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**TRANSFORMATION OF RESEARCHER'S PROFESSIONAL
QUALIFICATION REQUIREMENTS IN THE INFORMATION
SOCIETY**

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Abstract

The article deals with the issues related to the changes in qualification requirements of researchers in the modern information society. The author presents the development features of the information society and the complexity of the transition from Industry 4.0 to the Super Smart Society 5.0; the focus is also on the impact of information and digital breakthroughs on the researcher's activities and how it is manifested and fixed in various standard-setting documents regulating scientific and research activity in Russia and Europe. European requirements to the development of research careers, the Qualification Reference Book of Managers, Specialists and Other Employees (1998, as amended on March 27, 2018) and the requirements to the rating of academic staff used in various federal universities of Russia served as objects of contrastive comparative analysis. As a result of the study, it was shown that the requirements to the professional qualification used in Russia today do not fully reflect the changes in the activities of researchers that occur in connection with the informatisation of modern society. Nevertheless, the transformation of the requirements in compliance with the European vectors is evident in the rating requirements of scientific and teaching staff, which complex nature signals the need for continuous professional development and enhancement during the academic career.

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1. Introduction

Modern world is being seriously transformed in response to the external challenges of the 21st century that are mostly associated with the changes in socio-economic realities due to the process of technological shifts (Glazyev, 2009) or ongoing industrial revolutions (Xu, David, & Kim, 2018). Today, Japan has already announced the need for the world to move from the concept Industry 4.0 (the fourth industrial revolution), which was characterized by the German economist, founder and president of the World Economic Forum in Schwab (2015) as the time for introducing cyber physical systems into production to the construction of Super Smart Society 5.0. It is the next step after the information society which optimizes the resources of not only one person, but of the whole society due to the integration of physical and cyberspace for solving a wide range of tasks in all spheres of human life (Noritsugu, 2017). Most of the countries of the world, seeking to implement digital breakthroughs in the future, are trying to build effective short-term and long-term strategies for the development of the information society both at the global (Okinawa Charter on Global Information Society (2000), Declaration of Principles “Building the Information Society: a Global Challenge in the New Millennium” (2003), Tunis Commitment Action Plan (2005)), and national level (for example, About the State Program of the Russian Federation "Information Society (2011-2020)", 2010, "The Strategy for the Development of Information Society in the Russian Federation for 2017-2030", 2017).

But the emphasis is always on the need to create the information society, which is understood as a society where the information and the level of its application and accessibility fundamentally affect the economic and socio-cultural living conditions of the citizens, and the knowledge society, where perceiving and dissemination of reliable information, taking into account strategic national priorities have predominant importance for the development of the citizen, economy and the state (The Strategy for the Development of Information Society in the Russian Federation for 2017-2030, 2017).

The implementation of the national strategies of information development in the countries worldwide allows avoiding the “digital Middle Ages” in the era of communications and significantly reduces the “digital divide” (van Dijk & Hacker, 2003), i.e. minimizes “digital inequality” in the socio-economic, cultural, scientific and professional fields, makes it possible to overcome social differentiation and social distances in the information society, allows getting free access to the information, ideas and knowledge, achieving faster progress in the dissemination and use of information technology for personal and professional purposes.

2. Problem Statement

Today, a number of previously unused concepts, such as the Internet of things, virtual and augmented reality, cloud computing, digital economy and its ecosystem, e-democracy and artificial intelligence, have confidently entered our lives. These phenomena significantly alter the labor market, the very nature of labor (based on creativity and initiative) and the requirements for workers` qualifications, new professions having IT orientation appear (for example, a specialist in science ethics, psychologist in social networking, system analyst, knowledge engineer, information manager etc.).

As it is stated in “The Strategy for the Development of Information Society in the Russian Federation for 2017-2030” (2017), the key areas of work for increasing the competitiveness of the Russian information society are: 1. the development of science, technique and technology; 2. training of qualified staff in the field of information and communication technologies; 3. ensuring the relevance of research priorities and consistent development of applied solutions based on the advanced fundamental scientific research; 4. expanding the possibilities of multilateral and bilateral scientific and technical cooperation in the field of information and communication technologies, strengthening research capabilities and information exchange between the states.

It seems that this will help to significantly increase the coverage of digital technologies and make their use an essential part of the scientific and educational practice. In this regard, nowadays in Russia a national electronic library of the Russian Federation is being formed, which is a federal state information system - a set of documents and information in the electronic form (objects of historical, scientific and cultural heritage of the peoples of the Russian Federation) accessed via the Internet. The possibilities of using international sources of information (electronic libraries, digital repositories, bibliographic, abstract and citation databases, e.g. Scopus and WoS, digital platforms and services such as Dimensions and Publons, digital analytical instruments - SciVal etc.), particularly for research purposes are being widened.

