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Features of the Application of Digital Technologies for Human Resources Management of an Engineering Enterprise

Svitlana Urba[1*], Olga Chervona[1], Vladimir Panchenko[2], Lina Artemenko[3], Olga Guk[3]

[1] Department of Economic of Enterprise, Ivan Franko National University of Lviv, Lviv 79000, Ukraine
[2] Department of Pedagogy and Management of Education, Volodymyr Vynnychenko Central Ukrainian State Pedagogical University, Kropyvnytskyi 25000, Ukraine
[3] Department of Management of Enterprises, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Kyiv 03056, Ukraine

Corresponding Author Email: svitlana.urba.lnu.edu@gmail.com

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ABSTRACT

The main purpose of our study is to form a demonstration model of the main processes for introducing digital technologies into the human resources management system for engineering enterprises. Digital transformations are associated with management changes, which are based on the technologies of the Internet of Things, artificial intelligence, blockchain, machine learning, Industry 4.0, Big Data in all spheres of public life. Investing in human capital has always been considered a productive investment. The digital economy has increased the urgency of increasing labor productivity through the transformation of human governance mechanisms. The main and key processes of the introduction of digital technologies in the human resources management system of the engineering enterprise were considered. The digitalization of society has radically changed people's lives and opened up new opportunities in the field of human resources management. The digital transformation of the human resources system affects all types of businesses, from large corporations to small micro-firms. As a result, the key stages and processes of implementation of digital technologies in the human resources management system of the enterprise were presented. The research methodology consisted of the application of modeling and graphical display methods.

1. INTRODUCTION

Society went through several stages of automation of enterprises, the economy as a whole: attempts to comprehensively automate economic activity (business), to involve digital technologies for decision-making have been made from the very beginning of the introduction of computers. However, all these works did not make it possible to create a functioning automated control system. Rather, decision support systems were created to ensure the collection and preliminary processing of data necessary for a person to solve certain issues.

Modern trends in the development of the world economy are largely predetermined and will be determined in the future by the development of the global electronic network, information, and digital technologies, and the fuller realization of the potential of human capital and artificial intelligence. Therefore, the study of the problems of management activities in the digital economy is quite relevant both from the point of view of economic science and from the standpoint of the practical transformation of management systems at different levels.

Organizations as complex systems must adapt to changes in the environment, systemic changes, stochasticity, and emergence. The new digital era is thinking in terms of complex systems, so you should: 1) form a new digital culture and new digital thinking that can work in system dynamics mode; 2) develop thinking in terms of complex systems that can adapt to changes in the environment.

Every year the number of engineering enterprises that successfully implement the latest digital technologies is growing. Digitalization refers to the widespread introduction of digital electronic technologies in various aspects of a person's or enterprise's life in order to increase the efficiency of activities. Such technologies as ERP - systems (a software package with the help of which the use of enterprise resources is planned) have already become a part of management; CRM - systems (software designed to manage customer interactions); BPM (software products for business process management); HRM – systems (software created to automate human resource management), etc. The successful use of the necessary electronic resource increases the competitiveness of a modern engineering enterprise.

In the context of the transition to Industry 4.0, digital technologies should be considered as an effective tool for improving the efficiency of the management of manufacturing organizations. Along with the digital transformation of production business processes, the human resource management system of engineering enterprises is also undergoing a digital transformation.

In the current context of the global COVID-19 pandemic, there is a parallel transition to a digital economy. The inclusion of modern innovative digital technologies in traditional work processes has changed the principles of work organization,

