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THE PROBLEMS OF PERSONNEL MANAGEMENT OF METALLURGICAL ENTERPRISES ON THE WAY OF IMPLEMENTATION OF INDUSTRY 4.0

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An important feature of the potential of modern enterprises is their informatization, which is closely related to human resources. The value of human resources is determined by the streams of information they generate in the process of management. The current post-crisis state of the economy gives special importance to the issue of the practical application of methods of improvement of personnel management that enable the company to achieve its strategic goals. Human resources are the most important part of every enterprise. With transformation by the rules of 4th Industrial revolution, human is more important than ever. Most of the public has an opinion that complete automatization of manufacturing process and other organizational tasks within the enterprise might result in losing the jobs, but the reality is complete opposite. Jobs won't be lost but they will go through certain transformations which must be accepted. Resistance to change is the biggest obstacle within the enterprise floor and, besides financial investments, it might slow or break the transformation process. New working positions will demand more complex tasks, while manual work will be completely automatized and simplified. Human takes the control of the process and improves it with knowledge available. Know-how will be the key factor of success at the market. Decision making will be decentralized with vertical and horizontal integration within the organizational system. Human must learn how to work, but also how to communicate in new working environment. The human-human, human-robot and robot-human relationships will be normal everyday activity, but with overall automatization and robotification of the process, human must feel safe and motivated. That will result in the new and innovative ideas, possibility of continuous improvement creates greater value. The article provides a list of the latest technologies used within the concept of Industry 4.0, analyzes the implications of the implementation of Industry 4.0 for personnel management practices, investigates the achievements of the Interpipe Steel plant as benchmarking, and proposes implementation of a system of automation of HR processes in metallurgical enterprises.

Keywords: personnel management, Industry 4.0, benchmarking, automation of HR-processes, IT-solutions.

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Introduction

Today our state is undergoing a socio-economic transformation, so one of the urgent tasks of management is to justify and implement innovative methods of personnel management. It is important because the effective work of an enterprise as a whole depends on effective personnel management system [6, p. 99].

In contemporary conditions, Industry 4.0 enables to collect and analyze data faster and more efficiently, while producing goods of higher quality at lower costs. This, in turn, improves productivity, promotes industry growth, and changes the profile of labor, thereby increasing the competitiveness of businesses and countries. There are main drivers for the transition to Industry 4.0: the possibility to

integrate and improve the management of horizontal and vertical value chains; digital technologies and the interconnection of goods and services (Internet of Things/ Services); new digital business models that offer to consumers significant additional value through customized solutions.

Formulation of the problem

In recent years, there were processes of technological transformations that led to the transition to a qualitatively new level of business technologies in the conditions of digitalization of the economy. The development of digital economy was strongly influenced by globalization and innovative technologies. The main vector of the development of digital economy is the interaction between consumers and producers not only within one country, but also in the whole world, which provides growth of GDP, labor productivity, employment, deepens innovative processes in all sectors of economy to improve the quality of life.

Analysis and research of publications

The issues of personnel management were addressed by many Ukrainian and foreign scientists, such as I. Ansoff, F. Becker, M. Meskon, G. Schmidt, D. Bohynia, M. Bilopolsky, L. Balabanova, M. Polishchuk, V. Savchenko, A. Kravchenko, A. Kibanov, and others. Specific aspects of personnel management that are related to the implementation of Industry 4.0 were investigated in the works of A. Malik, M. Trsteniak, J. Enka, N. Ahmad, F. Heckalau, A. Bulte, A. Tserik, and others. In Ukrainian scientific literature, the discussion of these issues is still on the early stage, and so they require careful study and analysis.

The purpose of this article is to find ways to overcome the problems of personnel management on metallurgical enterprises in the system Industry 4.0.