It allows at a fundamentally new level actualizing the need to own technologies for processing large amounts of data and digital literacy skills, makes us think about ensuring information security not only of the critical information infrastructure facilities, but also of multiple intellectual property objects (Strielkowski & Chigisheva, 2018). It is of critical importance for the scientists and researchers who enter the global labor market and are obliged to demonstrate a high level of visibility, efficiency, collaboration, transparency, validity and accessibility, especially in the Open Science (Chigisheva, 2018), which directly characterizes their level of professionalism and competence in their field of knowledge.

3. Research Questions

In the course of the study, it was proven that the modern information society significantly modifies the lives of people, information becomes multichannel and decentralized, its volumes are growing and these changes affect the daily lives and professional activities of people. The focus of this study is aimed at critical rethinking of the complex and diverse activities of the researcher in the information society, which involves answering the following questions:

How and by what means are the researcher’s professional qualification requirements transformed in the information society? Are these transformations of legislative or purely meaningful character?

Is it possible to remain professionally demanded for a researcher without following the strategy of professional improvement and development throughout his/her academic career in the information technology age?

4. Purpose of the Study

The main objective of the present research study is to show how and at what level are the researcher`s professional qualification requirements being transformed in the context of the constantly changing challenges in the modern information society.

5. Research Methods

In the process of working on the article, mainly theoretical research methods were used, such as analysis, synthesis, generalization, comparison, interpretation. The general reflexive function of the comparison allowed obtaining a perspective view of the phenomena and processes under the study (Azarian, 2011).

Using the elements of contrastive comparative analysis when considering Russian and European researcher`s professional qualification requirements seems appropriate from the position that “often the look into the other country, the other society, the other village or the other part of the world affords better understanding of one`s own history” (Kocka, 1980, p. 202), this ultimately makes it possible to increase the efficiency of various processes and practices used at the present stage in the own country (May, 1993). This methodological tool made it possible to identify a wide variety of factors that transform researcher`s professional qualification requirements at the global level.

6. Findings

6.1. Modern researcher in the global world of Open Science

Open Science is one of the attributes of the information society. The aim of Open Science is to make scientific research, data and their dissemination accessible to all society representatives, whether amateurs or professionals. It includes such activities as publishing open research, campaigns in support of open access, encouraging scientists to practice “open notebook science”, and generally facilitating the publication and circulation of scientific knowledge. These processes require greater visibility, efficiency, interaction, transparency, credibility and accessibility. It is obvious that all these characteristics are easy to reach if you use digital resources and tools as efficiently as possible.

Open Science skills necessary for a modern researcher are:

“skills and expertise necessary for open access publishing (library and research information skills, open publication literacy skills);

skills related to data management and open data (data production, analysis, use, reuse etc.);

skills enabling professional research conduct (research management skills, legal skills, research integrity and ethics skills);

citizen science skills (interaction with general public)” (Providing researchers with the skills and competencies they need to practise Open Science. Open Science Skills Working Group Report, 2017, p. 17-18).

6.2. Qualification requirements for a European researcher at different career stages

In the publication ‘Towards a European Framework for Research Careers’ (2011) that was represented by the European research network for innovation in the form of preliminary guidance for the researchers whose work should strengthen European science and technology, promote free circulation of knowledge and technological advances thus, making them more competitive in contemporary world (Chigisheva, 2015). The career paths that researchers may follow at the international level are represented in this document. It is important that their career progress does not depend on their age or nationality or country of residence. This Framework serves a good stimulus for those who wish working at the global labor market and seek for international cooperation in developing research projects and joint activities with researchers all over the world. Thus, four stages of researcher’s career development were identified: R1 – First Stage Researcher (up to the point of PhD); R2 – Recognized Researcher (PhD holders or equivalent who are not yet fully independent); R3 – Established Researcher (researchers who have developed a level of independence); R4 – Leading Researcher (researchers leading their research area or field) (Chigisheva, 2015).

Table 01. Researcher profiles, competences and desirable competences having relation to Open science
 Source: Towards a European Framework of Research Careers, 2011.

