

# DIGITAL HRM AS A MODEL OF KNOWLEDGE MANAGEMENT IN THE DECADE OF SCIENCE AND TECHNOLOGY IN RUSSIA

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## A B S T R A C T

*This paper considered theoretical aspects of the concept of knowledge management as a factor in the technological and innovative development of the country and organisation. In this context, the essence of knowledge and its role in the economic and technological development were disclosed, the specifics and character of the process of knowledge management were considered, and the expedience and necessity of managing knowledge to ensure high competitiveness of organisations in the conditions of the market environment and technological conditions that change quickly were studied.*

*The research methodology is based on the systemic approach, the general scientific methods of analysis, synthesis, generalisation, and systematisation, content analysis, and correlation analysis of table data. The theoretical basis of the research is philosophical and conceptual provisions of the cognition of reality and capabilities of the human brain, which are implemented through the tools of the management of knowledge and intellectual capital, and the e-HRM and HR Tech concepts.*

*The value of this work lies in the generalisation of scientific approaches to the use of digital HRM from the position of knowledge management in the conditions of the state programme “The Decade of Science and Technology” in the Russian Federation and the development of a model of knowledge management that characterises the structure of the system and determines the points and capabilities of digital processes and tools to raise the level of organisations’ competitiveness.*



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## 1. INTRODUCTION

Digital transformation and quick technological progress are the main drivers of the development of human civilisation. They cover almost all spheres and processes, which, among others, include education,

science, and human resources management. The Decade of Science and Technology, which was announced in the Russian Federation from 2023 to 2032, forms important emphasis aimed at the necessity of accelerating the modernisation of the system of the

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country's intellectual development through the stimulation of science and innovations.

In these conditions, knowledge is considered the key factor in ensuring quality changes and the successful progress of socioeconomic systems. Digital human resources management is a new system of views and tools that can combine digital technologies and tools with traditional processes of formation and use of labour potential. Digital HRM (Human Resource Management) improves organisations' ability to attract, teach, develop, and keep highly qualified personnel and offers expanded opportunities for a better understanding of intellectual processes in sociocultural systems through an increase in the level of analyticity of accumulated and generated data.

The considered processes are of a global character and common for all humanity. In particular, they conform to the Sustainable Development Goals: SDG 4, SDG 8, and SDG 9. In the context of international trade, they focus on the necessity of raising the competitiveness of Russian companies and products in domestic and external markets.

Due to its socio-technical character, HRM with the use of digital tools improved the indicators of flexibility, effectiveness, and scalability of technological transformations. The COVID-19 pandemic significantly accelerated the process of digitalization, enforcing remote, digital, and hybrid forms of work in the sphere of labour resources management. However, a real transition to fully digital HRM has not yet taken place. Thus, the highest digitalization took place in communication processes (zoom conferences, webinars, corporate chats, etc.) and cloud technologies (joint access to files, cloud services for storing and sharing information, etc.). As for automatization of routine operations, collection and processing of big data, virtual cooperation, and other technologies, they have not become so widespread.

In any case, digital HRM offers an important and effective means for knowledge management in organisations in the conditions of an increase in competitive struggle and quick technological development. These processes reflect the combination of the global trends of globalisation and internal initiatives of the Russian Federation regarding the innovative transformation of the economy based on knowledge management.

## **2. EXPERIMENTAL SECTION**

The methodology of the research on the problem of knowledge management from the position of digital HRM in the conditions of actualisation of national and regional programmes of stimulating the development of science and technologies in Russia is characterised by large diversity and completeness. It stems from the philosophical aspects of cognition of reality and the

human brain, the individual and group of people's ability for creation, and information use. In the context of ensuring the targeted influence on the problem and its resolution, the current problems of the research are realised within the concept of knowledge management, the theory and practice of the management of labour resources and intellectual capital, the use of digitalization tools, and formation of the concepts of e-HRM and HR Tech based on them.