Statement of the main material

We live in the age of the end of the third, digital revolution that began in the second half of the last century. Its characteristic features are the development of information and communication technologies, automation and robotization of production processes. For the first time, the Industry 4.0 program was launched in 2011 at an industrial exhibition in Hanover, where the German government set the task of expanding the use of information technology in manufacturing. A highly professional team consisting of representatives of business and state worked in this direction to create a program of modernization of industrial enterprises of the country. The purpose of the program was to preserve and increase the competitive advantages of the enterprises of the country. The features of Industry 4.0 are fully automated production, with all processes managed in real time and according to changing external conditions. Cyber-physical systems create virtual copies of physical world objects, control physical processes, and make decentralized decisions. They are able to connect to one network, interact in real time, self-adjust, and self-study. An important role is played by Internet technologies that provide communication between staff and machines. Enterprises produce products according to the requirements of the individual customer, optimizing the cost of production [3, p. 85].

Experts point out the basic technologies that are expected to lead to revolutionary changes: the Internet of Things (IoT), the Industrial Internet of Things (IIoT), digital ecosystems, Data Driven Decision or Big Data, complex information systems that are open to customers and partners (digital platforms).

Industry 4.0 imposes on human resources management considerable challenges since it increases demand for a qualiыed staff equipped with broad sets of competencies. They indicate that with the spread of Industry 4.0 knowledge is becoming increasingly important, employees should have comprehensive technical skills to switch from nowadays operational tasks to more strategic ones in the future, or digitized processes require staff with coding skills. Concerning methodological competencies, the fourth industrial revolution requires employees who are: able to identify the sources of deviations and to improve processes, know how to structure and examine large amounts of data as well as able to use reliable sources for continuous learning in their changing workplace. With regard to social competencies, an employee in Industry 4.0 should understand different cultures and divergent work habits. Moreover, more complex tasks and ыattened hierarchies require from individuals leadership features/qualities. Finally, we stress the importance of personal competencies such as ambiguity tolerance, ыexibility, motivation to learn, ability to work under pressure, sustainable mindset and compliance, etc. [3, p. 85].

Possible factors of influence that may be experienced by major HR practices on the path to Industry 4.0 are given in Table 1 [9, c. 9].

Therefore, a prerequisite for increasing the level of labor potential in the process of the implementation of Industry 4.0 is improvement of the skills of the staff aimed at the ability to respond in time to changes in the conditions of work with digital processes and preservation of jobs during the stage of socio-economic transformation.

Metallurgy is one of the industry leaders in the implementation of information technologies. Of course, automation and various IT solutions must be accompanied by the development and implementation of a unified operational

Table 1

Implications of Industry 4.0 for HR Practices

HR Practices	Changes due to Industry 4.0
Organizational design	Skills and knowledge of workers may become irrelevant and this means that job design must keep adapting so that it incorporates the right skills of workers i.e. more technical skills as required for the machines they control or create
Staffing	More technical tools will be used in recruitment and selection like for example artificial intelligence to select applications, some also expect full automation of selection
Performance management	More use of Big Data to assess people's performance for example with biomedical data or from the machines they control. This requires managers to have knowledge of HR analytics
Training and education	Mismatch of education and job requirements leads to the necessity of more training on the job to gain the right knowledge for the function
Reward management	More flexibilization and individualization of rewards through for example cafeteria points

directives. This allows supporting the unification of products, specifications and technologies, the integrity, completeness and actuality of information. The proper management of a single database affects all departments and business processes: planning, inventory management, production management, budget planning, cost calculation, labor management, etc.

There is stable high demand for Enhanced Resource Planning (EPR) systems in the Ukrainian market. The segment of big companies is only 30% saturated with these technologies. However, the sales of ERP systems are increasing every year, given that the share of ERP solutions in the Ukrainian market now amounts to almost 13%.

As a rule, metallurgical enterprises use solutions of such large companies as Oracle, SAP, IFS and others. They quickly become accustomed to the use of these solutions and adapt their production processes and people.

Industry 4.0 is just appearing in Ukraine. However, «Zaporizhstal», Mariupol Metallurgical Industrial Complex, "Arcelor Mittal Kryviy Rih", and other industrial complexes have long been introducing modern automated systems of the control over technological processes and creating conditions for the next round of innovations.