Researcher profile	Competences and desirable competences having relation to open science
First Stage Researcher (R1)	Be able to <i>explain the outcome of research and value thereof to research colleagues.</i> Develops <i>integrated language, communication and environment skills, especially in an international context.</i>
Recognized Researcher (R2)	Has made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, innovation or application. This could merit national or <i>international refereed publication or patent.</i> Can communicate with their peers - be able to <i>explain the outcome of their research and value thereof to the research community.</i> Takes ownership for and manages own career progression, sets realistic and achievable career goals, <i>identifies and develops ways to improve employability.</i> Co-authors <i>papers at workshop and conferences.</i> Can be expected to promote, within professional contexts, <i>technological, social or cultural advancement in a knowledge based society.</i> Can <i>mentor First Stage Researchers, helping them to be more effective and successful</i> in their R&D trajectory.
Established Researcher (R3)	<i>Can take the lead in executing collaborative research projects in cooperation with colleagues and project partner.</i> <i>Publishes papers as lead author, organises workshop or conference sessions.</i> <i>Communicates the research effectively to the research community and wider society.</i>
Leading Researcher (R4)	<i>Has an international reputation based on research</i>

	<p><i>excellence in their field.</i> <i>Publishes and presents influential papers and books,</i> <i>serves on workshop and conference organising</i> <i>committees and delivers invited talks.</i> <i>Is an excellent communicator and networker within and</i> <i>outside the research community [creating networks].</i></p>
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The document demonstrates the profiles and necessary and desirable competences for each of them. It is easily detected that this document does not provide any direct connection to Open Science skills, however it implicitly demonstrates a strong focus on mostly all of them (see Table 01). It also should be mentioned that transition between the stages is desirable, but not a must and a researcher may choose either following all the stages to the career triumph or feeling free to achieve only some stages and keeping this position during the lifespan. Nevertheless, it gives a clear understanding of where to go and, what is very important, a right to choose.

6.3. Qualification requirements for different research positions in Russia

In modern Russia, there is a Qualification Reference Book of Managers, Specialists and Other Employees approved by the Resolution N. 37 of the Ministry of Labor of the Russian Federation on August 21, 1998, with the latest amendments and additions from March 27, 2018. The Qualification Reference Book contains two sections. The first section presents the qualification characteristics of industry-wide positions of managers, specialists, and other employees (technical executives) that are widespread at the enterprises, institutions and organizations, primarily in the industrial sectors of economy, including those funded by the state. The second section contains the qualification characteristics of the positions of those employed at research institutions, design, technology, project and survey organizations as well as editorial and publishing departments.

Also, according to the Qualification Reference Book, qualification characteristics of each position have three sections. In the “Responsibilities” section, the main labor functions are established that can be fully or partially assigned to an employee occupying this position, taking into account technological homogeneity and interconnectedness of work allowing for the optimal specialization of employees. The “Must Know” section contains the basic requirements to the employee regarding special knowledge as well as the knowledge of laws and regulations, instructions and other guidance materials, methods and tools that the employee should apply when performing the official duties. The section “Qualification requirements” defines the level of professional training of the employee, which is necessary to fulfil the prescribed official duties and requirements for work experience. At the same time, the levels of required professional training are given in accordance with the Federal Law of the Russian Federation “About Education in the Russian Federation” (2012) (see Table 02).

Table 02. Qualification requirements for research staff

	Position	Qualification requirements
1	Head (chief) of the research and development department (laboratory) of the institution; head (chief) of the research and development sector (laboratory), which is a part of the research and development department (division, laboratory) of the institute	Doctor or Candidate of Sciences Degree. Availability of scientific papers. Experience of scientific and organizational work for at least 5 years. Highly qualified specialists in the relevant field of knowledge with the specified work experience having no research degree may be appointed for the posts of the head (chief) of the research and development department (laboratory) of the institution and the head (chief) of the research sector (laboratory) that is a part of the research department (division, laboratory) of the institute for a period of 3 years.
2	Chief Researcher	Doctor of Sciences Degree. Availability of fundamental scientific papers or diplomas for discoveries and copyright certificates for inventions, as well as practical results. Scientific authority in the relevant field of knowledge.
3	Leading Researcher	Doctor or Candidate of Sciences Degree. Availability of scientific papers or copyright certificates for inventions, as well as large projects and developments implemented in practice.
4	Senior Researcher	Higher vocational education and working experience in the relevant specialty for at least 10 years, availability of scientific papers or copyright certificates for inventions. In case of having a degree - without any requirements for work experience.
5	Researcher	Higher vocational education and working experience in the specialty for at least 5 years, availability of copyright certificates for inventions or scientific works. In case of having a degree - without any requirements for work experience.
6	Junior Researcher	Higher vocational education and working experience in the specialty for at least 3 years. In case of having a degree, finished PhD studies or internship - without any requirements for work experience. If recommendations are made by the councils of higher education institutions (faculties), graduates of higher education institutions who have gained work experience during their period of study may be appointed for this position in exceptional cases.

Source: Qualification Reference Book of Managers, Specialists and Other Employees (1998, as amended on March 27, 2018).