In this research, the following methods were used: system approach, empirical methods of generalisation and systematisation, and other tools aimed at the study of the phenomenon of digital HRM as a model of knowledge management. Table and correlation analysis were utilised for the quantitative assessment of the considered processes. Content analysis was applied for the formation of the theoretical basis of the research based on analysis of literature sources; comparative analysis was used to reveal the key trends and challenges in the sphere of digitalization of HR processes and knowledge management in organisations. The main studies used in this work are devoted to different aspects of the application of digital human resources management from the position of knowledge management in modern conditions. In particular, they dwell on the trends of the role of human in the economic system in the knowledge economy (Bogoviz et al., 2018); elaborate on the issue of development of responsible HRM in Russian companies in the context of quality management in the conditions of Industry 4.0 (Ashmarina et al., 2023) and specifics of knowledge management as an inseparable component of the development of personnel (Galynchik & Gasnikova, 2021); study the resource-oriented approach to knowledge management as a competitive advantage (Halawi et al., 2005) and modern systems of knowledge management, in particular, knowledge engineering (Kainova & Volkova, 2023); consider approaches to the organisation of the system of knowledge management at companies (Vikhoreva, 2022; Zudin et al., 2023); analyse advantages and limits of human participation in the creation of intangible assets in Industry 4.0 compared to machines (Lobova et al., 2020); describe the concept of ecosystems in the knowledge economy (Masiuk et al., 2022); study the interaction between HR Tech and personnel training (Kaufman & Zelentsova, 2022) and transformation of knowledge management in the conditions of the development of the digital economy (Kaufman, 2018); consider the modelling of the system of knowledge management in the conditions of digitalization (Zimova & Prokhorov, 2023; Koriakina & Volodina, 2023) and e-HRM as a tool of human resources management in the digital economy (Mitrofanova & Mitrofanova, 2021); elaborate on the involvement of digital personnel and corporate training in quality management in Industry 4.0 with the balance, sustainability, and competitiveness (Tolmachev et al., 2023); deal with the issue of quality management in Industry 4.0 through the movement of labour resources

towards the “core” of the digital economy (Sozinova et al., 2023); consider the projection of the Decade of Science and Technology in Russia (Nechaeva, 2023) and modern trends of knowledge management in organisations (Prokhorov, 2023).

The key hypothesis of this work consists in the presence of a connection between the factors of knowledge management and the level of economic and technological development of the country, which is based on the corresponding mechanisms, tools, and links, which need to be revealed, analysed, and substantiated. The goal of this work was to search for opportunities and tools that can ensure an increase in competitiveness, quality, or effectiveness of companies due to the development or use of the model of knowledge management, which is implemented in the context of digital management of labour resources. To achieve this goal, the essence of the main categories of the research was disclosed, the influence of knowledge on the successfulness of a company's development was characterised, the key differences between digital and traditional HRM were established, the state of development of science and innovations in Russia was analysed, and the processes of knowledge management within digital HRM were specified.

### **3. RESULTS**

The transition to the digital economy actualised the importance of knowledge. At present, almost all companies in the process of their development go through the stages of generation of knowledge, its acceptance, and readiness to their use to create new technologies, products, and values. In this context, knowledge is the key element that ensures development, transformation, and quality transition to a new level. Knowledge is the main resource of the digital economy. Its specific feature lies in its being outside the process of production and consumption. That is why, knowledge is not exhausted, and access to knowledge depends on the adjacent intellectual processes, which have the individual, group, or public character. Thus, knowledge management treats knowledge in connection with the adjacent intellectual and managerial processes. Another peculiarity of knowledge in the conditions of digitalization is the acceleration of the process of its losing relevance. This stimulates management systems for constant improvement and development, which increases the importance of the problem of knowledge management. Thus, in the conditions of digitalization, knowledge becomes the main production factor and active strategic resource, which, in the aggregate, defines economic growth and requires special approaches to its management (Galynchik & Gasnikova, 2021).

Knowledge is one of the main intangible assets of any organisation. However, only a small share of organisations or individuals create knowledge, while

most of them focus on their adaptation, expansion, transformation, development, etc. From the position of organisational issues, knowledge management becomes more complicated and is manifested through the interaction of formalised and non-formalised knowledge, as well as their transformation through socialisation, internalisation, externalisation, and combination (Zimova and Prokhorov, 2023). The role of human resources in the knowledge economy is much higher than in the traditional economy. Therefore, human labour is separated from the regular production process and becomes a factor in the creation and implementation of innovations and new values (Bogoviz et al., 2018).

The scientific category of “knowledge” does not have a clear and unambiguous treatment in the economic literature. Its understanding as certain information, knowledge, ideas, competencies, etc. is invariably connected with bearers of knowledge – humans (scholars, employees, etc.). Despite the ability of certain elements of “knowledge” to exist separately from humans (books, programmes, databases, etc.), data and programmes acquire the status of knowledge, possessed by someone, only in combination with human bearers. Thus, the model of knowledge management cannot be considered separately from human carriers.