As an example of benchmarking, let us consider the achievements of the metallurgical steelmaking plant Interpipe Steel (Dnipro). Interpipe Steel has was the first company to launch large-scale digital transformation programs for its production. The world leader in pipe and wheel manufacturing has already implemented a number of digitization projects: vertical and horizontal integration, asset management and maintenance, and many digital services in logistics, sales and personnel management. Equally important for the development of Industry 4.0 is the achieved level of financial and economic indicators, social, educational and sectoral projects of Interpipe Steel. The set of these directions forms the national benchmark - the level of development that is recommended for all industrial enterprises. The company «Interpipe» implemented the project IT-Enterprise.EAM, which helps in automatic management of basic production assets [2, p. 44].

With respect to the characteristics of «digital staff» and its difference from ordinary staff, the following technological changes introduced by Interpipe Steel are important:

– the widespread use of smartphones and special mobile devices to perform work tasks (for example, reading or entering product data for tracking purposes);

– the use of data through applications available in Internet of Things;

– the use of applications for online access to information with voice control and Smart Glass;

– the provision of additional online services for staff (for example, information on vacations and facilities to initiate internal office documents).

These changes took place from 2014 to 2019 and are still ongoing. The whole transition from «implicit to explicit» is also one of the characteristics of the Fourth Industrial Revolution: it is often impossible to anticipate and plan for all the consequences of new technologies, because many changes occur for the first time. But just as we are increasingly using mobile applications to solve practical problems, so on Interpipe Steel, the smartphone has become an integral part of workplace tool. According to IT management, 90 % of employees use smartphones - and this is also a significant factor in favor of the «digitization» of staff.

The positive effects of the widespread adoption of digital devices and the retraining of staff on Interpipe Steel are:

1) increased productivity of staff;

2) switch to more complex and more interesting tasks with higher added value. This reduces the time

of routine operations and the probability of an error in their performance;

3) reduction of the number of cross-functional conflicts and the time required to solve them - all employees are in the same information field and use the «single source of truth» (the famous phrase in the automation of complex production systems that point to different truths in different systems in the era 3.0);

4) retraining staff generates initiatives for new opportunities and improvements [2, p. 29].

Noteworthy is the project of information system that provides e-interaction between employees and company services. Ultimately, the goal is to increase the loyalty and knowledge of employee.

The company not only introduces additional digital technologies for direct staff work, but also uses them to train and enhance the level of service functions. For example, training of repair personnel (electronics engineers, hydraulics, pneumatics specialists, etc.) takes place in modern mechatronic laboratories on Festo equipment. One of the latest projects is to create a mobile application for remote communication with staff. Its main tasks are to provide service and raise knowledge of employees. So employees of the company will be able to access services from their smartphone (for example, to create some types of service notes, get help information).

The manufacturer's high-tech image and the adherence to Industry 4.0 principles, such as openness and collaboration, make it easier for Interpipe Steel to retain and retrain staff. Equally important in this area are digital jobs, the transition of production personnel into the category of digital workforce, as well as new digital services for all employees [34, c. 44].

Having analyzed the experience of the leading metallurgical enterprises of Ukraine, we can conclude that the most effective way to improve the process of personnel management and increase the labor potential at the enterprise is the automation of HR processes.

The automation of HR processes is a complex of modern software solutions and tools designed to efficiently solve key personnel problems by means of automation and optimization of business processes.

Modern solutions of the automation of HR-processes allow:

1) to reduce time for processing personnel information by 30%;

2) to reduce labor costs by 10–30% by means of more accurate planning;

3) to reduce staff overwork by 10 to 50%.

In order to determine the readiness of Ukrainian metallurgical enterprises for Industry 4.0, the author conducted a survey of the employees of a metallurgical enterprise of Zaporizhzhya region on the possibilities of increasing the competitiveness and labor potential of the enterprise through the implementation of tools of Industry 4.0. The results of the survey indicate an understanding of the need to use modern technologies to increase the level of competitiveness and labor potential of the enterprise. The survey also identified the respondents' opinion on the main factors of enterprise competitiveness on the way to Industry 4.0, the most promising IT technologies and existing barriers to their implementation, problems of personnel management in the current conditions, etc.

On the basis of the conducted research, in order to increase the level of labor potential of the enterprise, the author proposed a system of automation of HR processes at a metallurgical enterprise, which is given in Table 2.

