondents worked in this field despite having no formal specialized education.

Table 4. The responders' age groups and specialized education

Age	Number of responders	Share of the responders who graduated in an ICT-related major, %
50-60	61	19.67
60-70	24	8.33
70+	7	0.00

Table 5. The responders' distribution per the professions and the education majors

Profession type	Number of responders	Share of the responders who graduated in an ICT-related major, %
Medium or high ICT mastery	9	77.78
Some elements of ICT mastery	11	100.00

Of the 12 responders aged 50-60 who had ICT-related education, only 11 worked in the related field, while 4 responders who did not have the education, did have ICT-related jobs in their career history. Of the responders aged 60-70, only 1 of the 2 who graduated in ICT-related major had a corresponding job, while 4 responders reported having worked in IT industry despite having no related education. In the age group over 70, only 1 responder had a short experience of working as computer operator (inputting data on received goods into information system), even though he did not have a related education. The data presented in the above tables suggest that nowadays the economy mostly demands highly educated employees who have medium or high mastery of IT competences. The development of ICT leads to decreased oppor-

tunities for non-specialists to get an IT-related job. This situation is notably different from the period of 1980-2000 when due to the shortage of specialists the barriers for employment in IT industry were rather low. It was then when some of the today's pensioners managed to obtain ICT-related work experience and the corresponding competences.

Further, we surveyed all the participants on the personal use of ICT – the resulting data is presented in Table 6 (multiple options could be selected). The list of ICT uses was composed according to [20]. The most popular uses that we found were: engaging in social networks, searching for information, watching videos and reading news, articles and books.

Table 6. The responders' personal use of ICT

ICT uses	The number of positive responses
Engaging in social networks	79
Searching for information	79
Watching videos	74
Reading news, articles and books	72
Uploading personal files	68
Listening to the music	62
Buying / selling	54
Sending / receiving e-mails	47
Performing financial transactions	38
Downloading software	24
Distant learning	17

Interestingly, the responders' satisfaction with their IT competence level was rather high, particularly in the 50-60 age group. The responders aged over 60 reported that they see little need in acquiring an IT competence.

4   Discussion

The results of our study of ICT effect in the work history correspond to the research of the age structure in Russian IT specialists in [18] and confirm the shortage of the industry-related professional skills in Russian elder people found in [19]. The discovered personal uses of ICT (Table 6) are in line with the international trends found in elder people, who have also moved from mostly reading e-mails and information search [42] to communicating via messengers and social networks. In this, our results is more consistent with [43] who found that the people over 80 are mostly interested in online messaging and obtaining new information, and also that the ICT usage had relation with psychological well-being of the oldest-old participants.

The related research works studying the Russian pensioners are not entirely consistent, which may be explained with varying samples. For instance, for the sample of 50 elder people in [44] they found that the most popular ICT uses were e-government services, information search and online communication.

In the study of 68 people in [45] they found that the communication and reading news items were the most prominent. All in all, it seems that somehow different concepts are used to describe more or less the same activities. Probably greater sample sizes and consideration of the factors such as national culture, age, gender, education level, family status, etc. would be needed to achieve better consistency.

All in all, our research suggests that ICT usage for personal purposes by elder people may allow developing their social relationships, decrease the perceived isolation, provide mental stimulation beneficial for their overall health, broaden the worldview, improve the set of skills and knowledge, and share the experience. As for the generalizability of our study, we need to note that we only covered the subjects aged over 50 residing in the Siberian Federal district of Russia, who were mostly female (82.7%) and had higher education (62.4%). This demographic is generally renowned for their high level of mental and physical activity, the desire to obtain better competences, as well as the balance between the household and outdoors tasks. Although they do not show much use of online technologies, they are self-satisfied with it.

Conclusions

The global extension of IT usage, both in industrial context and at home, and the need to maintain physical and psychological health of the ageing population call for wide adoption of IT competences. However, their mastery in Russian citizens of pre-retirement and retirement age remains moderate: only 36% of males and 30% of females in this demographic group possess at least basic IT skills. At the same time, learning IT skills nowadays remains one of the most popular forms of training and continuing education.

However, training in IT implies that elder people need to engage in relatively atypical activities, and the previously formed social-cultural behavior stereotypes act as barriers for that. This in particular limits their abilities in changing career tracks and choosing new professions (Table 1), which is essential in the light of the ongoing pension reform in Russia. At the same time our survey of the people aged over 50 in the Siberian Federal District suggested low relation between the formal education in IT and choosing career in this industry.

Arguably even more severe effect of elder people's low engagement with ICT is neglect of computerized cognitive training, which proved to be effective in maintaining mental health and preventing age-related dementia, as well as for improving functions of attention, memory and flexibility of thinking [46]. Unfortunately, even such socially active group of elderly as the students of People's Faculty who self-reported recurrent usage of computers comparable with the traditional household activities (Table 3) showed little interest in continuous CCT.

Overall, our results suggest that the age-related IT gap first noted some decades ago still persists and that motivation in elder people remains the key barrier for overcoming it (cf. [21]). To make broad strata of the elderly population engage with ICT and CCT, more usable websites targeting this particular user group need to be devel-

oped, taking into account the age-related differences in perception and memorizing information, as well as individual variability in the dynamics of these processes.

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