since many operations that were previously performed manually are now transferred to the digital environment, and attaching an employee to the workplace has ceased to be mandatory. Digital transformations change the ways of implementing and organizing work activities, the work processes themselves, stimulate the emergence of digital thinking and make the experience of employees unique, forming a special digital environment and a digital ecosystem of human resources management, to which existing HR (HR, it's mean Human resources) technologies must adapt. In human resources management, the introduction of innovative digital technologies will lead to the solution of a double problem: updating the business processes of human resources management, on the other hand, and updating the workforce and ways of organizing labor processes (work) on the other. The situation is obvious when the digital transformation of human resources management concerned not only HR, it is a transformation that includes the organization as a whole; these are cardinal changes involving the integration of technologies, gradually reducing the boundaries between digital and human in human resources management. A digital revolution will take place, which will include the development of processes and products within the framework of a new reality for the digital world: self-driving cars, smart robots, artificial intelligence, nanotechnologies, etc. The digital HR revolution has created significant concerns among professionals in the field regarding the bad consequences of digitalization just for the sake of simply digitizing the processes of managing an enterprise's human resources. Very often, this situation leads to the use of technology that does not meet the needs of the business and does not give the company the expected effect.

Digitalization of engineering enterprise human resources management is a significant change that affects the place of organization and management of human capital. Modern conceptual foundations for the digital transformation of human resources management are formed around the role of a person in the digitalization of HR processes.

In our opinion, the study of the transformation of HR competencies and software for the field of human resources management cannot take place in isolation and should be connected with studies of the structural, functional, and digital transformation of the human resources management of an engineering enterprise and the impact of changes related to the functioning of the HR sphere during a pandemic. and after it.

The digitalization of business processes has long turned from a vague prospect into an integral part of the operational activities of organizations of various forms of ownership. Many medium and large companies have managed to automate most of the operations that were previously performed manually, and attaching an employee to an office workplace has ceased to be mandatory. Widely used technologies of open space, remote work, including freelancing, outsourcing. The readiness of organizations to rebuild business processes taking into account the latest IT trends and, first of all, digitalization is currently an important condition for the competitiveness of companies. Sometimes it is necessary for their survival in the market.

The main purpose of our study is to form a demonstration model of the main processes for introducing digital technologies into the human resources management system for engineering enterprises.

2. LITERATURE REVIEW

Important generalizations and theoretically methodological foundations that can become the basis for such research were laid by: Becker [1] in the study of the essence and main aspects of the human resource management system of an enterprise; Minich [2] general aspects of human resources management features; Bilan et al. [3] to determine the main factors of human resource management of an enterprise in modern conditions of development; Chlivickas et al. [4] general trends in the formation of an enterprise's human resource management strategy.

A specific forecast of the digitalization of human resources management can only be carried out taking into account the specific features of the development of these processes in Ukrainian management practice. So, certain areas of development of digital competencies of managers need to be updated, under the requirements of enterprise digitalization. In particular, Hu and Li [5] and Pilukienė [6] highlight the significant impact of digital technologies on management processes and the development of modern managerial competencies. According to Ali et al. [7], the rapid development of digital transformation will stimulate the formation of non-standard employment, therefore, an urgent change in the vectors of socio-economic policy is needed during the new digital-post-industrial time. Against the background of such global changes, it is necessary to consider the features of the use of digital technologies in human resources management during a pandemic. According to Koišová et al. [8], the impact of COVID-19 has been observed in the practice of selection, training, performance management, and compensation management, as well as technologies for continuous monitoring of personnel performance in organizations that work from home, on the technology of diagnosing work-life balance problems and ways to evaluate the effectiveness of online learning. We fully agree with the opinion of practical scientists that the pandemic marked the beginning of digital HR transformation and developed new remote HR processes, in particular: consulting, training, communication, collaboration; and new ways of using traditional technologies in the adaptation of personnel in new conditions. In general, the development of digital infrastructure and the use of large databases caused a large-scale digital transformation of human resources management, which accelerated significantly during the coronavirus pandemic.

Despite the great attention among scientists to the problems of human resource management at an enterprise [1-12], it can be noted that today there is no clear generalizing plan for a step-by-step reflection of the main processes of integrating digital technologies into the human resource management system at engineering enterprises in modern conditions of development and under the influence of globalization.

3. METHODOLOGY

The methodology of our research to achieve the main goal is based on a systematic approach, within which the following methods are applied:

1. Pre-modeling and scientific analysis - induction and deduction, comparison and systematization - to understand the essential elements of the subject of research; analysis and synthesis - when studying the features of the functioning of

engineering enterprises; non-parametric statistical - to characterize the current state and identify trends in the development of engineering enterprises;

2. Stage basic analysis and formation of a working model - modeling - to develop models of the mechanism for introducing digital technologies into the human resource management system of engineering enterprises; graphic - with a visual presentation of theoretical and methodological material;

3. The final stage of forming conclusions - abstract-logical - for theoretical generalizations and conclusions of the study.