The results of the application of the automation of HR-processes are envisaged as follows: the appearance of the tool of effective planning and accounting of the competencies of employees; the increase and optimization of staff engagement; the management of employee expectations through a transparent system of career motivation and development; the rapid search for talented employees and their rapid development, the reduction of costs for recruiting personnel from the foreign market; the increase of the efficiency of internal communications in the field of organizational processes; the reduction of profit losses due to small staff efficiency.

Conclusions

The automation of HR-processes is an effective tool for the improvement of personnel management systems of metallurgical enterprises in the era of Industry 4.0. The advantages of implementing the automation of HR-processes are:

– reduction of the time spent on typical staffing procedures. The capacities for automatic submission and processing applications of various types, formation of personnel documentation by templates allow to accelerate key HR-processes, ranging from finding and hiring staff, its training and transfer within the enterprise, to its discharge and fixing the vacant positions;

– facilitation of the interaction of employee. The automation of HR processes implies a significant reduction in the need for personal contacts of employees in the process of completing personnel tasks and coordination procedures. Especially noticeable is the effect of the facilitation of interaction on the enterprises with a large number of staff and complex chain of coordination, as well as the groups of companies that include territorial-remote business units, branches, and offices;

- reliability of the storage of personnel information. The introduction of an automated system of HR processes makes it impossible to lose

Table 2

The system of automation of HR-processes at metallurgical enterprise

The components of HR-Process Automation Systems	Tasks that the system can solve
Recruiting	– quickly create and update your own candidate base: download from a computer, from a company sit via e-mail, from job boards and social networks; – effective and convenient process of search and recruitment; – creating a job description and automatically posting it on job boards and social networks; – automatically collect responses from job boards and social networks; – closed cycle of work with the candidate from the resume to the recruitment; – automatic feedback to the candidate, complete history of the candidate interaction; – appointment of appointments and interviews "on the fly" with the outlook; – recruiter and the selection process efficiency evaluation.
Payroll accounting	– automation of all payroll related processes; – formation of the planned salary fund for any period, reports and analysis; – maintaining personal accounts of staff for main and secondary job employees; – calculation of vacations, sick leave, other documents generation with payment for the average (government obligations, business trips, etc.); – payroll (all charges, deductions and taxes) for basic and combined positions; – payments formation in the inter-settlement period, automatic accounting of expenses on fuel at tl calculation of wages (advance, bonuses, payments to holidays, etc.); – calculation of part-time salary taking into account the company peculiarities in the calculation ar distribution of part-time salary; – formation of payment sheets and payment information; – calculation of deductions to funds; – accounting and analysis of wage arrears; – maintaining the archive for the selected time period; – automatic reporting in accordance with the law.
Personnel accounting	– creation and change of organizational structure "on the fly"; – development of payment and extra payment systems; – staff requirement analysis and staff planning; – personnel documents generation; – relevant staff data; – all about vacations: schedules, orders, unused vacations; – large number of reports;
Personnel motivation based on the KPI	– building a KPI based motivational system (key performance indicator); – construction of the company's strategic map; – motivation system construction at the level of separate units; – calculation and analysis of KPI; – bonuses calculation and analysis of efficiency; – goals formation (companies, teams, personal); – goals approval; – interim and final evaluation.
Personnel development	– training a team of professionals capable of solving all the tasks facing the company; – formation of post profiles with the corresponding set of competencies; – questionnaires and tests development to determine the candidates and employees level of competencies; – training programs development to increase the employees level of competence; – evaluate staff or candidates according to the job profile; – selection of the most suitable employee according to the profile of the post; – staff development planning and staff career development.