In terms of knowledge management, it is impossible to consider knowledge as something static, something that can be accumulated or stored without change. On the contrary, knowledge management determines knowledge's unique ability for constant “live” change and adaptation. According to this, apart from generation and involvement of knowledge, the concept of its management includes such elements as accumulation of knowledge in the required moment in the required place, increase in knowledge and its update, joint use of knowledge or improvement of its state according to problems solved by organisation or individual. In this context, knowledge acquires structural, human, or social manifestation.

The system of knowledge management is an interaction of diverse components. They form a unified information environment of the organisation, ensuring the collective work of personnel in the acquisition and exchange of knowledge and skills, providing access to the unified corporate database, and creating conditions for the effective application of knowledge by employees to achieve common organisational goals (Vikhoreva, 2022).

The definition of “knowledge management” first appeared in 1986 in the context of a discussion of the issues of organisational creation, storing, and dissemination of ideas and information, which was opposed to chaotic intellectual development. According to this, treatment of this category was determined as a process of creation or acquisition, as well as

dissemination and use, of knowledge to raise the efficiency, effectiveness, and competitiveness of an organisation (Prokhorov, 2023). At present, the relevance of knowledge management is very high, because the economy and market have become knowledge-intensive, and the main factors in success became innovations and technological development which are based on new knowledge and ideas.

From the position of involving different factors in knowledge management and ensuring their effective use in the interests of the organisation and society, knowledge management is based on the processes of socio-technological engineering. Within an organisation, this process facilitates an increase in the level of creativity among employees, but these processes cannot be based only on internal interactions. On the contrary, they widely use external information, which is accumulated and generated in the interaction with different elements of the market and social groups. Active interaction of the system of knowledge management with social and technological factors determines the conditions of formation, accumulation, use, expansion, and update of knowledge. The key role

is assigned to employees, who, using technical and engineering tools, ensure not only the role of the main carriers of knowledge but also other actions that are connected with management. Therefore, the formation of the system of knowledge management is considered in close connection with human resources management (Kainova & Volkova, 2023).

The resource-based approach in the economy defines the perception of knowledge, which is manifested in the form of concrete indicators of quantitative, cost, and relative character. In terms of management, these indicators reflect the involvement of resources and allow assessing their effectiveness from the position of the achieved result. The main indicators of the resource provision of the process of knowledge management are the number of involved personnel (x1) and financing of different R&D (x2). Indicators that characterise the successfulness of knowledge management can differ substantially, but they mostly include quantitative or relative indicators of patent activities, scientific publications indexed in international scientometric databases, and the development of innovations or innovative activity.

**Table 1.** Dynamics of the indicators of scientific and innovative activities in the Russian Federation over 2010-2022.

Indicators		Years					2022/2010 indicators ratio
		2010	2015	2020	2021	2022	
x1	Personnel in R&D, thousand people	736.5	738.9	679.3	662.7	669.9	91.0 %
x2	Internal expenses for R&D, billion RUB in 2010 constant prices	523.4	597.2	617.8	575.3	548.1	104.7%
x3	Share of expenses for financing R&D in GDP, %	1.13	1.10	1.09	0.96	0.94	-0.19
x4	Share of innovative goods, etc. in the total volume of supplied goods, etc., %	4.8	8.4	5.7	5.0	5.1	+0.3
x5	Share of the country in the world total number of publications, Scopus, %	1.8	2.6	3.9	3.6	3.0	+1.2
x6	Level of innovative activity of organisations, %	9.5	9.3	10.8	11.9	11.0	+1.5
x7	Coefficient of inventing activity (number of domestic patents for inventions per 10,000 population)	2.01	2.00	1.62	1.34	1.30	-0.71
x8	Coefficient of technological dependence (ratio of the number of foreign and domestic patents for an invention, which are filed in Russia)	0.48	0.56	0.47	0.58	0.42	-0.06

Source: Compiled by the authors based on Vlasova et al. (2023).

Indicators in the given sample allow characterising the state and dynamics of the scientific and innovative process in the Russian Federation from 2010 to 2022. Despite an increase in internal expenses for R&D (by 4.7 %), the number of personnel involved in the process decreases (-9 %), and the share of expenditures for financing R&D in the structure of GDP (-0.19 %) is reduced.

As for indicators that characterise successfulness of scientific and innovative activities, most of them demonstrated an increase compared to the basic period of 2010, but a decrease within the short-term period of 2020-2022. Thus, the development of the sphere of science and innovations, which are the main generating factors for new ideas and knowledge in Russia, needs to be accelerated. To reveal potential links between the main indicators of scientific and innovative activities in

the Russian Federation, a correlation analysis of the sample was conducted (Table 2).