The reason for using the systems approach was that the systems approach is the most important and productive for the study of socio-economic phenomena. This systematic approach is used to present the integrity of the key stages of the introduction of digital technologies in the human resources management system of the engineering enterprise.

So, the method of functional modeling that we use involves the establishment of mathematical notation for all our stages of achieving the main goal: «X_0- Introducting digital technologies into the human resources management system»:

X_1- Introduction of new communication systems (Chatbots).

X_2 - The use of popular social networks.

X_3- Analysis of big data.

Thus, all X_1-X_3 represent a symbolic reflection of the stages of achieving X_0.

Thus, the article uses one method of functional modeling and graphical display of processes - IDEF0. Mathematical symbols serve as the formation of a conventional designation of complex phrases to simplify modeling and understanding.

The main advantages of this model in the context of optimizing the mechanism for introducing digital technologies into the personnel management system are that it is convenient to build using the appropriate vector diagramming software, and that it allows you to visualize all the main processes and sub-processes of the goal.

4. RESULTS OF RESEARCH

So, to begin with, through the application of the methodology we have chosen for the study, we will form a diagram in the form of a “black box” with the corresponding inputs, outputs and other elements to demonstrate the key aspects that will affect the mechanism for introducing digital technologies to the human resource management system of engineering enterprises (Figure 1).

It should be noted that I_1 represents the input elements to achieve the fundamental goal of our study. Of course, in our case it will be financial and material resources. Elements C_i and M_i are auxiliary assistance in achieving the set goals and may differ depending on the specifics of the engineering enterprise. And at the output we get a certain result from a series of actions and actions that will be presented later in the text.

So, let's form our main model for implementing the mechanism for introducing digital technologies into the human resources management system for engineering enterprises (Figure 2).

Let us consider in more detail each of the proposed stages of introducing digital technologies into the human resource management system for an engineering enterprise, according to their mathematical notation:

X_1- Introduction of new communication systems (Chatbots). With the help of chatbots, you can automate a large part of the selection and recruiting process. This technology is of particular relevance at the stage of personnel selection, since it allows you to interact with candidates 24/7, you can use them to track the status of candidates, schedule interviews or calls with potential candidates. HR practice has developed ways to use tools for communication robots. Evaluating the effectiveness of chatbots is possible only in the future, now the effectiveness of this step can be confirmed theoretically with the help of scientific research in this area.

So, let's model a detailed mechanism for introducing new communication systems (X_1) into the human resources management system for engineering enterprises (Figure 3).

It should also be noted that the main HR processes in which this technology can be implemented are the selection, adaptation of personnel, and corporate culture management. New developments already today make it possible to organize communications with personnel on all personnel management processes and, in our opinion, will be especially relevant for supporting the implementation of personnel management processes remotely during the period of quarantine restrictions and after them.

