Construction and Analysis of Automated Human Resource Management System

Sergey Ivanov[1] and Mykola Ivanov[2]

Abstract

The issues of constructing and developing an automated system that is adaptive to external internal factors of personnel management are important for improvement of personal management of modern enterprises. Due to these issues there is a need in the automation the process of approving both strategic and operational plans at the enterprise. To reach this goal the adaptive personnel management system under consideration is built on the basis of an automated dynamic model, taking into account decision support in the personnel management process for each employee, which makes it possible to reduce the significance of the discrepancy between strategic and operational tasks. The results of a study of local sustainability for the constructed automated personnel management system make it possible to draw a conclusion about possibilities to increase the efficiency of using human resources in the enterprise with the use of the system. The proposed automated personnel management system is presented in the form of cross-links, which helps prevent duplication of employee tasks.

Keywords: *Human Resource, Economics, Labor Theory, Automated Control Systems, Management*

INTRODUCTION

In the analysis of modern labor economics (Brožová, 2015), conclusions were drawn that can be divided according to the degree of use of automated control systems and methods of achieving the desired result. Considering that we live in the era of Industry 4.0, which was defined by the German economist Klaus Schwab at the Davos Economic Forum 2016 (Schwab, 2016). According to this concept, it is argued that in the era of the fourth industrial revolution (Industry 4.0), in which the virtual and physical world are combined with the help of the Internet network and information tools. In addition, Industry 4.0 is characterized by changing economic relations and the widespread use of smart technologies, big data and cloud computing. A decisive factor for the success of the application is the widespread use of Industry 4.0 components to support the activities performed within the framework of their application in control systems (Kanski and Pizon, 2023). The authors paid special attention to two components: data management and business virtualization, since they are key to a positive assessment of their activities. It is noted that the presence of these two components increases the likelihood of success of a business management project.

We are currently moving to a new stage of economic development, this is Industry 5.0, which is aimed at the use of automated, intelligent systems for a sustainable production process and aimed at effective HR management, where intellectual capital is stimulated, namely human creativity and experience through the use of automated control systems. New technologies such as virtual reality (VR), augmented reality (AR) and mixed reality (MR) can become key components of automated systems (Elangovan, 2023).

It is the use of these technologies that makes it possible to solve problems of multiple personnel assessments, which are required when building automated HR management systems and organizing remote work for employees. One of the issues related to remote work of personnel is the process of their motivation in the new conditions.

To solve the problem of multiple assessment of personnel assessment and its subsequent representation in a management system, where both numerical and linguistic variables are used, which are difficult to take into account in the assessment process and management decision-making. This problem has been resolved (Ivanov et al., 2020) using the fuzzy logic method. The presented method includes four stages that allow us to

---

[1] Department of Economics, Zaporozhye National University, Zaporizhzhia, Ukraine. Email: flydaiver@gmail.com

[2] Department of Economics, Zaporozhye National University, Zaporizhzhia, Ukraine

solve the problem of choosing the analyzed indicators, procedures for assessing indicators of labor productivity, level of education, assessing the level of management at the enterprise, the level of interchangeability, assessing additional tasks and the quality of their implementation. It should be emphasized that the final success of the problem being solved is the result of completing the proposed steps using fuzzy logic methods. To improve corporate governance, a corporate economic evaluation model has been proposed (Kang et al., 2023). The advantage of the proposed fuzzy logic algorithm is that it can efficiently represent fuzzy data and is easy to understand. In this work, a fuzzy logic algorithm was used to study a model of economic management of enterprises.

One challenge that needs to be considered is the evaluation of public sector employees. In the work of (Bakker, 2015), the model under consideration used the theory of demands and resources, which takes into account how a public sector employee copes with his responsibilities. The proposed model takes into account the component of the employee's feelings and whether he remains involved in work and whether he works well. However, if these work demands are constantly increasing, then the performance of civil servants decreases.

To solve this problem, integrative models can be applied (Beltrán-Martín & Bou-Llusar, 2018; Delery et al., 2017), which take into account the analysis of the contribution of abilities, motivation and opportunities of employees to participate in the relationship between HR and employee performance. In doing so, the authors test a multilevel model that analyzes the top-down influence of three HR packages (skills, motivation, and empowerment).

However, these studies also have some limitations, which are identified by the authors: the variables are subjective in nature (HR sets) and were measured through managers' opinions about the nature of HR practices. In addition, the sample is limited to research departments, which does not imply automated HR management. The solution to these limitations has been addressed in research on strategic human resource management, human capital and competitive advantage (Delery & Roumpi, 2017).