We see the absence of clear logical and structural links between most of the studied processes. In this context, the volume of scientific potential, expressed through the number of scholars and innovators, is closely connected only with the factor of inventing activity (x7), which is also manifested in the share of innovative goods (x4). A decrease in the number of scholars and innovators (x1) is set onto an increase in the volume of their financing (x2), with a simultaneous reduction in the share of investments in GDP (x3). Thus, internal expenditures for R&D (x2) correlate closely and directly, in a relative way, only with the indicator of the activity of scholars' publications in Scopus (x5). The dynamics of the activity by these publications are in close reverse connection with the indicator of inventing activity (x7).

Thus, the fundamental scientific and innovative processes in the Russian economy are rather ambiguous. They influence the corresponding indicators differently and demonstrate that activation of work on knowledge

management in organisations of the Russian Federation and an increase in scientific and innovative activities in the Decade of Science and Technology are very important tasks.

**Table 2.** Results of the correlation analysis of the indicators of scientific and innovative activities of the Russian Federation

	x1	x2	x3	x4	x5	x6	x7	x8
x1	1.000							
x2	-0.125	1.000						
x3	0.807	0.267	1.000					
x4	0.510	0.498	0.383	1.000				
x5	-0.777	0.659	-0.410	-0.056	1.000			
x6	-0.292	0.214	-0.164	0.202	0.317	1.000		
x7	0.893	-0.136	0.757	0.422	-0.614	-0.439	1.000	
x8	0.199	0.472	0.229	0.529	0.160	0.425	0.084	1.000

Source: Compiled by the authors based on Vlasova et al. (2023).

Knowledge is an inseparable element of development and progress in the conditions of the market economy. It plays a special role in innovative processes, ensuring quality changes and transition to a new level in knowledge management and an increase in competitiveness, productiveness, or effectiveness. Industry 4.0 sets special demands for knowledge, which are manifested at different stages of human resources management and innovative development. Thus, the model offered by a group of authors under the guidance of U.V. Ashmarina determines the important role of knowledge at the following stages of human resources management in innovative processes:

- Generation of innovations, in which knowledge is the key element of science-intensive work and the system of research work;
- Registration of innovations, in which knowledge obtains a material form as registered patents and rights for innovations, developments, etc.;
- Implementation of innovations and their adaptation to the company’s business model, in which knowledge is integrated into the economic & production and managerial system of the company, ensuring an increase in quality, competitiveness, or achievement of other effects;
- Commercialisation of knowledge – a process in which successful implementation of knowledge in the system of management provides an economic effect in the form of an increase in effectiveness, profitability, market share, etc. (Ashmarina et al., 2023).

The above processes are accompanied by the expansion of the sphere of knowledge through the tools of involving the knowledge of other persons and organisations and through the involvement of novel technologies. The factor of involvement of knowledge and digital personnel from outside of the organisation allows ensuring a high quality of processes achieving innovativeness (Tolmachev et al., 2023).

Unlike the classic concept of human resources management, digital HRM covers more complex processes, which are simultaneously manifested in opposing trends: a decrease in the quantitative need for highly qualified employees through the processes of automatization and robotization and an increase in demands for quality of labour resources (improvement of the level of qualification and digital competencies, stimulation of creative activity, etc.) (Sozinova et al., 2023). In such conditions, the role of the process of knowledge management grows significantly.

At present, in human resources management, the elements of automatization, expert systems of managerial decision support, and artificial intelligence are widely used. The services and tools in isolation do not ensure quality changes, but create conditions for their quick implementation. The most popular information systems of knowledge management in the Russian market are iSpring Learn, e.Queo, Unicraft, Mirapolis LMS, eTutoriumLMS, ShareKnowledge, WebTutor, Teachbase, and Docebo. Neural networks are more widely used in human resources management (Prokhorov, 2023).

The main difficulty in the use of digital HRM lies in the relative autonomy of social and digital tools of management. They interact with each other not in an organic way, for they have different origins and nature. Application of the concept of digital HRM to the model of knowledge management allows differentiating the influence of human and machine labour on the achievement of results (Lobova et al., 2020). In this context, machine technologies are important drivers of the improvement of innovative, managerial, and research work due to the automatization of the processes of creation of intangible assets and their use in companies’ activities. The key differences between the traditional and digital management of human resources are shown in Table 3.

