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TIME MANAGEMENT MODEL IN THE ENTERPRISE PERSONNEL SECURITY SYSTEM

ABSTRACT

The purpose of the study is to increase the level of personnel security of an enterprise by integrating time management models adapted to the conditions of modern challenges and martial law. The work used the methodology of system analysis, which allowed for a comprehensive consideration of the problem and the formation of a multi-level model of working time management. The results of the study identified key external and internal factors (political, economic, social, technological) that affect personnel security in crisis conditions. It is proven that effective time management allows reducing the level of stress of personnel and the risk of losing key employees, thereby strengthening the personnel security of the enterprise; the relationship between the implementation of a hierarchical system of priorities in the distribution of tasks and increasing the enterprise's resilience to external shocks (in particular, military ones) is established; the features of the application of time management models in martial law conditions are characterized (flexibility of schedules, reserving time for critical functions, ensuring communication and support for employees). It is determined that the proposed model allows for timely assessment of the effectiveness of the current time management system and to identify changes during the initial period of time.

Keywords: time management, personnel security, system analysis, PEST analysis, enterprise activities

JEL Classification: M12, M54, H56, J24

INTRODUCTION

The relevance of the problem of effective use of working time is becoming increasingly important in the conditions of scientific and technological revolution, globalization, economic crisis, the emergence of new forms of employment and, accordingly, the reform of social and labour relations. Time is the most valuable human resource, which is limited and non-renewable, it cannot be replaced or compensated, but it can be effectively "converted", turning into life values. The correct use of time is the key to the successful performance of professional duties, and achieving goals. Therefore, the introduction of time management technologies into the personnel management system is becoming particularly relevant, which allows for increasing the efficiency of activities by optimizing time costs for preparation and decision-making, achieving strategic and tactical goals, and performing production and intellectual tasks. Economic time has a dualistic nature: on the one hand, it is a subjective temporal category, the variability of which depends on social criteria and ideas, and on the other hand, time is relative and depends on the features of the system (its size, energy, information, connectivity) in which it passes. Time has inherent characteristics of quantity and quality: it can be measured as an element of a chronological phenomenon, as well as evaluated by such qualitative indicators as usefulness, satisfaction, and efficiency. At the same time, effective time management is of particular importance for managers, since they manage not only their own time but also the working time of their subordinates. The manager distributes the goals and tasks that he sets for people according to the criterion of "importance - urgency" in order to achieve the set goal as quickly and efficiently as possible. It is he who plans the total time (the resource allocated to achieve a specific goal) and selects the tasks that are best delegated to subordinates.

Modern business conditions are characterized by the complexity and dynamism of the internal and external environment. In this context, one of the key challenges is the deployment of a full-scale invasion and the introduction of martial law in Ukraine. This has led to radical upheavals in the domestic labour market. In this context, millions of workers were simply forced to relocate within or outside the country, and some of them were mobilized into the army. In turn, enterprises found themselves in conditions of personnel shortage and were forced to form new mechanisms for restructuring their operational and personnel policies. From this, it is important to determine the essence of personnel security of an enterprise - as a state of protection of the labour potential of the latter from internal and external threats.

In addition to direct consequences, the war caused such negative consequences as a decrease in staff motivation, disruption or destruction of familiar working conditions. In such extreme conditions, a decrease in the integration of time management is even more relevant. Enterprises are forced to implement new strategies for organizing work even in conditions of constant air raids, blackouts and psychological stress. In this context, the experience of Ukrainian enterprises demonstrates that maintaining continuous operations requires the implementation of flexible and prompt actions based on certain priorities. In particular, prioritization and effective distribution of tasks between the actual personnel have become an obligatory condition for the implementation of the set plans in the situation of personnel shortages, and physical and mental fatigue of the personnel. At the same time, this can lead to an increase in the workload of employees, who are often forced to work remotely, being in a bomb shelter. All this, one way or another, leads to an increase in the level of stress and is fraught with the mental and physical well-being of employees. This situation further actualizes the importance of managing working hours and resources, since the latter is the basis for maintaining the personnel security of the enterprise.

Today, effective time management is considered a key tool for ensuring the personnel security of the enterprise. Thoughtful and systematic planning of working hours is aimed at reducing the level of work overload, which has a direct impact on the psychological state and productivity of employees.