The process of digital transformation is to identify the impact and ability to analyze big data for human resource management. In the study (Dremel et al., 2017) reviewed the successful implementation of big data analytics, which significantly influenced organizational transformation and the construction of a new organizational structure and business processes.

However, the studies did not take into account that human control is unstable. Therefore, the research of (Peng & Bao L, 2023) introduced an enterprise business management system based on intelligent data processing technology and built an enterprise management system. A structure for analyzing business management and a system that can help managers draw up an optimal plan for the implementation of management activities are presented. However, the issue of motivation has received insufficient attention.

One solution to the problem of motivation in the workplace, which directly affects employee productivity, is discussed in (Ganta, 2014), which shows that employees who are motivated and satisfied with their work perform their duties to the best of their abilities, and as a result, production volumes increase.

Research on the impact of strategic human resource management on employees is guided by research (Alshammari & Asaari, 2024), which is based on the application of a resource-based approach and provides an assessment of human resource management to bridge the "micro-macro" gap. The study provides a brief overview of the conceptual logic linking HR management practices and expected outcomes. The authors present a conceptual model that takes into account human resource management while taking into account the firm's sustainable competitive advantage. At the same time, the model does not take into account the dynamics of the personnel management process and the risks that arise as a result of the emergence of new digital tools.

Therefore, based on sociotechnical systems theory, research (Imran et al., 2021) has shown that leadership, management structure and culture are key drivers of digital transformation that help industrial organizations achieve performance results.

Thus, the problems of the digital economy, as well as digital transformation, manifest themselves in changes in traditional business strategies, and also transform the structure of social relations for both the consumer and

the enterprise. The study (Junior et al., 2020) was aimed at solving these problems, which made it possible to determine what skills are required to improve business efficiency in the process of digital transformation.

The work of (Krishnaveni & Monica, 2018) was aimed at studying influence in the process of human resource management, in which statistical methods were applied, which made it possible to find out the factors that had the greatest impact on employee productivity. The results showed that human resource management practices, namely empowerment, as well as competency development practices, emerged as important factors that enhance employee performance.

Currently, business in the world requires a set of complex and specific solutions, namely automated HR management. To solve the problem of enterprise management in modern economic conditions, the development of new methods and systems for automated HR management is required.

It should also be noted that in the modern economy there is a widespread use of intelligent and cloud technologies, Big Data, artificial neural networks and fuzzy sets, data exchange.

As the analytical review shows, in the sustainable development of states and businesses, it is an urgent task to develop automated HR management systems with adaptation to both external and internal factors. Solving this problem makes it possible to organize automated management decision-making at a qualitatively new level, which ensures increased competitiveness of the enterprise.

Depending on the scope of application, approaches and technologies of the digital economy can be divided into the following areas of application: fuzzy logic, storage and processing of multidimensional data by neural networks and artificial intelligence (AI) systems. Regarding the use of cloud technologies, the first example is the use of Amazon Web Services (Hofmanna et al., 2022) and other cloud platforms.

These technologies are determined by the extent to which they are used in automated HR management systems. Thus, the degree of use of technology is transforming both traditional and innovative HR management methods. In addition, such technologies increase the efficiency of the quality of personnel selection, as well as their level and competence.

Development towards an industrial society requires the use of methods and models to solve local problems that arise during the functioning of economic objects in information systems. Therefore, the issue of developing the enterprise economy is of a special nature in the context of the transition to a digital economy. At the same time, insufficient attention is paid to the issue of building automated human resource management systems.

Thus, the article is devoted to the construction of a conceptual model of adaptive planning, a model of automated human resource management and the study of its sustainability.

For this study, methods of system analysis and set theory were used, in particular, methods were implemented for selecting intelligent computing tools using the theory of fuzzy sets - for classifying digital marketing systems of enterprises, constructing a conceptual model for managing the marketing activities of an enterprise in the digital economy and a model for operational data processing based on OLAP technologies.

To solve the problem of strengthening and stabilizing the development of business entities in modern economic conditions, new approaches and concepts for the development of business entities are needed.

At the same time, the authors' attention is focused mainly on the prospects and opportunities for HR development.

The first trend is formulated by the degree of use of cloud computing. High information technologies are covering all countries and are reviving the usual methods of analyzing HR processes. At this time, job programs are used that offer company employees to undergo rapid testing or internships. With the help of such events, both the degree and quality of personnel selection, and even the level of training, are increased.

The second direction in personnel management is its proactive management. Modern judgment about the provisions of proactive management is based on solving forecasting problems followed by the method of active enterprise management. To solve this problem, work programs are used, which, based on express tests, provide

a perspective on predicting the effectiveness of an employee's work at the enterprise. With the help of such systems, not only the level and quality of personnel selection increases, but also the quality of its work.

