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Human resource management and extracting information about research activity in the field

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Abstract. The article deals with the issues of human resources management and the extraction of information about research activity in this field using the functionality of scientific electronic library eLibrary. The article reflects the analysis results of modern ideas about human resources and their management, defines the problems of extracting information about research activity and the problem statement; analyzes the known approaches to extracting information about research activity; offers a methodology for data processing for information extraction; provides quantitative characteristics obtained from the research and their interpretation; reviews the results of information extraction about the main trends in human resources and interpretation of these results.

The proposed definition of the problem involves selecting from a set of scientific articles D a set of documents relevant to the query: the ranking of authors by research activity in the field of human resources; the ranking of journals with publications in the field of human resources; the ranking of organizations whose authors do research in the field of human resources; the ranking of authors of the most cited publications in the field; a set of major trends in human resources at the present time. The results from the analysis of the content of the selected articles showed that the greatest interest in the field of human resource management is associated with both the requirements imposed on the personnel in connection with the digitalization of the economy and the implementation of digitalization in companies.

Keywords: human resources, human resource management, information extraction, data processing methodology, digital platform, research activity, digital economy.

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Управление человеческими ресурсами и извлечение информации об исследовательской активности в данной области

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Резюме. В статье рассматриваются вопросы управления человеческими ресурсами и извлечения информации об исследовательской активности в данной области с использованием

функциональных возможностей научной электронной библиотеки eLibrary. Отражены результаты анализа современных представлений о человеческих ресурсах и управлений этими ресурсами, формулируются проблемы извлечения информации об исследовательской активности и постановка задачи; проводится анализ известных подходов к извлечению информации об исследовательской активности; предлагается методика обработки данных для извлечения информации; приводятся полученные в результате исследований количественные характеристики и их интерпретация; рассматриваются результаты извлечения информации об основных трендах в области человеческих ресурсов и интерпретация этих результатов.

Предлагаемая формулировка проблемы подразумевает выбор из совокупности статей D нескольких документов, соответствующих критериям поиска: Рейтинг авторов по исследовательской активности в сфере управления человеческими ресурсами; рейтинг журналов, посвящённых проблемам управления человеческими ресурсами; рейтинг организаций, чьи сотрудники занимаются исследованиями в сфере управления человеческими ресурсами; рейтинг авторов по цитируемости публикаций в сфере управления человеческими ресурсами; список основных тенденций в сфере управления человеческими ресурсами в настоящее время. Результаты анализа содержания выбранных статей показали, что наибольший интерес в сфере управления человеческими ресурсами связан как с предъявляемыми к сотрудникам требованиями на фоне цифровизации экономики, так и с ее внедрением в работу организаций.

Ключевые слова: человеческие ресурсы, управление человеческими ресурсами, извлечение информации, методика обработки данных, цифровая платформа, исследовательская активность, цифровая экономика.

Благодарности: Результаты, в частности, предложенная математическая формулировка проблемы получения информации об исследовательской активности и главных тенденциях в исследуемой области, формализация поискового запроса и алгоритма обработки данных о публикациях, анализ информации и их интерпретация были получены в рамках исследования, осуществленного частично при финансовой поддержке Российского научного фонда (РНФ), грант № 22-19-00471.

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Introduction

Nowadays, when technologies are rapidly changing, and, consequently, there is a shift in professions, the need for new competencies, the issues of human resources management (HRM), as the most significant in any organization, capable of improving the efficiency of its activities, are relevant.

Research activity of various scientific schools and organizations in the field of human resources is of great interest not only for theorists, but also for practitioners [1, 2]. Generally, the results of research in any field of knowledge are reflected in publications of various levels.

Today, the solutions have been developed [3] that provide thematic search of scientific publications, which can help in identifying the main trends in the new field of research

The article deals with human resource management and retrieval of information about research activity in the field using the functionality of eLibrary. The first section analyzes the current understanding of human resources and their management, the second section identifies the problems of research activity information extraction and states the problem; the third section considers the known approaches to research activity information extraction; the fourth section offers a methodology for data processing for research activity information extraction; the fifth section presents the research results represented by quantitative characteristics and their

interpretation; the sixth section reviews the results of extracted information in the form of established trends in human resources and the interpretation of these results.