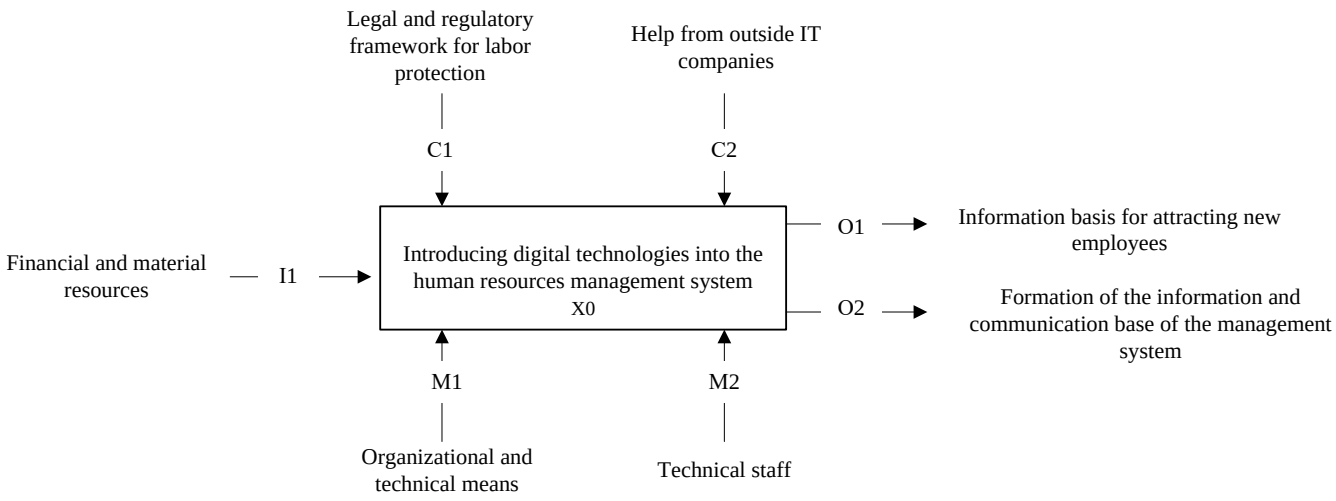

Figure 1. Diagram of the main auxiliary elements of the mechanism for introducing digital technologies into the human resource management system at the engineering enterprise

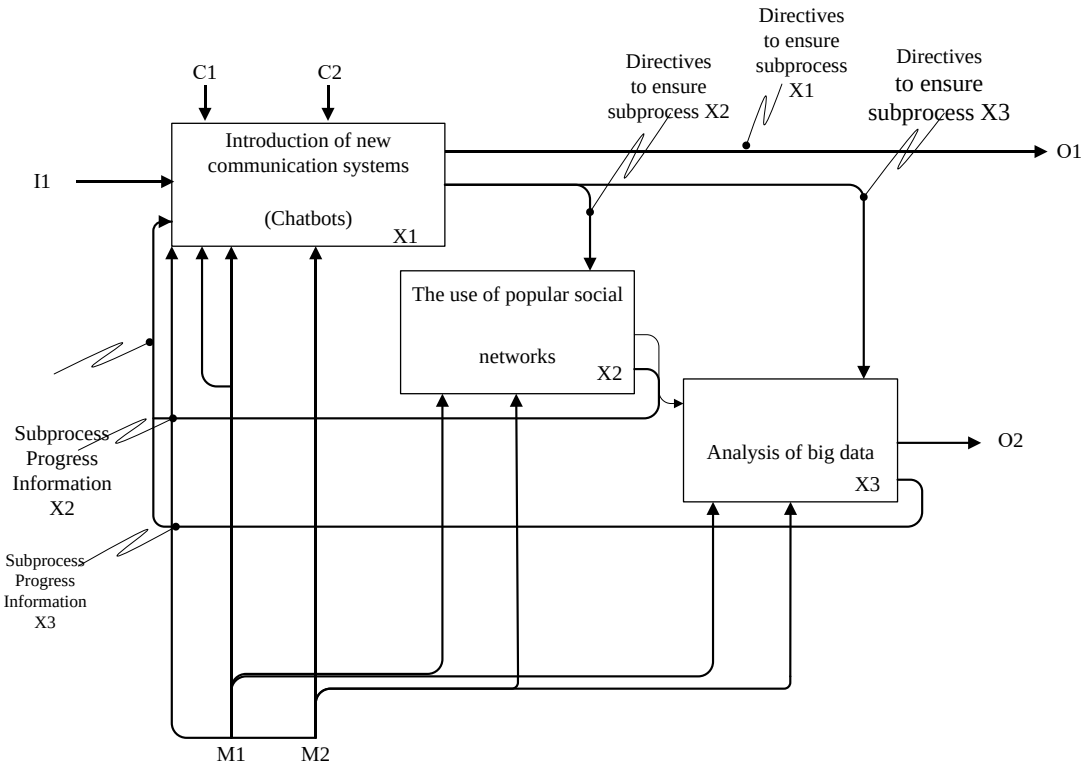

Figure 2. The main model for implementing the mechanism for introducing digital technologies into the human resources management system for engineering enterprises