**Table 3.** Comparison of traditional and digital HRM

Aspect	Traditional HRM	Digital HRM
Processes	Most processes are performed manually and on paper	Most processes are automatized and digitised
Data on employees	Stored in paper archives and electronic table	Stored in centralised digital systems of HR management
Analytics	Limited capabilities of collection and analysis of data	Expanded capabilities of collection, analysis, and visualisation of data with the help of digital analytical tools
Communication	Limited capabilities for effective communication between employees and the HR department	Improved communication due to the use of the digital tools of cooperation and exchange of messages
Accessibility	Limited access to information and HR resources for employees	Improved access to information and HR resources through corporate portals
Training	Traditional indoor training measures	Electronic training and virtual training programmes
Attraction	Limited capabilities for attracting and keeping talents	Improved capabilities for attracting and keeping talents due to the use of digital tools and platforms
Flexibility	Limited flexibility in reaction to changes and trends	Larger flexibility and ability to quickly adapt to changes due to digital solutions
Scalability	Limited scalability of HR operations	Improved scalability due to the use of cloud solutions and automatization
Analytics of talents	Limited capabilities of analysis of talents and forecasting the needs of personnel	Expanded capabilities for analysis of talents, forecasting of the needs for personnel and strategic planning of human resources

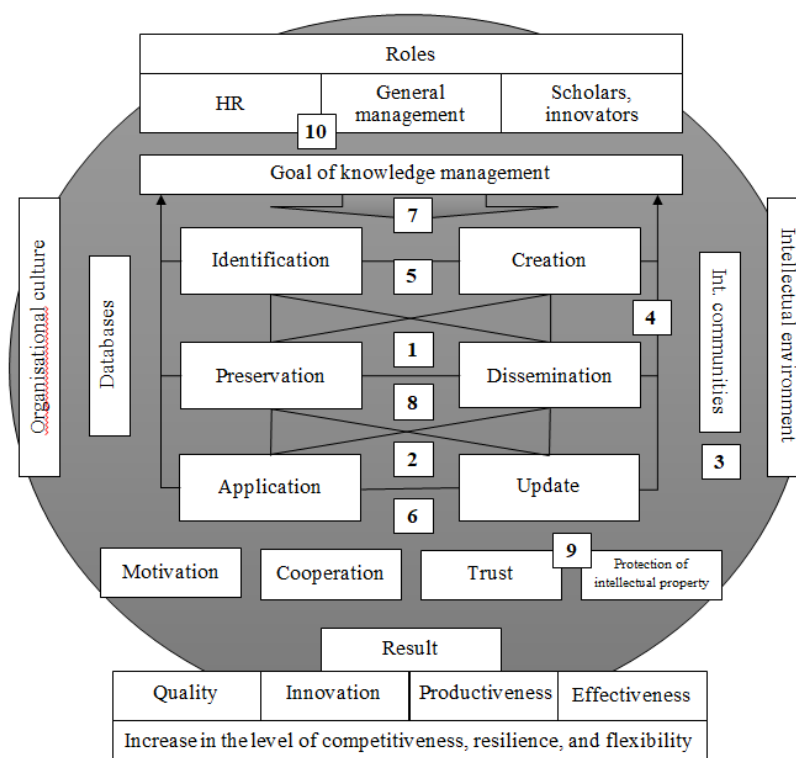
Source: Prepared by the authors based on Prokhorov (2023) and Zudin et al. (2023)

Integration of the system of knowledge management into digital HRM has a large potential, but it requires observation of clear principles that can raise the effectiveness of such a combination. To ensure success, such symbiosis must have a clearly determined strategic goal and ensure the possibility of revealing knowledge and its carriers, active involvement of all interested parties in the process, and quick and convenient access to knowledge. Based on this, the model of knowledge management must include mutually coordinated and linked elements, which are formed around a range of processes, which include creation, acquisition, systematisation, codification, storing, dissemination, possession, use, transformation, updating, transfer, and protection (Zudin et al., 2023). Combined with other elements of the knowledge management system and digital tools, such a model acquires a clear structure (Fig. 1).