Human Resources and Management

As noted by researchers [2, 4] dealing with the issues of human resource management, the terminology used in this field has undergone changes: from personnel management to human resource management. Nowadays, there is no common terminology in the literature. The term “human resources” is regarded differently by various researchers, often related to the nature of the tasks to be performed. Some authors define human resources as the totality of people with their physical and mental abilities, which can potentially be used as a production resource to improve the efficiency of any economic system [5]. Others frame the term “human resources” [4] as "a concept reflecting the main wealth of any society, the prosperity of which is possible with the creation of conditions for the reproduction, development and use of this resource, taking into account the interests of each person". The author [1] notes that the concept of “human resources” includes “personal, physical and spiritual qualities, which can be potentially used by a person in their labor activity”.

Considering human resource management, the authors [6] present the management process as a combination of technologies, mechanisms, and procedures. E.Y. Butko [7] notes that HRM technology pays much attention to “intangible assets and intellectual capital”. The monograph [8] regards a typical management cycle (planning, analysis, regulation, accounting, control), which can also be interpreted for resource management tasks (Figure 1). Regulation of the object takes place based on making management decisions.

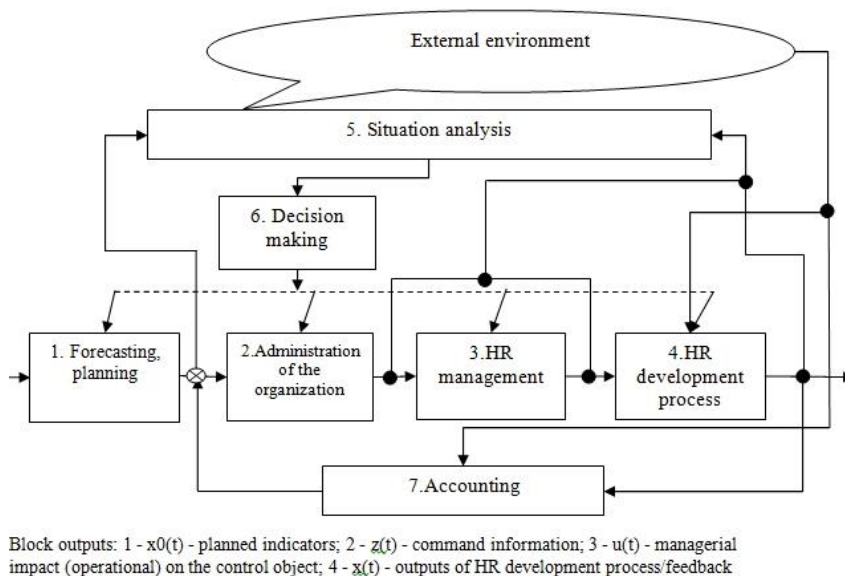


Figure 1 – Human resources management system diagram

Рисунок 1 – Схема системы управления человеческими ресурсами

I. Esaulova [2] shows the need to develop “new models of human resource development systems, taking into account the ongoing changes in the practice of personnel training and development”.

The multidimensionality of the tasks and functions connected with human resource management leads to the significance of the issues under consideration. Human resource management is an important managerial task, the solution of which should ensure the effectiveness of organizational systems, which can be regional, production, etc.

Currently, Russia has embarked on the task of digitalization in all areas of the national economy. This has led to the emergence of new requirements for employees when hiring them and the need for retraining the existing personnel [9, 10]. The COVID-19 pandemic has altered the conditions for changes in labor functions.

In this regard, new questions have emerged in the field of human resource management: how to organize management; whether there are scientific developments devoted to this issue; which scientists are involved in researching these problems. The answers to these questions can be obtained by analyzing the research results reflected in scientific publications.

Description of the information extraction problem. Problem statement

One of the components of a scientific study is the analysis of the current state of the scientific problem. Usually, researchers review from 100 to 250 sources. Thus, S.A. Kuznetsov [11] in his dissertation devoted to the field of human resource management considers several aspects: in terms of the concept “human resources” he refers to 12 researchers; modern views on the concept “human resources” – 14 researchers; basic functions of human resource management – 8 researchers; problems of human resource management – 28 researchers; classification of factors affecting human resource management – 6 researchers; analysis of human resource management in innovation-oriented organizations – 10 researchers.