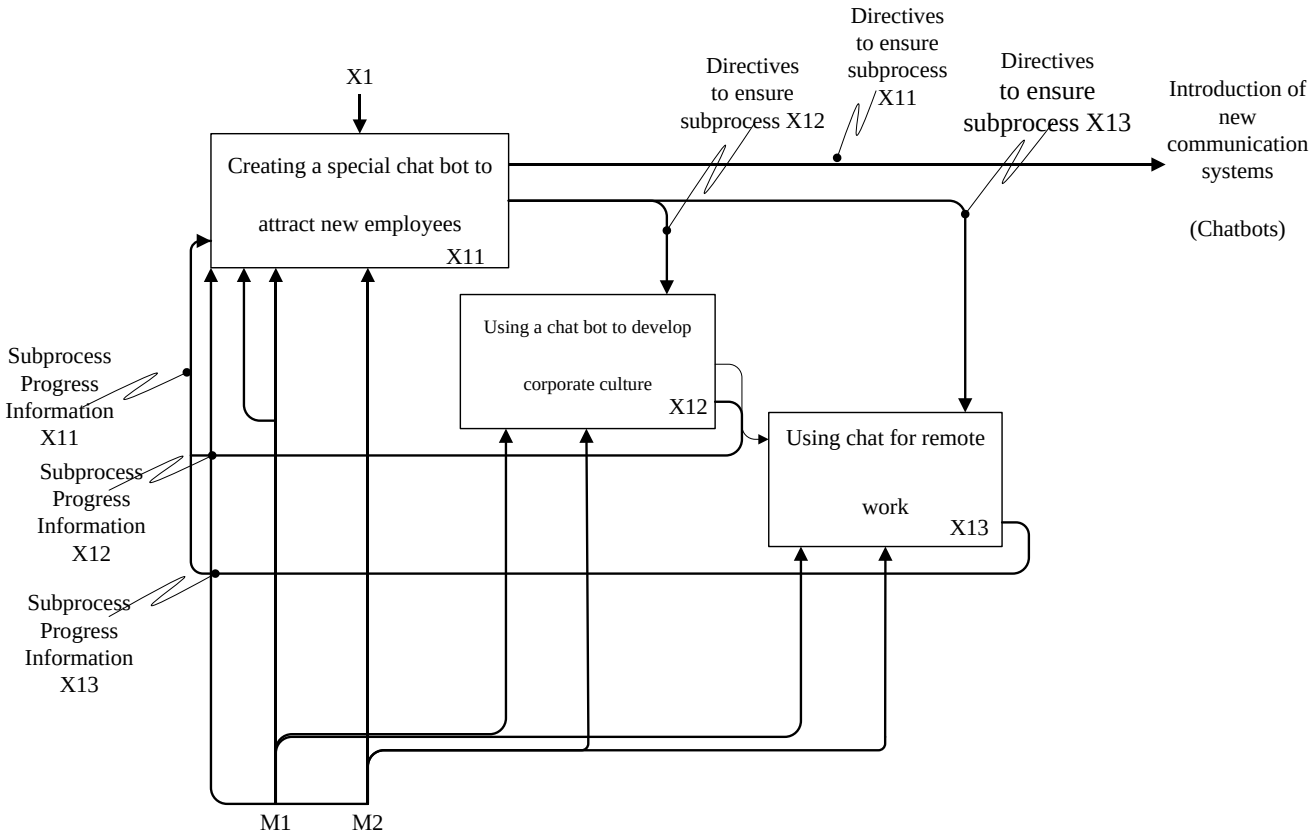

Figure 3. The mechanism for introducing new communication systems into the human resources management system for engineering enterprises

X_2 - The use of popular social networks. Social media is a reliable digital HR tool because it improves the way employers and recruiters find new talent. Despite the fact that they are used to implementing several HR tasks (interviews, adaptation, training, etc.), their main role is manifested in the qualitative selection of candidates for a vacancy. It has become a popular trend among HR managers to reach out to potential candidates through different channels such as Facebook or Instagram.