Continuation table 2

Self-service portal for employees Front HR-System	– provide general information about the company, news and announcements; – organizational structure of the enterprise, contacts of services and employees; – vacancies; – employee capability card (training, tests, analysis of competencies), application for participation in the training; – vacation balance, application for a vacation and its approval; – application for a business trip; – application for processing departure clearance; – getting an income statement; – the history of own payments and payroll sheet for any period; – status of personal KPI and company KPI.
Time and attendance and integration with access control system	– formation of charts of any complexity for any period of time; – integration with access control system (SCS), comparison with scheduled schedules, analysis of deviations; – time sheet generation by different indicators (for each day, according to the results of the month); – automatic display of all documents in the employee's time sheet (personnel orders, sick leave, business trips, etc.); – hourly accounting by type of working time; – filling of time sheets monitoring; – flexible delimitation of access rights to time records; – typical printing forms of the time sheets in accordance with the law.
HRM processes business analysis	– analysis of data by age and gender; – analysis of personnel rotation; – family status analysis; – analysis of the periods of work in the company; – analysis of personnel qualifications by different indicators; – average wages analysis and salary distribution by employee groups.

primary information about employees, whereas flexible settings enable the distribution of the rights of access to personnel documentation and ensure its targeted use;

– enhancement of employees' executive discipline. A system of regular automatic reminders, capacities to keep track of the timing and progress of current staffing tasks ensure the timely and complete implementation of the planned / required HR procedures. Thus, the automation of personnel issues allows the customer to reduce the number of errors in the work, improve the overall executive discipline of staff, avoid violations of labor law and possible financial penalties;

– transparency of personnel processes. One condition of the social responsibility of modern business is its compliance with the principles of honesty, transparency and openness, reduction of the degree of influence of the «human factor» in the decision-making process;

– powerful integration capacities. A system of the automation of HR processes integrates easily with other systems of the company (such as the systems of human resources and finances), and ensures full synchronization with the current business processes.

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ПРОБЛЕМИ УПРАВЛІННЯ ПЕРСОНАЛОМ МЕТАЛУРГІЙНИХ ПІДПРИЄМСТВ НА ШЛЯХУ ВПРОВАДЖЕННЯ ІНДУСТРІЇ 4.0

Сепета В.В.

Важливою особливістю потенціалу сучасних підприємств є їх інформатизація, що тісно пов'язана із кадровим потенціалом. Цінність кадрового потенціалу визначається інформаційними потоками, які він генерує в процесі господарювання. В умовах сучасного посткризового стану економіки особливо важливим стає питання практичного застосування методів удосконалення управління персоналом, що дають підприємству можливість досягти стратегічних цілей. З урахуванням змін, які несе за собою Четверта промислова революція, роль людини буде важлива як ніколи. На думку суспільства, завершення автоматизації виробничих процесів та інших організаційних завдань на підприємствах може призвести до втрати робочих місць, але реальність є абсолютно протилежною. Робочі місця не будуть втрачені, але вони мають пройти певні трансформації, які потрібно прийняти. Опір змінам – найбільша перешкода в межах організації, і, крім фінансових інвестицій, він може сповільнити або завадити процесу трансформації. Нові посадові обов'язки вимагатимуть вирішення більш складних завдань, в той час як ручна праця буде повністю автоматизована та спрощена. Працівник візьме контроль над процесом і удосконалить його накопиченими знаннями. Новітні технології стануть ключовим фактором успіху на ринку, прийняття рішень буде здійснюватись децентралізовано з вертикальною та горизонтальною інтеграцією в межах організаційної системи. Людина повинна навчитися працювати, а також спілкуватися в новому робочому середовищі. Стосунки людина-людина, людина-робот і робот-людина стануть нормальними у повсякденній діяльності, але із загальною автоматизацією та «робототехнікою» процесів працівник повинен відчувати себе безпечно та мотивовано. Це призведе до появи нових інноваційних ідей, можливість постійного вдосконалення буде мати більшу цінність. У статті наведено перелік новітніх технологій, що застосовуються в рамках концепції Індустрія 4.0, проаналізовано наслідки впровадження Індустрії 4.0 для практик управління персоналом, досліджено у якості бенчмаркінгу досягнення заводу «Інтерпайп Сталь», а також запропоновано впровадження системи автоматизації HR-процесів на металургійних підприємствах.

Ключові слова: управління персоналом, Індустрія 4.0, бенчмаркінг, автоматизація HR-процесів, IT-рішення.