Modern technologies and tools enable the analysis of a larger volume of publications and highlight the most significant areas of development in the field of research. The choice of the specific direction of the topic within the research allows further detailed analysis of the available solutions.

When considering the output of a journal publication, it can be represented by a number of characteristics: title of the publication (a), information about the authors ($B = \langle b_1, b_2, \dots, b_n \rangle$), journal title (c), publication year (e), edition number, article placement pages in the journal issue. The output includes only the last name, first name and patronymic of one or more authors (B). In the article itself, they are supplemented by the organization (g) or their set ($G = \langle g_1, g_2, \dots, g_m \rangle$), which the authors represent. This information is also of interest in the analysis.

The main goal is to identify the most significant areas of development in the field of human resource management with the help of scientific electronic library eLIBRARY.ru (hereinafter – SEL). Many scientific publications in the given field are given. In the study, SEL will act as a tool for selecting scientific publications of interest to the researcher.

Mathematical statement of the problem. Given: a set of documents (scientific articles) $D = \{a, B, c, e, G, t\}$ where, in addition to the listed characteristics, there is a text directly; researcher request – $z_i \in Z = \{z_1, z_2, \dots, z_N\}$.

Find: D' – the set of documents relevant to the query $z_i, i=1, \dots, 4$; z_1 – the ranking of authors by research activity in the field under consideration; z_2 – the rating of journals with publications in the field under consideration; z_3 – the rating of organizations whose authors do research in the field under consideration; z_4 – the ranking of authors by most cited publications in human resources; RD – the set of main trends in human resources at present.

Known approaches to extracting information about research activity

When selecting a research area and identifying problems in this area, an analysis of the scientific literature is conducted. Generally, researchers turn to scientific resources. Examples of foreign scientific resources are Elsevier, Clarivate Analytics, American Institute of Physics, Institute of Physics Publishing, Institute of Electrical and Electronics Engineers, Springer. Examples of Russian resources are eLibrary, CyberLeninka, Math-Net.ru, etc.

There is a software solution “Theme Modeling of Scientific Articles” which allows one to determine the subject of a scientific article, search for articles on similar topics and monitor

articles on a given topic. The software solution is based on the TF-IDF vector representation model and the model of thematic modeling by latent Dirichlet allocation. The CyberLeninka resource was used to conduct experimental studies.

The practice of using the database of scientific electronic library eLIBRARY.ru shows that the accumulated publication potential (array of information) allows making generalizations (to identify relevant problems) on the basis of the proposed analytical tools. In particular, we can talk about the relevance of the technical capabilities of this database for multistage multiparametric selection of the subjects of scientific publication activity when compiling a sampling model for the study of such activity.

The practice of utilizing SEL for thematic modeling has been used by a number of authors within the subject areas “Artificial Intelligence and Information Security”, “Vortex Electromagnetic Fields in Infocommunication Systems”, “DSS in Medicine”, “Emotional Artificial Intelligence”, etc. [12, 13, 14].

The authors [12, 13, 14] propose a two-step approach, based on a preliminary analysis of the information of the selected subject area with the aid of the known platform data, which aims to highlight the most significant publications in the considered field of scientific research, and to conduct semantic analysis in the sample in order to identify current trends in the field of scientific research.

Proposed data processing methodology for extracting information on research activity

For the research we used SEL eLIBRARY.ru, which has an extensive array of functions required to solve the task as well as a large volume of publications with a very wide range of research areas. When formulating a search query, keywords play a significant role because the basis (a general query) can give a considerable number of articles, which will complicate the analysis of semantics. The keywords chosen for this study are “human resources” and “человеческие ресурсы” (“human resources” in Russian).

The SEL homepage navigator contains a built-in search function, the ability to conduct an advanced search query in the library. The system makes it possible to specify where to look for the information (in the title of the publication, in the abstract, in the keywords, in the names of the organizations of the authors, in the lists of cited literature and in the full texts of publications) and in what types of publications (journal articles, books, conference proceedings, deposited manuscripts, dissertations, reports and patents). The analysis of the search form of the SEL portal allows us to formalize the structure of the user's query in the form of a diagram with usage options (Figure 2).