The next direction is based on the application of predictive analysis in HR using historical data layers.

Today, HR is seen as a strategic and holistic approach to enterprise management, namely human resources, based on an intellectual analysis of personnel effectiveness in achieving strategic goals.

Human resources are an important component of enterprise management. Therefore, the purpose of human resource management is to ensure that the company's employees are used to obtain the maximum possible benefit from their abilities. Personnel management is based on the achievements of labor psychology and uses technologies and procedures for personnel management, that is, those procedures that affect the selection of personnel, the manifestation and satisfaction of employee requirements, and the management of relations between the company and its employees.

Today, managing people is much more complex than managing physical resources, partly because of the potential for conflict when using robots and the interests of the employee and the employer. Workers increasingly seek to participate in decisions related to their workplaces (their work environment).

As enterprises evolve, HR undergoes significant changes. During the evolution of the company, global technological and structural upheavals, increased competition and flexibility in production, as well as decentralization and privatization led to the development of collective management from personnel activities to human resources management.

Personnel management has its own solid scientific history. But, in full, her ideas and theories appeared in the new half of the 19th century; they were refined for a long time as part of various studies related to the production of goods and the practice of trade and budget organizations.

In general, there are 5 stages in the development of human resource management. Each stage is characterized by the process of determining the management functions and technologies that are the basis for creating the effective use of human resources in the enterprise.

In accordance with the progress and in the process of developing the economic activities of enterprises, the management itself was structured and meaningfully enriched. Qualitative changes are decisive in this management process, which made it possible to identify the stages of development of management thought.

In the first phase of HR development, individual entrepreneurs seeking to improve working conditions created excellent platforms to improve physical working conditions, work environment and employee well-being.

The second stage of personnel management shows that the warring countries of Europe and the United States (the period of the First World War) experienced an urgent need for human resources and an equally urgent need to increase labor productivity in a short time. During this time, the US and European governments vigorously stimulated consistent research into the field of employer-employee labor relations and human factors in industry. This led to the formation of a modern view of personnel management.

The third stage of development of personnel management is revealed by the emergence of various academic management concepts in the 30-40s of the 20th century. For example, another area of research such as industrial psychology, which paid exclusive attention to the search for the most effective and fruitful relationships between human and material resources, received another growth. The Second World War contributed to the growth of interest in various aspects of industrial psychology and, for example, in issues of leadership.

By the 1960s, within the continuum of the HR function, partial areas of specialization could be identified, framed as partial sciences with their own subject and area of study, applicable to virtually all brands and formats of business and all types of jobs involving HR.

Today, personnel policies and corresponding generally accepted procedures are used in attracting, selecting and training personnel, in the course of labor relations, in planning work, managing the remuneration system and assessing the performance of any employee.

Increasing competition in the market for the functioning of enterprises in the 1980s and 1990s, the need to develop and implement modern industrial technologies brought personnel management to the forefront. Under these conditions, the success of the enterprise depended entirely on the availability of highly skilled workers, practical reality (often associated with teamwork) and the possibility of carrying out a cultural revolution both at the state level and at the level of individual production. Team activities began to be gradually linked to an increasingly wider range of organizational tasks, as well as business strategy. Human resource management has invariably become more and more involved in the management of group businesses. HR decisions began to be made at the highest levels of management.

Personnel management is an important element of a broader concept in the management of a state, region or enterprise. Therefore, the noted phenomenon that HR is viewed as a resource that is as important as financial and material is particularly significant.

Employees will no longer passively submit to the board of directors; they increasingly expect and need a more qualified approach to their hiring and management. Behavioral analysis suggests that the board's experienced response to this harassment will contribute to the company's bottom line. Personnel management technology, in particular in relation to the characteristics of the employee, his professional training and understanding of the complexity of the activity, can only be successfully applied with the assistance and support of the personnel themselves.

One of the approaches inherent in human resources management emphasizes the need for clear communications with employees, namely: developing an organizational culture suitable for the introduction of flexible working methods; conflict management by business group leaders; group activity and employee participation in the development of collective decisions; improving the long-term prospects of workers, rather than simply achieving a certain competitiveness in performing day-to-day duties.

All management decisions affecting the relationship between a company and an employee affect the human resource management (HRM) process, and accordingly this means that HR practices are increasingly linked to business strategy. HRM is proactive in nature and aims to improve the company's performance and meet the needs of employees. Its close integration with the overall business strategy is the fundamental difference between HRM and traditional human resource management.