LITERATURE REVIEW

As Maceika (2007) rightly notes, if in classical scientific methodology, time is considered an unchanging, constant quantity, then the theory of relativity has refuted this stereotype. The second law of thermodynamics proves that time is irreversible, and therefore every moment of the system's development is unique and is a step towards the increase in entropy (if the system is closed) or the emergence of a new system (if it is open). Time in the economy becomes linear and discrete if social (economic) memory is reified in material values. If people and institutions act as memory carriers, time becomes nonlinear due to social consciousness, ideology, and individual worldview. At the same time, his opinion is supported by others (Komarova, 2010), adding that in the context of management, its effectiveness can be assessed through the correct indicators.

In most cases, scientists and practitioners confirm (Melnyk, 2020; Todoshchuk, 2023; Stankevičienė, 2008; Samoilikova et al.,2023) that the implementation of measures to organize work and one's own life will undoubtedly contribute to the widespread use of achievements of science and technology, increasing the efficiency of the use of labour and material resources, and increasing the quality of work performed. Managing one's own working time will help achieve both harmony in personal life and improve the efficiency of the entire enterprise. However, at the same time, in their opinion, in order to increase the level of personnel security through this, it is necessary to first properly assess all this.

In their opinion, Poolkrajang, A. (2023) and Akhmetshin, (2018) identified two opposing paradigms in time management: speed and slowness. According to the first paradigm, speed is a rather important factor in activity (project deadlines are being shortened), and the target audience and its behaviour are becoming more unpredictable (short-termism reigns, it is necessary to cope with greater responsibility and expectations regarding the manifestation of creativity). Slow time management eliminates the symptoms, but not the cause of the time problem. At the same time, scientists continue that in the context of assessment, it is best to highlight: productivity, economy and effectiveness, which we agree with. At the same time, the problem is that not every time management is easy to assess. For example, corporate time management, as a type of social, focuses on the time organization of work of all employees of the enterprise in order to effectively use time by each of them. The corporate time management system includes three levels: enterprise time management, time management of individual departments, and individual time management of leading specialists. According to Motorniuk, (2023), it is extremely important for enterprises to assess its effectiveness, especially in the context of ensuring personnel security.

For example, Krasivsky, et al. (2023) believe that for time management to be effective, it is necessary to adhere to a system of self-assessment of the individual, which is based on four main aspects of human nature: 1) how we interact

with the world around us and where we direct our energy; 2) what kind of information we perceive first and most easily; 3) how we make decisions; 4) do we prefer to live in a concrete, ordered world (making decisions) or in a freer, dynamic one (studying possible options). However, in our opinion, a comprehensive assessment should be carried out with the involvement of relevant experts.

AIMS AND OBJECTIVES

The purpose of this study is to develop theoretical foundations and practical recommendations for building a time management model in the system of ensuring personnel security of an enterprise in the conditions of modern challenges. To achieve this goal, the following main tasks have been identified: to propose an approach to assessing the effectiveness of time management; to conduct a PEST analysis of factors affecting the time and personnel management system.

METHODS

The study used a systematic approach and methods of system analysis for a comprehensive consideration of the problem of personnel safety of the enterprise. The combination of qualitative and quantitative methods allowed us to take into account the relationships between external environmental factors, internal business processes and personnel behaviour.

The method of normalization is also used. The normalization of stimulating and de-stimulating indicators is carried out according to different formulas. Unlike the traditional version, the normalization of quantitative criteria is carried out according to formula (1):

$$Hi(H)=(Hi-Hmax)/(Hmax-Hmin) \quad (1)$$

where N is the actual value of the criterion, Nmax is the maximum value of the criterion, Hmin is the minimum value of the criterion, and N(n) is the normalized value of the criterion.

For normalization, a characteristic evaluation scale is determined in the range from 0 to 1. The complete absence of the characteristic is equal to 0. The maximum value of the characteristic in the aggregate is equal to 1. The data normalized in this way allow for direct comparison of individual indicators in dynamics and serves for calculation. Next, it is necessary to assess the importance (significance) of each of the structural components of the hierarchy, i.e., determine the weight coefficients for each of the indicators of the last level of the hierarchy. The value of the weight coefficients aij for the indicators is determined by the formula (2):

$$a_{ij}=\frac{cijdij}{\sum cijdij} \quad (2)$$

where dij – the value of factor loadings of the i-th indicator in the j-th period; cij – the contribution of the j-th component to the total variance of the set of indicators of the i-th characteristic.