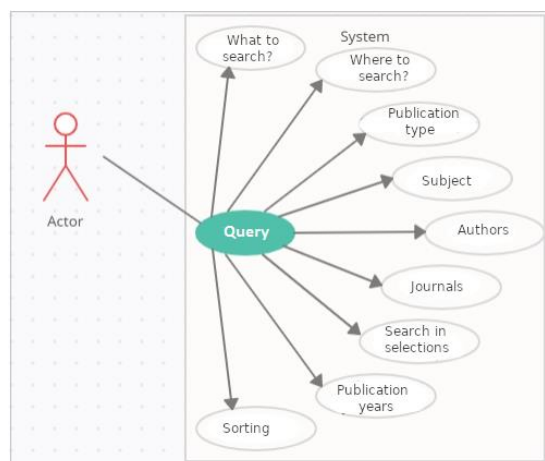


Figure 2 – Formalization of the request structure in eLIBRARY.ru
 Рисунок 2 – Формализация структуры запроса в eLIBRARY.ru

A generalized algorithm for processing data on publications is proposed for the purposes of extracting information about research trends in the area under consideration (Figure 3).

The system makes it possible to specify search topics, specific authors or journals. This specification of the search query promotes improvement of its result. The ability to set search query parameters (search by morphology, search by similar text, search by publications with full text on eLIBRARY.ru, etc.) determines the output by the necessary parameters. Clarification of the publication year/time interval helps to focus on publications included in a given time period. The system also provides the ability to filter by relevance.

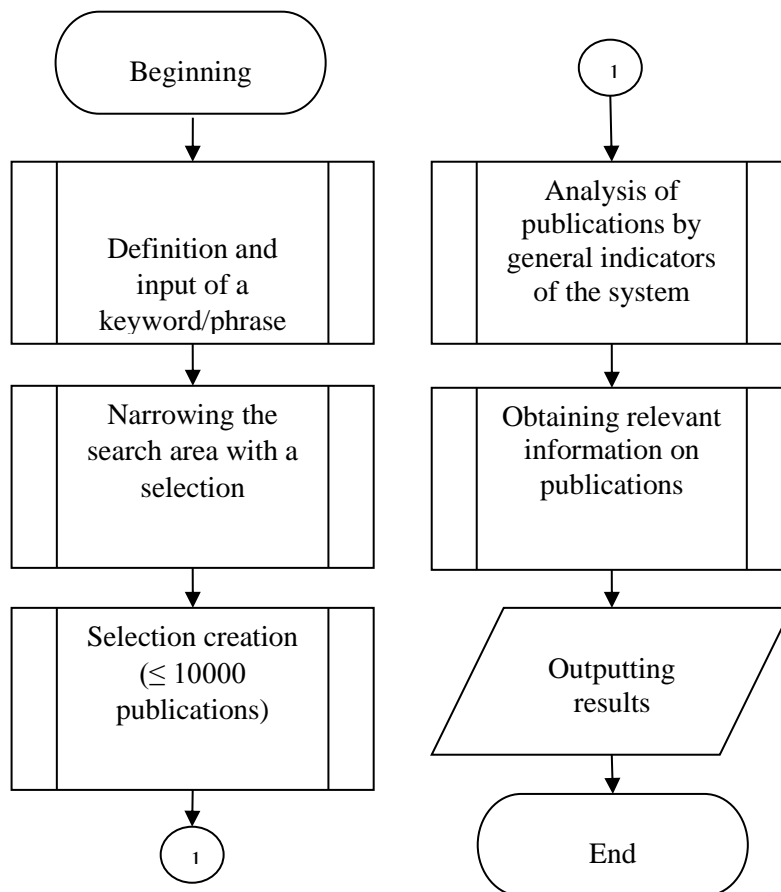


Figure 3 – Generalized publication data processing algorithm
 Рисунок 3 – Обобщенный алгоритм обработки данных о публикациях

During the analysis in the extended search, a number of selection criteria were set to identify the most active stakeholders: where keywords are searched in publications (in the title of the publication, in the abstract, in keywords); type of publication (articles in journals, books, conference proceedings, dissertations); topic (personnel management, economy, economic sciences, computerization, informatization, information service economy); parameters directly (search with morphology, search in publications with full text on elibrary.ru); publication years (2015-2021); receipts (for all time).