Recruiting in social networks has already become a separate area of personnel selection, which is indispensable in digital time. Now there are many digital tools available to automate and streamline the recruitment process, especially during the period of quarantine restrictions and social distancing. In our opinion, the prerequisites for the successful use of social networks in the practice of digitalization of personnel management is consistent compliance with the algorithm for introducing social networks into HR practice.

According to the studies analyzed, social media is a reliable digital HR tool as it improves the way employers and recruiters find new talent. Despite the fact that they are used to implement several HR tasks (interviews, adaptation, training, etc.), their main role is manifested in the qualitative selection of candidates for a vacancy. Thanks to such wide opportunities, recruiting in social networks has already become a separate area of recruitment, which is indispensable in digital time. Now there are many digital tools available to automate and streamline the recruitment process, especially during the period of quarantine restrictions and social distancing. In our opinion, the prerequisites for the successful use of social networks in the practice of digitalization of personnel management is consistent compliance with the algorithm for introducing social networks into HR practice.

Building a strong and positive presence on digital social platforms to engage workers will help you land promising candidates.

Stage "X_2 - The use of popular social networks" is very extensive in itself and has a wide range of possibilities, therefore, let's consider it in detail in the form of a corresponding model (Figure 4).

When creating an employer brand, an organization should demonstrate its own initiative on digital platforms, encourage leaving, and promote positive feedback or comments from current employees in organizational profiles. The creation of an organizational profile in social networks and its development takes place entirely in the digital environment.

X_3- Analysis of big data. The statistics of the collected data can help companies improve productivity, increase customer satisfaction, and even increase revenue. Experts from the Forbes Human Resources Council say studying job data can provide valuable insights that can help HR teams improve not only their own work but the overall performance of their companies. Data analysis allows you to implement a strategic HR function; HR analytics enables leaders to make informed decisions about selection, internal mobility, performance management, and overall employee experience. HR analytics and other data can help focus efforts on what matters and predict outcomes; create the basis for informed strategic planning - therefore, the analysis of big data is critical for the development of an effective strategy for personnel management, which also determines the business goals and goals of the organization; big data analysis will influence plans to increase motivation and recruitment of staff, improve retention and identification of high potential talents, etc.

So, for a detailed review of the main aspects of "X_3- Analysis of big data", we will form a model for implementing the mechanism for analyzing large amounts of data, as part of the general model for introducing digital technologies into the human resource management system at engineering enterprises (Figure 5).

It should be made clear that “Subprocess Progress Information” represents data and information that is obtained as a result of the execution of that other process or step and may be useful to achieve the stated goal.

Directives to ensure subprocess shown by us in the figures are the results of the decisions made and act as a kind of framework beyond which one should not go when performing a particular process or stage.