The HR strategy is based on the fact that enterprise management must combine HR management with business strategy. These activities enable directors at all levels to attract, select, organize, compensate, employ, improve and retain workers who meet the company's wishes and employment requirements.

This requires, in particular, the effective integration of personnel requirements management into the collective internal planning process.

To successfully implement a personnel management system, the following is necessary:

– be represented at a privileged level of enterprise management;

– participate in the development of the company's strategy and organizational structure;

– should cover the implementation of the personnel development strategy.

There are the following areas in personnel management:

– individual development;

– development based on the needs of the current job or situation;

– development in connection with new working conditions or in new conditions;

– measures aimed at redefining personal or organizational goals;

– development aimed at improving working conditions.

Thus, human resource management today is considered as a strategic and holistic approach to enterprise management, which has the following characteristics: strategic parameters and taking into account the general situation of HR within the state, region, enterprise, company; the desire to actively stimulate change and introduce new ways of working; determining the general directions of the company's policy in the field of relations in the field of hired labor; expansion and deepening of social partnership; long-term perspective; viewing personnel as an investment that needs to be developed, as well as a cost that needs to be controlled; combination of available human resources, qualifications and abilities with the plans and vector of development of the enterprise; group work and employee participation in the development of collective solutions.

THEORY

Therefore, an analytical review was carried out and a conceptual model of personnel management was built as a system of methods, principles and functions, including the processes of planning, personnel forecasting, recruitment and selection of personnel, determination of wages and development of a motivation system, professional guidance and adaptation of employees, personnel training, performance assessment resources, training of management personnel. Modern market conditions indicate an acceleration of the dynamics of economic processes, which confirms the relevance of research and development of new adaptive management models in the field of human resource management.

To solve this problem, it is advisable to use modern adaptive technologies in enterprise management processes, in particular, to create an automated system for monitoring the efficiency of human resources. The development and application of adaptive systems is based on the adaptive management approach. According to the approach, adaptation in management processes is carried out by adjusting the analytical model of automated management depending on the dynamics of external factors. The adaptive control mechanism is determined by two types of adaptation: passive and active.

Let us describe the conceptual model of adaptive planning and management, the general diagram of which is presented in Fig. 1.
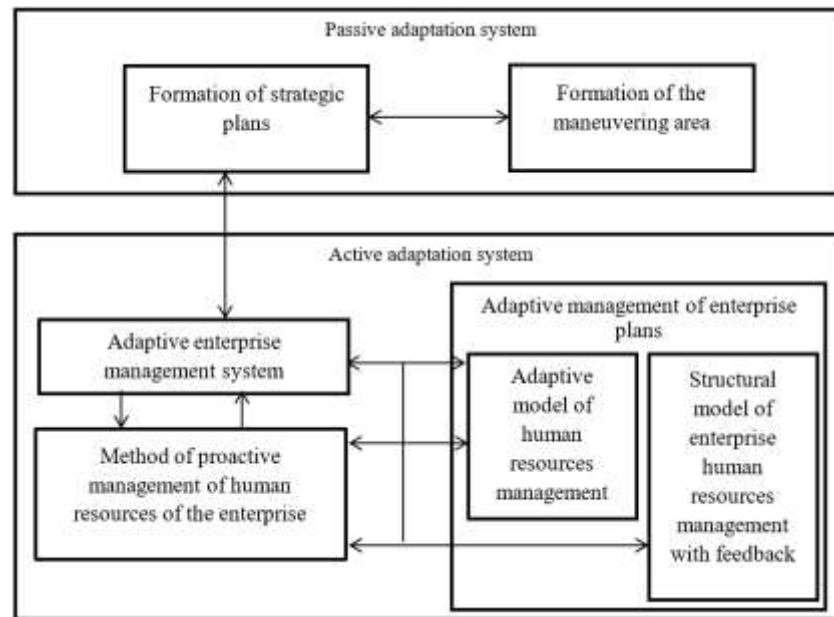

Fig. 1. Conceptual model of adaptive planning and management

The conceptual model presented in Fig. 1, consists of two systems: passive and active adaptation. The passive adaptation system consists of two interconnected blocks: a block for forming a maneuvering zone and a block for forming strategic plans. Passive adaptation is determined by the fact that in the process of developing a plan, the system uses adaptive properties, thereby realizing the adaptation effect. Adaptive properties used in the formation of strategic plans are implemented in the form of a maneuvering zone (OM is determined by

the characteristics of personnel, the number and degree of their interchangeability, as well as the performance of personnel). They determine the most effective response of an enterprise to changes in its operating conditions.