It is possible to save only 10,000 publications in the selection, but even this volume already complicates the semantic analysis. In order to reduce the sample, it is necessary to carry out a narrow search. Such an analysis helps to select the most significant scientific articles in the area under consideration, particularly, in the field of human resources.

Research results and their interpretation. Quantitative characteristics

The search results obtained according to the parameters (Hirsch index; number of self-citations; number of articles cited at least once; average number of citations per article; average number of articles per author; number of authors; weighted average impact factor of the journals in which the articles were published; number of articles in the journals included in RSCI; number of articles included in the RSCI core; number of articles in the journals included in Web of Science or Scopus; number of articles in the journals; total number of publications) (Figure 4) show that the difference in the values of some characteristics (number of authors, total number of citations, number of articles in journals, etc.) is significant for the choice of key words while for others (total number of publications, Hirsch index, etc.) it is insignificant.

It is noteworthy that the number of published journal articles for the term “human resources” is 5,350, and it is 4,519 for the phrase “человеческие ресурсы”. Such volumes of publications make it practically impossible to analyze their content manually. The use of automatic text processing tools can help to solve the problems.

Performance analysis of the most active authors by topic is presented (Figures 5,6) for the period from 2015 to 2021.

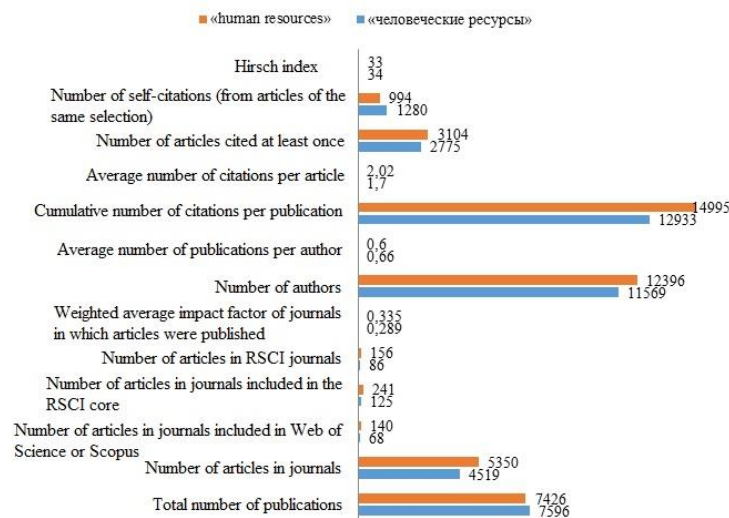


Figure 4 – Values of characteristics based on search results in the NEL for the phrases “human resources” and “человеческие ресурсы”

Рисунок 4 – Значения характеристик по результатам поиска в НЭБ по словосочетаниям “human resources” и “человеческие ресурсы”

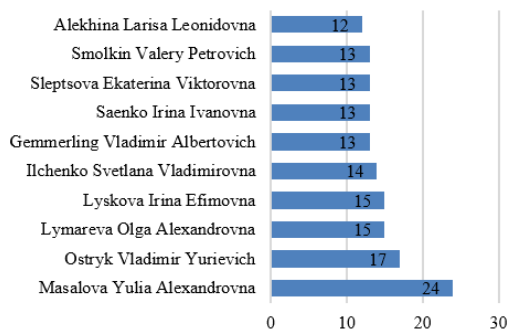


Figure 5 – Analysis of the number of “human resources” publications

Рисунок 5 – Анализ количества публикаций «HR»



Figure 6 – Analysis of the number of “человеческие ресурсы” publications

Рисунок 6 – Анализ количества публикаций «человеческие ресурсы»

The analysis showed that the greatest publication activity is observed in the authors Y.A. Masalov (Novosibirsk State University of Economics and Management) [15], I.E. Lyskov (Komi Republican Academy of State Service and Management) [16], V.Y. Ostryk (Crimean Federal University named after V. I. Vernadsky) [17], I.I. Saenko (Kuban State Agrarian University named after I. T. Trubilin) [18], S. V. Ilchenko (Moscow Institute of Law) [19], O.A. Lymareva (Kuban State University) [20]. Their papers consider various issues related to “human resources”. It is necessary to distinguish general problems – the change of evolutionary views on the category of “human resources” [20], problems of human resource efficiency in Russia as well as conditions and directions of human resource development [18]; and specific issues – the role of human resources in solving modern tasks of socio-economic and socio-cultural development of an organization [16]; quality of human resources in the educational system [15]; competence approach in human resource management [19] and effective personnel evaluation [17].