When analyzing the qualification requirements imposed on Russian researchers, working in various positions, and mentioned in the main state document regulating their professional activities, it becomes apparent that there are no specific requirements for the level of information and communication

technology skills or digital literacy (despite regular changes and amendments), but at the same time modern scientists should carry out their research activities in a fast developing information society. Almost the same situation can be traced in the sections “Responsibilities” and “Must Know”, however, in the last section, starting with the position of junior researcher and ending with senior researcher, there appears an indication of the need to carry out experiments and observations including ICT use.

However, a more detailed explanation of what is meant is not given. For the remaining posts at a higher level, it is said only about the release of the necessary scientific and technical documentation (leading and chief researcher) or about the ability to issue scientific and technical documentation (head or chief of the research and development department or laboratory).

6.4. Individual rating of scientific and teaching staff in the context of qualification requirements

In the absence of changes in the researchers` qualification requirements represented in the regulatory documents, the introduction of effective contracts in Russian educational and research institutions has become important for the understanding of the ongoing meaningful transformations at the qualification level required in terms of digital literacy and Open Science skills. Today, an effective contract is, first of all, a financial motivational mechanism that stimulates the scientific and teaching staff of universities to increase the individual effectiveness of educational and scientific activities with a focus on the results that the university should achieve and that are “fixed in the programs, projects and development strategies” (Borovskaya, Masych, & Shevchenko, 2013, p. 13). The rating of an employee in higher education institutions is applied both to the persons who are engaged exclusively in the scientific activities and to those fulfilling scientific and teaching ones. It should be particularly noted that this practice is now widespread in Russian universities; thus, the analysis of the criteria used allows us assessing the reflection adequacy of the challenges faced by researchers in the context of Open Science and the requirements for the effectiveness of their work, implying the presence of appropriate professional qualifications.

We have reviewed the current methodologies used for calculating the rating of scientific and teaching staff in three federal universities of Russia, namely, Kazan (Volga region) Federal University (KFU), North-Caucasus Federal University (NCFU) and Southern Federal University (SFU). The analyzed materials are publicly available at the universities` websites; however, the emphasis was placed on the indicators related mostly to the scientific activities (see Table 03).

Table 03. Rating criteria at KFU, NCFU, SFU

University	Regularity	Total number of criteria	Number of criteria reflecting achievements in scientific activities	Criteria relevant directly to open science
Kazan (Volga region) Federal University (KFU)	monthly	10	8	9
North-Caucasus Federal University	annually	27	13	8

(NCFU)				
Southern Federal University (SFU)	annually	56	22	15

Source: KFU website (2019), NCFU website (2019), SFU website (2019).

Among the most popular assessment criteria are Scopus and WoS publications (KFU, NCFU, SFU), depending on the quartile of the journal and SNIP (KFU only). Also, SFU does not discount publications in the journals indexed in other industry databases, such as Agris, Pub Med, Chemical Abstracts, as well as those issued by the major foreign publishers, for example, Springer. The focus on internationalization may be traced in all university rankings. They focus on the joint publications with foreign partners (at SFU with partners from foreign universities that are in 100 top universities), issued or submitted applications for grant competitions with foreign organizations (NCFU, SFU), the publication of monographs by leading publishing houses of the world in English (NCFU, SFU). The knowledge of a foreign language as a means of international scientific communication is given a great importance; in the KFU rating it is a separate position. Also, an important requirement for work in the information society, as well as in the conditions of Open Science is civil science, i.e. the skills of positioning research results in/to the society that play an important role. This is not only participation in the international conferences, symposia and events (KFU, NCFU, SFU), but also the presence in the media during the reporting period (KFU), registration of ID ORCID, Author ID, Researcher ID (for all universities), which allows increasing the visibility and recognition of the researcher. Thus, the availability of ratings largely compensates and reflects the changes that occur over time in the development of information and digital technologies in the modern world.

7. Conclusion

The research study has proved that researcher`s professional qualification requirements used at the official level in Russia today do not fully correspond with the changes of the information age that potentiate deep reconceptualization of research methods and techniques. This situation carries the risk of hiring staff who formally meet existing qualification requirements, but do not have the necessary skills to work and conduct research using modern digital and information resources; it can significantly affect both individual and organizational scientific productivity. Nevertheless, the transformation of qualification requirements and their compliance with the global vectors is implicitly viewed in the rating requirements of scientific and teaching staff; their complex nature signals the need for continuous professional improvement and development throughout the academic career.

We believe that continuous development of digital literacy by the researcher allows him/her making more rapid progress in the dissemination and use of scientific results, and therefore bring greater benefits to the society. As a recommendation and position for further reflection, it is important to draw attention to the need of clarification and regular update of researcher`s qualification requirements in the legislative documents that will guide research and educational organizations, as well as allow stopping the endless production of assessment criteria and ratings at the universities. Unfortunately, contemporary

situation does not lead to ordering, but to the chaos in the organizations and dissatisfaction of significant part of scientific and teaching staff.

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