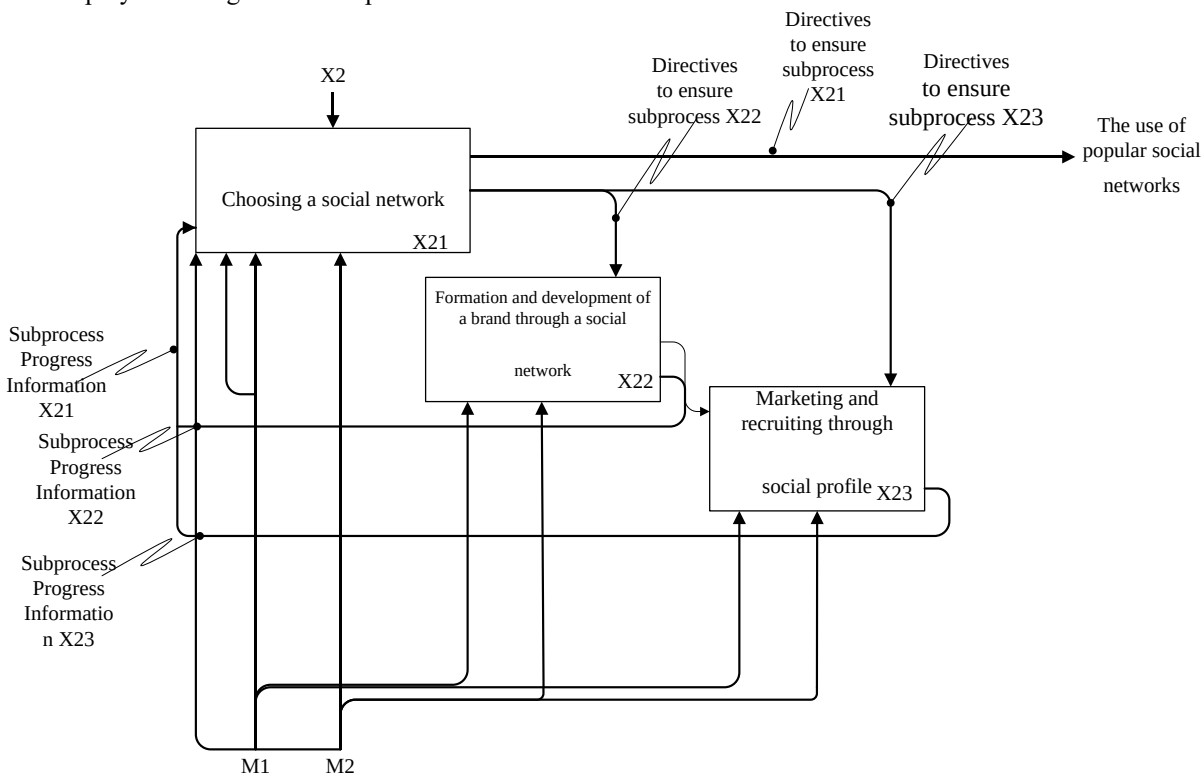

Figure 4. The mechanism for introducing new popular social networks into the human resources management system for engineering enterprises