Another interesting result could be the identification of the authors with the most cited publications (Figure 7). According to the authors of this article, these publications reflect current development trends in the field of human resources, in particular, modern human resource management technologies [21, 23, 24, 27, 28] and resource management in the digital economy [22, 26, 29, 30]. In addition, it is worth noting the impact of business process development on organizational behavior [25].

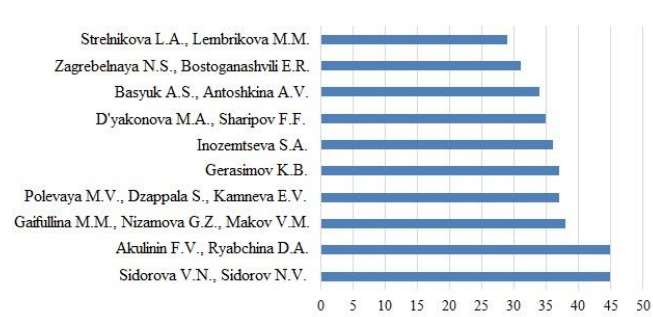


Figure 7 – Authors of the most cited publications in the field of “human resources”
Рисунок 7 – Авторы наиболее цитируемых публикаций в области «человеческих ресурсов»

The results of the research activity analysis of journals allow us to arrange their multitude and compare them with each other (Figures 8,9).

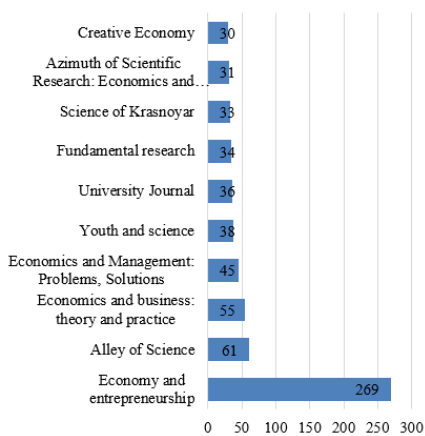


Figure 8 – Analysis of human resources journals
Рисунок 8 – Анализ журналов «HR»

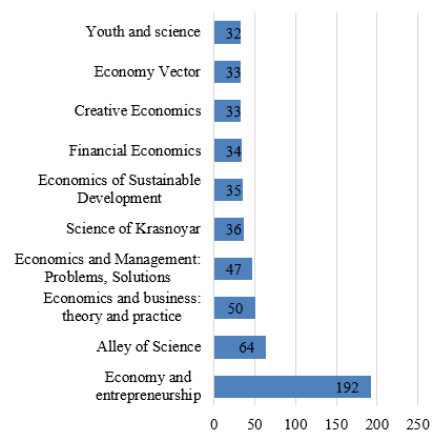


Figure 9 – Analysis of “человеческие ресурсы” journals
Рисунок 9 – Анализ журналов «ЧР»

It should be noted that a number of journals containing the biggest number of publications in the field of “human resources” such as Economics and Entrepreneurship (since 2007); Krasnoyarsk Science (since 2012); Economics and Management: problems, solutions (since 2011); Creative Economy (since 2007); Basic Research (since 2003) are included in the list of peer-reviewed scientific journals of the Higher Attestation Commission. For more than 10 years they have been publishing the results of topical scientific research of fundamental and applied nature. Some of the journals (Science Alley, Youth and Science, Vector of Economics) and others began publishing activities later.

The next step is to analyze the research activity of organizations (universities) (Figures 10,11).