ПРОБЛЕМЫ УПРАВЛЕНИЯ ПЕРСОНАЛОМ МЕТАЛЛУРГИЧЕСКИХ ПРЕДПРИЯТИЙ НА ПУТИ ВНЕДРЕНИЯ ИНДУСТРИИ 4.0

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Важной особенностью потенциала современных предприятий является их информатизация, которая тесно связана с кадровым потенциалом. Ценность кадрового потенциала определяется информационными потоками, которые он генерирует в процессе хозяйствования. В условиях современного посткризисного состояния экономики особенно важным становится вопрос практического применения методов совершенствования управления персоналом, которые дают предприятию возможность достичь стратегических целей. С учетом изменений, которые влечет за собой Четвертая промышленная революция, роль человека будет важна как никогда. По мнению общества, завершение автоматизации производственных процессов и других организационных задач на предприятиях может привести к потере рабочих мест, но реальность абсолютно противоположна. Рабочие места не будут потеряны, но они должны пройти определенные трансформации, которые нужно принять. Сопротивление изменениям – самое большое препятствие в пределах организации, и, кроме финансовых инвестиций, оно может замедлить или помешать процессу трансформации. Новые должностные обязанности будут требовать решения более сложных задач, в то время как ручной труд будет полностью автоматизирован и упрощен. Работник возьмет контроль над процессом и усовершенствует его накопленными знаниями. Новейшие технологии станут ключевым фактором успеха на рынке, принятие решений будет осуществляться децентрализовано с вертикальной и горизонтальной интеграцией в рамках организационной системы. Человек должен научиться работать, а также общаться в новой рабочей среде. Отношения человек-человек, человек-робот и робот-человек станут нормальными в повседневной деятельности, но с общей автоматизацией и «робототехникой» процессов работник должен чувствовать себя безопасно и мотивировано. Это приведет к появлению новых инновационных идей, возможность постоянного совершенствования будет иметь большую ценность. В статье приведен перечень новейших технологий, применяемых в рамках концепции Индустрия 4.0, проанализированы последствия введения Индустрии 4.0 для практик управления персоналом, исследованы в качестве бенчмаркинга достижения завода «Интерпайп Сталь», а также предложено внедрение системы автоматизации HR-процессов на металлургических предприятиях.

Ключевые слова: управление персоналом, Индустрия 4.0, бенчмаркинг, автоматизация HR-процессов, IT-решения.

THE PROBLEMS OF PERSONNEL MANAGEMENT OF METALLURGICAL ENTERPRISES ON THE WAY OF IMPLEMENTATION OF INDUSTRY 4.0

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An important feature of the potential of modern enterprises is their informatization, which is closely related to human resources. The value of human resources is determined by the streams of information they generate in the process of management. The current post-crisis state of the economy gives special importance to the issue of the practical application of methods of improvement of personnel management that enable the company to achieve its strategic goals. Human resources are the most important part of every enterprise. With transformation by the rules of 4th Industrial revolution, human is more important than ever. Most of the public has an opinion that complete automatization of manufacturing process and other organizational tasks within the enterprise might result in losing the jobs, but the reality is complete opposite. Jobs won't be lost but they will go through certain transformations which must be accepted. Resistance to change is the biggest obstacle within the enterprise floor and, besides financial investments, it might slow or break the transformation process. New working positions will demand more complex tasks, while manual work will be completely automatized and simplified. Human takes the control of the process and improves it with knowledge available. Know-how will be the key factor of success at the market. Decision making will be decentralized with vertical and horizontal integration within the organizational system. Human must learn how to work, but also how to communicate in new working environment. The human-human, human-robot and robot-human relationships will be normal everyday activity, but with overall automatization and robotification of the process, human must feel safe and motivated. That will result in the new and innovative ideas, possibility of continuous improvement creates greater value. The article provides a list of the latest technologies used within the concept of Industry 4.0, analyzes the implications of the implementation of Industry 4.0 for personnel management practices, investigates the achievements of the Interpipe Steel plant as benchmarking, and proposes implementation of a system of automation of HR processes in metallurgical enterprises.

Keywords: personnel management, Industry 4.0, benchmarking, automation of HR-processes, IT-solutions.

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