The active adaptation system is based on adaptive management of enterprise plans, which consists of two models: an adaptive human resource management model and a structural model of enterprise human resource management with feedback.

To apply and interrelate the results of these models and adapt strategic plans in a system of active adaptation, an adaptive enterprise management system was developed. Based on this relationship, this system allows you to combine the results of active and passive adaptation blocks for the sustainable functioning of the enterprise.

Implementation of strategic and operational plans for the additional maneuvering area (AM). DM is used to analyze, calculate and adjust the strategic plan of the enterprise.

The conceptual model of adaptive planning and control assumes that the maneuvering area, taking into account direct and indirect reserves, can be determined by solving a stochastic programming problem.

Active adaptation of the plan is based on the models presented in the conceptual model of adaptive planning and management (adaptive model of human resource management and structural model of enterprise human resource management with feedback) with their further use in the adaptive enterprise management system.

Strategic plans using an adaptive enterprise management system take into account the influence of random factors on the system to adjust tasks in order to reduce costs, in particular, a random vector of failures affecting the system means a loss of working time by type of work as a result of irrational actions or forced downtime for various reasons.

All activities of an enterprise are interdependent and influence each other. Due to the high share of personnel costs, one of the most important tasks is to ensure a balance between the needs and quality of human resources. The solution to this problem is based on the use of dynamic systems using automated controls, which makes it possible to reduce the "mismatch" (the difference between plans adjusted to take into account changes in external and internal factors, and the current tasks of the company's divisions) of tasks performed by the company's divisions.

Let's build a model of enterprise human resource management based on the dynamics of human resource management.

During the operation, the enterprise's divisions work according to certain operational plans $R_\Sigma = R_\Sigma(t)$, which reflect the tasks of production, sales, marketing, etc.

Under the influence of external factors (market conditions, needs, exchange rates, etc.), adjustments $Pl = Pl(t)$ occur in the planning, which must be taken into account in the tasks of the enterprise's divisions.

That is, the company faces inconsistencies between the plans Pl and R_Σ, which negatively affects the efficiency of the company. Therefore, to reconcile the plans, a task reconciliation system (TRS) is used, which generates adjustments to the operational plans ΔR_o of each of the m enterprise units ($o = \overline{1, m}$).

The determined adjustment ΔR_o of the o-th unit using the management decision support system is used to obtain a new operational plan R_o'. New plans R_o' take into account adjustments in planning Pl under the influence of external and internal factors.

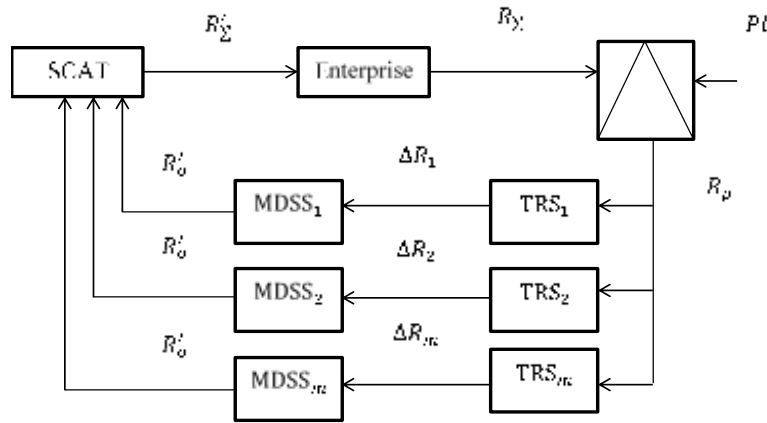The general diagram of the adaptive human resource management model is presented in Fig. 2.

Fig. 2. Adaptive human resource management model,

where is the management decision support system for the personnel of the o-th division, MDSS_o, $o = \overline{1, m}$,

m- the total number of units of production at the enterprise,

SCAT- is a subsystem for combining adjusted tasks into - a set of new operational tasks for the enterprise, $R_m' R_\Sigma'$,

- subsystem for determining the standard value of R_p as the discrepancy between plans And $R_\Sigma Pl$,

TRS_o this is a system for coordinating tasks and their implementation by the o-th department, $o = \overline{1, m}$.

Let's describe in more detail the developed adaptive model of enterprise human resources management. To do this, we will draw up a general equation describing changes in the adjustable parameter $R_p = R_p(t)$, which shows the difference between operational plans R_Σ and adjustments in planning Pl.

Adjustment of plans is carried out by adjusting, the current value of which is equal to the enterprise:R_p

$$R_p = Pl - R_\Sigma(t). \tag{1}$$

When the enterprise management issues a task, a database of tasks performed by the o-th unit is formed. At the same time, due to the established information system of the enterprise, the current regulation data R_p is fed into the system of consistency of tasks of the TRS_o for the o-th unit.