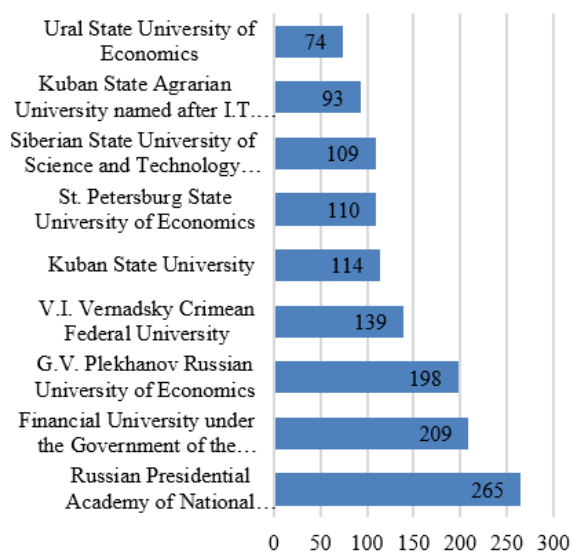


Figure 10 – Analysis of human resources research organizations
Рисунок 10 – Анализ исследовательских организаций «HR»

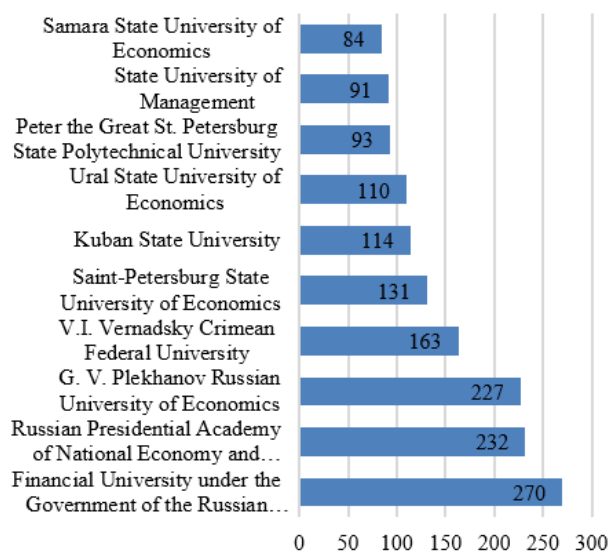


Figure 11 – Analysis of “человеческие ресурсы” research organizations
Рисунок 11 – Анализ исследовательских организаций «ЧР»

The analysis results of the universities representing scientific schools which conduct research in human resource management show that the greatest publication activity of authors in the field is in Financial University under the Government of the Russian Federation, Russian Presidential Academy of National Economy and Public Administration, Plekhanov Russian University of Economics. These organizations lead in both selections.

Research results and their interpretation. Established trends in the research area

A preliminary analysis of the results of quantitative indicators of research activity allowed us to identify scientific publications that are most interesting in the field of human resources. As noted earlier, the authors of publications consider both general and specific problems in this area.

Modern human resource management technologies [21, 23, 24, 27, 28] and resource management in the digital economy [9, 10, 22, 26, 29, 30] can be attributed to current trends in human resource development. In addition, it is worth noting the impact of business process development on organizational behavior [25].

The publication [10] considers the key problems of human resource development, taking into account the development of the digital economy. It is emphasized that nowadays it is becoming more and more difficult for an employee to meet the employer's requirements. In their opinion, this is due to the robotization process, which is one of the blocks of Industry 4.0.

The article [9] notes that HR-management faces the challenges of digital transformation associated with effective recruiting, training and attraction of employees, talent management, capable of generating innovations and ensuring the effectiveness and efficiency of activities.

Conclusion

The problem of human resource management is particularly relevant in the digital economy.

Extracting information about the latest research achievements of famous scientific schools is an independent task due to the large publication activity in this field in general.

The proposed methodology of information extraction using the eLIBRARY.ru digital platform helps, first of all, to determine the rankings of authors, scientific journals and organizations by the criterion of publication activity of the stakeholders and to determine several leaders.

A preliminary analysis of publications made it possible to identify the most active authors, journals, and organizations in the field of human resources.

Financial University under the Government of the Russian Federation and Russian Presidential Academy of National Economy and Public Administration were chosen for the analysis of the most interesting and significant articles.

The analysis of the content in these articles allows us to highlight the most interesting results in this field of science. In particular, more interest in the field of human resource management is associated both with the requirements imposed on personnel in connection with the digitalization of the economy, and the implementation of digitalization in organizations. This area is the most interesting topic as there is some uncertainty for both employees and employers. The labor market in the digital economy needs workers with qualification competencies that do not depend on a specific labor process.

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