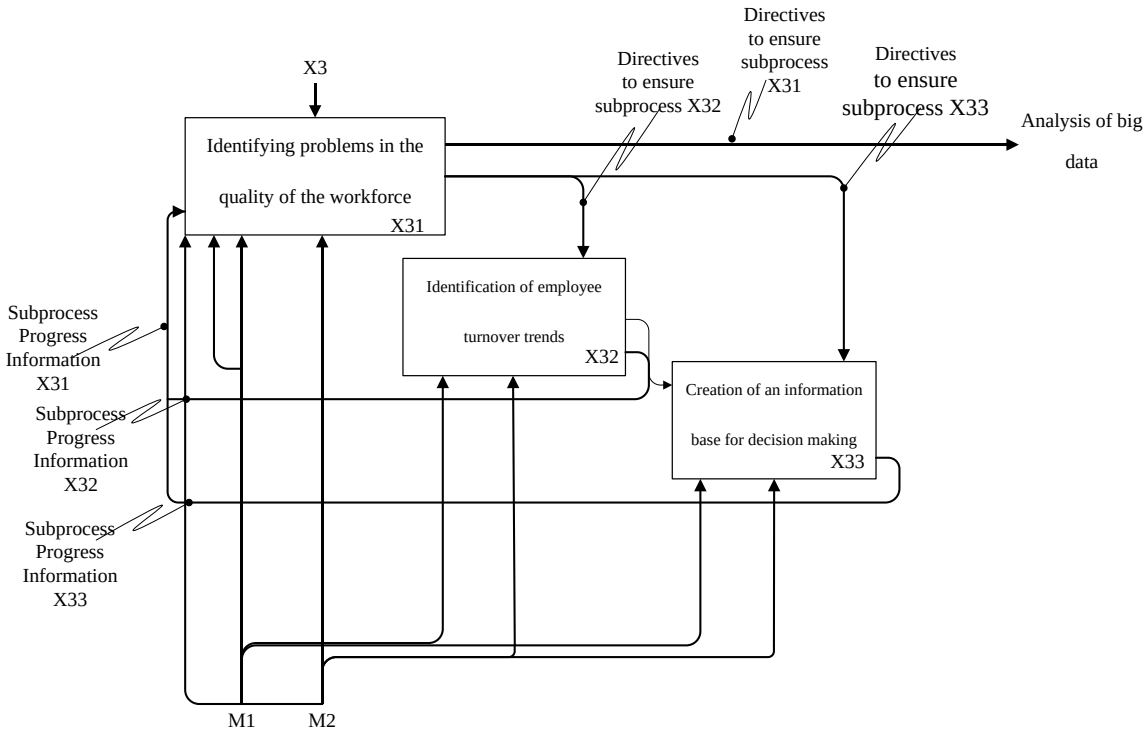

Figure 5. The mechanism for introducing analysis of big data into the human resources management system for engineering enterprises

5. DISCUSSIONS

A significant acceleration in the development of advanced technologies contributes to a significant increase in their penetration into all spheres of economic and social life, in particular, into the processes of managing organizations and doing business. At the same time, digital transformations are changing the way management activities are carried out, transforming change management processes, leading to the emergence of digital thinking and revolutionizing the experience of workers, requiring the actualization of existing HR technologies. The speed of transition from a traditional to a high-tech way of doing business, along with the effective use of existing human capital, determines the level of competitiveness of a company today and requires the construction of a new type of HR strategy, which is based on the active use of advanced technologies and ensures high productivity, innovation, flexibility, and adaptability.

Discussing the results of our study, it should be emphasized that it has several differences from similar ones in this area. Of course, we will not consider all scientific works in this area, but we will give a few examples. For example, a number of scientists [13-16] considered the importance of human resources for enterprises and how important their management system is. Our study focuses more on how important modern technology is to this process.

Human capital and human resources, in general, make a significant contribution to the development of an enterprise and business as a whole [17-19], but we, for our part, sought to demonstrate how important the management system for these resources is and what role new, modern technologies play in this.

The key in the human resource management system of an enterprise is innovation, the same technology. As noted by Stachova et al. [20], the efficiency and effectiveness of the entire enterprise depend on this. We cannot but agree with this, and that is why we chose such a problem for our study.

As a result, our study has an element of novelty through a model that demonstrates the key stages and processes that should accompany an engineering enterprise's human resource management system when introducing new digital technologies.

6. CONCLUSIONS

The further development of digital HR technologies creates a competitive advantage for the engineering enterprise, having a greater impact on cost reduction, and also eliminates existing obstacles (routines) in human resources management. It should be noted that the development of artificial intelligence and machine learning requires not only the appropriate transformation of human resources management processes but also the training of personnel, which are limiting factors for digital development. To ensure the future competitive advantages of the engineering industry, it is necessary to create a mobile intellectual platform (business (trade + IT) + university + consumer) based on partnership with IT companies, focusing on the preparation of college and university students. The need to improve specialized education and prevent a significant outflow of IT graduates from the country, reaching 30%, is an urgent strategic task for both industry practitioners and teachers.

Globalization and digital technologies are changing approaches to company human resources management. HR departments have a strategic role in driving innovative digital solutions and providing training for all departments serving big data.

We have formed a model that demonstrates the key stages and processes of introducing digital technologies into the

human resources management system of an engineering enterprise. The study has limitations and is due to the fact that we studied only the specifics of the activities of engineering enterprises.

Further research should pay attention to new digital technologies and the impact of the metaverse on the activities of enterprises and doing business. A separate issue in further research should be the use of applications and analytics based on artificial intelligence since, in the post-COVID period, artificial intelligence will help overcome differences between HR and other departments, and 2022 will be the year when HR becomes more automated, data-driven and artificially driven. intelligence, in other words, more dexterous in understanding, managing, and constantly improving organizational performance. However, this approach requires that HR technologies strengthen their skills in artificial intelligence – there are many opportunities for its use: predicting staffing needs using analytics; improving the performance of managers; addressing potential HR issues (e.g., bias, wage and benefit imbalances; 24/7 employee service through virtual agents, etc.). Artificial intelligence should be one of the best ways to connect HR with the whole organization and understand the needs of each department. But that's all for future research.

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