At the output of the TRS_o for the oth unit, a management decision $\Delta R_o = \Delta R_o(t)$ of operational management is formed, which is then sent to the MDSS.

In each MDSS_o, $(o = \overline{1, m})$, the corresponding new operational tasks $R_1', R_2', \ldots, R_m'$, are determined, which ensure the consideration of the management decision ΔR_o.

Let us present the economic-mathematical model in the operator form as an equation for balancing the tasks of operational management and strategic planning.

The value at the output of the management system R_Σ' is formed from the operational tasks for management ($\sum$) adjusted in the MDSS_o, and it can be written in the following form:

$$R_\Sigma' = \sum_{o=1}^m R_o', \quad o = \overline{1, m}, \tag{2}$$

where o is a division of the enterprise,

m- total number of units of the enterprise,

R_o' operational task adjusted in SPRP for the second unit.

Operational management of the enterprise is presented as:

$$R_\Sigma = \sum_{o=1}^{m} R_o, \quad o = \overline{1, m}, \tag{3}$$

where o is a division of the enterprise,

m - the total number of enterprise units,

R_o' is the operational task adjusted in the SPRP for the oth unit.

The management task for each division can be performed either by one of the divisions or be common to several divisions of the enterprise. The discrepancy between the strategic plan and the operational execution of tasks can be summarized as follows:

$$\Delta R_o = F_{3o}(R_p), \tag{4}$$

where F_{3o} is the function of task coordination for departments,

ΔR_o is the discrepancy in plans for o department.

The value obtained at the output of the **TRS** characterizes the consistency value, the value and sign that corresponds to the value and sign of the current task execution.

The value obtained at the output of the **MDSS** takes into account the inertial properties of the control system:

$$R_o' = \Delta R_o K(p) = F_{3o}(R_p)K(p), \tag{5}$$

$$R_o = R_o' S_R = F_{3o}(R_p)K(p)S_R, \tag{6}$$

where $K(p) = \dfrac{1}{Tp+1}$ is the transfer coefficient of the enterprise management system,

S_R is the sensitivity of the operational plan to the manager,

T is the time period for which the inertial properties (delays) of the enterprise management system are taken into account,

$p \equiv \dfrac{d}{dt}$ is the Laplace operator.

Then the dimensionless normalized condition for the performance of work by employees of the enterprise can be written in the following form:

$$R_p = Pl - \sum_{o=1}^{m} R_o = Pl - \sum_{o=1}^{m} F_{3o}(R_p)K(p)S_R. \tag{7}$$

The Adaptive human resources management system of the enterprise is shown in Fig. 3.
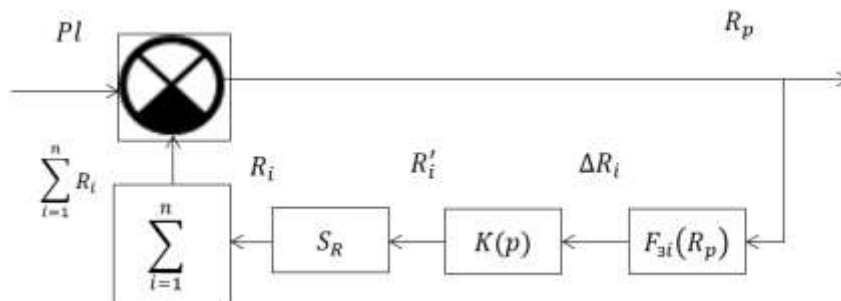

Fig. 3. Equivalent model of automated adaptive human resource management system enterprises,

Where ⊗ is an operation in which an unshaded segment means that we are adding a value, and a shaded segment means that we are subtracting.

According to the scheme in Fig. 3, we construct the equation $R_p = Pl - \sum_{i=1}^{n} F_{3o}(R_p)K(p)S_R$. For the sake of consistency, let's rewrite this equation in the following form:

$$R - \sum_{o=1}^{m} F_{3o}(R_p)K(p)S_R = Pl(0) - Pl, \tag{8}$$

where $Pl(0)$ is the initial plan of the enterprise, according to which the initial operational tasks for the enterprise's divisions are built.

This equation has a simple meaning: the current difference $R = R_p - Pl$ between the control system response and the impact is equal to their initial mismatch $Pl(0) - Pl$ in the free mode, excluding the correction.