In the centre of the model, there are key processes, which are interconnected (identification of knowledge takes place simultaneously and interdependently with the creation, storing is connected with dissemination, and the application is set onto the update of knowledge). The basis of these processes is determined by the goal of knowledge management. This goal defines the directions and goals of knowledge management and, at the same time, feels their impact. All processes use, with the purpose, the factors of intellectual community, knowledge database, etc. The main challenges of the

system are the preservation of motivation, search for opportunities for cooperation and mobility, preservation of trust between the participants, and protection of intellectual rights. The system functions in the designated organisational culture and intellectual environment. The result of such a system is parameters of quality, novelty, and productiveness, which, in the aggregate, ensure competitiveness and can be measured through the methodology of KPI, a balanced system of indicators, etc.

Digital HRM (human resources management) can become an effective model of knowledge management in the Decade of Science and Technology in Russia. Within this initiative, the planned measures, aimed at involving talented youth in scientific and technical activities, such as “Science of winning”, “Science nearby”, “Congress of young scholars”, “Pupils in scientific and technical activities”, “Scientific playgrounds”, “Science for whole family”, “Back to school”, should be not of purely formal character but should be integrated into the intellectual environment of organisations (Nechaeva, 2023). In this context, digital HRM can play a key role in involving, training, and keeping talented scholars and researchers through the use of new HR technologies, data analytics, social media, and tools of cooperation. This will help in effective knowledge management and transfer, which is critically important for the scientific and technological progress in the country.



**Symbols denoting digital processes and tools:**

1. Databases of knowledge, corporate portals, cloud services;
2. Systems of managerial decision support;
3. Social networks, communities, forums, etc.;
4. Systems of talent management;
5. Recruiting systems for involving experts and carriers of knowledge;
6. Analytics;
7. Forecasting;
8. Management of access rights;
9. Intellectual property protection;
10. Development of digital literacy and competencies of knowledge management.

**Figure 1.** The model of knowledge management based on digital technologies

Source: Prepared by the authors based on Halawi et al. (2005), Mitrofanova and Mitrofanova (2021), Prokhorov (2023), and Zudin et al. (2023)

**4. Discussion**

From the position of the integration of knowledge in the system of HRM with the use of digital technologies and implementation of the active national programme, knowledge management is at the intersection of many spheres of scientific and practical research, which leads to the need for a discussion. The main discussion lies in the necessity of constant clarification of the key definitions of the research, the value of which changes in the process of technological development. This is especially true for the categories of “knowledge” and HRM. Thus, it is necessary to reconsider and clarify the essence and contents of knowledge, which treatment in the conditions of digitalization acquires more technological character, which is connected with the dissemination of the technologies of artificial intelligence and virtual reality. As for HRM, the focus should be made on the study of the problems and

directions for the use of digital technologies from the position of their influence on interpersonal, social, and psychological characteristics of personnel management, including ethical components.

The problem of identifying the role and influence of government programmes on scientific, technological, and innovative development also requires in-depth research. Here one should not be limited by general processes and indicators but must study in detail the specialised programmes, to reveal the most successful practices and their dissemination. This task deserves attention from the position of using the most successful tools to achieve success within the programme of the Decade of Science and Technology in Russia.

Further directions of the research will be aimed at a more in-depth study of the above problems, as well as the search for organisational and technological methods

and tools, which can raise the effectiveness of knowledge management within the use of opportunities of digital HRM. From this position, assessment of the current solutions and the search for new solutions must have a constant character, given the dynamic nature of the studied processes and an increase in the relevance of digital technologies in the sphere of human resources management.

## 5. CONCLUSION

The programme of the Decade of Science and Technology in Russia is very timely and relevant. It allows the detection of the problems in the country's development and solving them in the conditions of quick economic, institutional, and technological changes. The success of the implementation of this programme largely depends on basic tools which will be used for the achievement of the declared goals. One such tool is the model of knowledge management, which allows identifying, supplementing, updating, using, and operating the current knowledge within establishments and organisations, which, in turn,

positively influences the level of their competitiveness and effectiveness.

Given the uniqueness of knowledge and the growth of its role during the transition to Industry 4.0, knowledge management requires special attention. Thus, it is necessary to focus on the processes of knowledge management and their integration with the connected factors of organisational and technological development. Acknowledging the key role of human resources in the generation and dissemination of knowledge, the need for the formation of effective HRM systems becomes increasingly relevant. They can ensure the successful development of knowledge, which will be manifested not only in the number of scientific innovations and solutions but also in an increase in the competitiveness of organisations and their effectiveness. The use of digital technologies in such systems substantially raises their potential and offers better opportunities for the detection of knowledge, its storing and protection, access and dissemination. Thus, the integration of such technologies and tools in human resources management is one of the main tasks of modern management at all levels.

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