RESULTS

Lets consider the local stability for the first of the units, if the system is stable for one of the units, then it will be so for the others. To write the equation in the operator form, we substitute $\frac{1}{Tp+1}$ for the transmission coefficient of the enterprise control system $K(p)$:

$$R(Tp + 1) - F_{3o}(R_p)S_R = (Tp + 1)(Pl(0) - Pl). \tag{9}$$

Since $p \equiv \frac{d}{dt}$ is the Laplace operator, $Pl(0)Tp$ will be equal to zero, since $Pl(0) = const$:

$$RTp + R - F_{3o}(R_p)S_R = Pl(0) - PlTp - Pl, \tag{10}$$

$$RTp + R - F_{3o}(R_p)S_R + PlTp = Pl(0) - Pl. \tag{11}$$

Thus, the general form of the equation of adaptive enterprise management is as follows:

$$(R + Pl)Tp + (R - F_{31}(R_p)S_R) = Pl(0) - Pl. \tag{12}$$

The local stability of the system is estimated. A system of differential equations is stable if all coefficients of the characteristic equation are positive:

$$(R + Pl)T > 0 \quad \text{та} \quad (R - F_{31}(R_p)S_R) - (Pl(0) - Pl) > 0. \tag{13}$$

The first inequality is always positive, because $R > 0$ and $Pl > 0$, i.e. their sum cannot be negative.

If you open the brackets in the second inequality, you will see that $R + Pl > Pl(0) + F_{31}(R_p)S_R$, because $R + Pl$ the sum of operational and strategic planning will always be greater than the adjustment of plans plus the initial strategic plan.

Thus, the proposed dynamic model of synchronization of personnel tasks in the system of proactive enterprise management is sustainable. The dynamic model of proactive enterprise management makes it possible to increase the efficiency of human resources use at the enterprise.

The next step is to build a structural model of enterprise human resource management with feedback. This is related to such a factor as stress resistance. Stress tolerance can also be defined as a human property that ensures coordinated interrelationships between all components of mental practice in an emotionally stressful situation and, thus, supports the final realization of tasks.

Such factors include: acute - death of loved ones, war, etc.; chronic, caused by difficult situations at work, dissatisfaction with personal life.

Severe stress changes employees, raising a resonance that has the ability to strengthen vitality and acclimatize to the modern state.

Chronic stress, which is often not considered an important factor, leads to adaptation problems.

To solve this problem, we use cross-linkages in the enterprise management system. At the same time, the adaptive management system will be adjusted to changes in both internal and external factors.

In the adaptive model of human resources management, cross-linkages are used. The control loop is represented in the form of cross-links, which allows the system to identify and remove duplicate tasks.
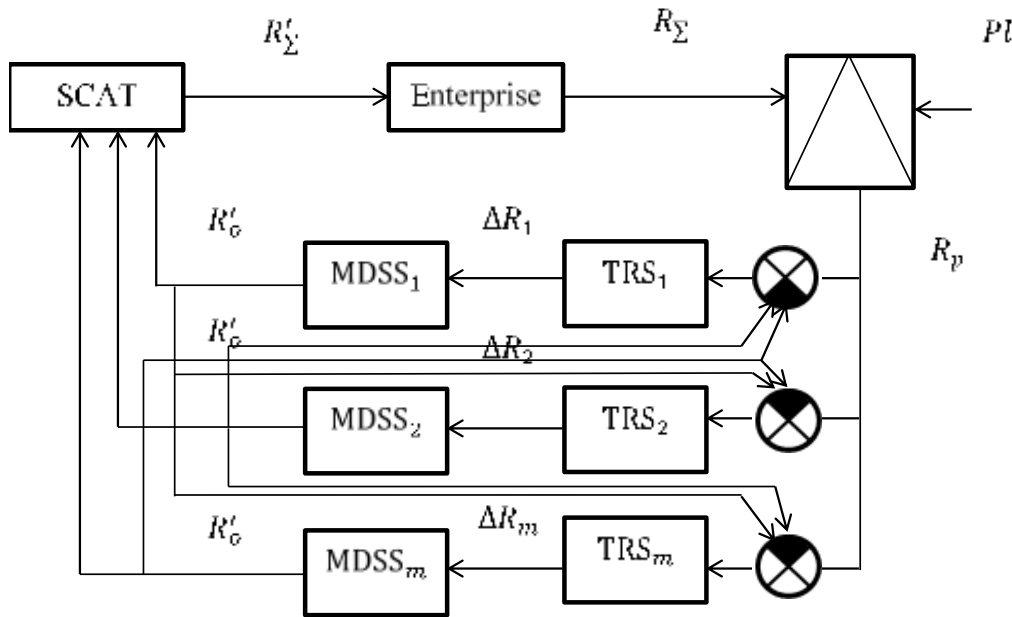

Fig. 4. Model of automated enterprise human resource management with feedback

The system ensures the adoption of m management decisions, provided that consistency between individual $R'_o(t)$ and all tasks of employees $R'_\Sigma(t)$ is taken into account.

At the same time, stability is achieved (conditional independence) in the management system due to the exclusion of similar tasks among employees, which makes the human resources management system of the enterprise more flexible.

The structural model of the enterprise's human resources management with feedback includes: the contour of the dynamic management system, cross-connections, TRS_m, $MDSS_m$.

The consistency vector $R'_\Sigma(t)$ is worked out during the time required for management decisions. All component models of the control system depend on time t and change according to the deadline of the tasks.

In addition, the influence of external and internal factors on personnel is taken into account in the process of enterprise management. This influence in time has a different interval of action. Therefore, for effective management, adaptive management is proposed for slow processes and feedback management for fast ones.

CONCLUSION

The article proposes an approach to building an automated adaptive model of human resource management, which is due to the need to take into account discrepancies in approved enterprise management plans with the dynamics of economic processes of their implementation. The inclusion of the "Task Coordination" and "Management Decision Support" subsystems in the human resource management model, implemented in an intelligent information system, increases its adaptive properties, provides the ability to determine and adjust the tasks of departments, which makes it possible to achieve a qualitatively new level in the automation of the human resource management process and increase the efficiency of their use.

An equivalent model of automated human resource management of an enterprise with feedback has been

developed, in which a control loop has been introduced, which is a cross-connection between the subsystem for supporting human resource management and the subsystem for coordinating departmental plans. Using the model will increase the stability of the human resource management system to changes in internal and external factors, take into account the dynamics of task performance, identify and avoid duplication of tasks, which is aimed at increasing the economic efficiency of using the enterprise's human resources.

Wider use of automated human resource management systems will make it possible to effectively use the intellectual capital of enterprise employees.

REFERENCES

Brožová D. (2015)."Modern labour economics: the neoclassical paradigm with institutional content". Procedia Economics and Finance, 30: 50 – 56.

Schwab, Kl. (2016). The Fourth Industrial Revolution. Currency, Geneva.

Kanski L., Pizon J. (2023). The impact of selected components of industry 4.0 on project management. Journal of Innovation & Knowledge 8 100336. https://doi.org/10.1016/j.jik.2023.100336

Ivanov M., Ivanov S., Terentieva N., Maltiz V., Kalyuzhnaya J.(2020). "Fuzzy modeling in human resource management". E3S Web of Conferences 166. https://doi.org/10.1051/e3sconf/202016613010

Bakker, A. B.(2015). "A job demands–resources approach to public service motivation". Public Administration Review, 75(5), 723-732. https://doi.org/10.1111/puar.12388

Beltrán-Martín, I., Bou-Llusar, J. C. (2018). "Examining the intermediate role of employee abilities, motivation and opportunities to participate in the relationship between HR bundles and employee performance". BRQ Business Research Quarterly, 21(2): 99-110.

Delery, J. E., Roumpi, D.(2017). "Strategic human resource management, human capital and competitive advantage: is the field going in circles?". Human Resource Management Journal, 27(1): 1-21.

Dremel, C., Wulf, J., Herterich, M. M., Waizmann, J.-C., Brenner, W.(2017). "How AUDI AG established big data analytics in its digital transformation". MIS Quarterly Executive, 16(2): 81-101. https://www.researchgate.net/publication/317232875

Ganta, V. C.(2014). "Motivation in the workplace to improve the employee performance. International Journal of Engineering Technology". Management and Applied Sciences, 2(6): 221-230.

Imran, F., Shahzad, K., Butt, A., Kantola, J.(2021). Digital transformation of industrial organizations: Toward an integrated framework. Journal of change management, 21(4): 451-479. https://doi.org/10.1080/14697017.2021.1929406Junior, F., Cabral, P. M. F., Brinkhues, R. A.(2020). "Digital Transformation: The Gap Between Digital Leadership and Business Performance". ISLA 2020: 20.

https://aisel.aisnet.org/isla2020/

Krishnaveni, R., Monica, R.(2018). "Factors influencing employee performance: The role of human resource management practices and work engagement". International Journal of Business Performance Management, 19(4): 450-475.

Hofmanna W., Langb S., Reichardtc P., Reggelin T.(2022). "A brief introduction to deploy Amazon Web Services for online discrete-event simulation". 3rd International Conference on Industry 4.0 and Smart Manufacturing. ScienceDirect. Procedia Computer Science, 200: 386–393.