The algorithm for calculating the values of factor loadings (dij) and the coefficient of the contribution of each component to the factor loading (cij) is implemented in standard software packages for statistical data processing (SPSS, STATISTICA, SYSTAT, etc.).

By definition, expert assessments are quantitative and qualitative (usually in points or ordinal numbers, ratings) assessments of processes and phenomena, economic quantities, and indicators performed by experts on the basis of judgments. In turn, we used expert analysis as a method for assessing the degree of influence of factors (scale 1–3) and the probability of changing their action (scale 1–5). At the same time, an increase in the value on the scale in both cases means an increase in influence and probability of changes, respectively. In order to obtain weighted results for each of the PEST factors, we perform the following:

1. Processing expert assessments of the degree of influence of factors, which involves: – calculation of the arithmetic mean value of the weight of the i-th factor (i = 1, …, n) (3-4):

$$Vi=\frac{\sum_j^m ei}{m} \quad (3)$$

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$$Wi=\frac{Vi}{\sum_j^n Vi} \quad (4)$$

where ej – the assessment of the influence of the factor of the j-th expert (j = 1, …, m); normalization of the obtained estimates on the scale [0, 1].

Generalization of expert estimates of the probability of change in the action of factors, which involves calculating the arithmetic mean value of the obtained expert estimates for each factor. Calculation of the real values of the influence of factors as a weighted average value (5-6):

$$Y_i=W_i*X_i \quad (5)$$

$$Xi=\frac{\sum_j^m oj}{m} \quad (6)$$

where oj is the estimate of the probability of the influence of the actions of the factor j-th expert (j = 1, …, m).

RESULTS

Based on the importance of time management as an important component of ensuring the personnel security of an enterprise, a comprehensive analysis of its effectiveness is of particular importance, which will allow identifying and tracking negative trends and determining directions and ways to overcome them. To assess the effectiveness of the time management system at the enterprise, we selected 3 operating enterprises with radically different personnel security systems and a generally different number of personnel, in order to find the average generalized value (Table 1).

Table 1. Data on enterprises selected for modelling.

LLC "Elgraf"	LLC "VD "High Castle"	LLC "Colorful Sky"
Number of personnel:120-130	*Number of personnel:55-75*	*Number of personnel:10-15*
Human resource security system: organized through a thorough screening of candidates, which includes an in-depth analysis of professional qualities, training in ethics and corporate culture, as well as a constant audit of employee activities, which minimizes the risks of internal threats and ensures the smooth functioning of the company	Human resource security system: conducting specialized training on security issues and regular audits of internal processes, which guarantees the preservation of confidential information and the stability of personnel policy	Human resource security system: covers the development of regulatory documents, regular training and monitoring of compliance with internal instructions, which allows for effective risk management and protection of corporate information
Time management system: built on detailed planning of working hours with the use of modern information technologies to monitor the performance of tasks, which contributes to the optimization of work processes, increased productivity and overall business efficiency	Time management system: organized using a detailed working time schedule, the use of specialized programs for monitoring productivity and periodic reports on task performance, which allows you to quickly respond to changes and optimize business processes	Time management system: implemented through the introduction of flexible work schedules, the use of digital tools for task planning and weekly performance analyses, which stimulates individual employee development and contributes to the sustainable growth of the enterprise

We believe that the assessment of the time management system at an enterprise should be based on three key models: the productivity model (determined by the achievement of the goals set by the personnel security system in order to form a security potential); the cost-effectiveness model (characterized by indicators of a cost-effective nature, without reference to the targeted use of available resources); the effectiveness model (reflecting the possible socio-economic effect of effective time management). To begin with, let us present the average value for all three selected enterprises of the indicators that will be used during the study (Table 2).

Table 2. Determination of weighted indicators of time management efficiency at enterprises.

Indicators	F1	F2	Weight values
Number of employees per 100	0.993	-0.05	0.078
Total labour costs	0.97	-0.108	0.079
Part of the employees who were only hired in the last year	0.78	-0.49	0.074
Part of the employees who were laid off	-0.9	-0.34	0.08
Part of the employees responsible for safety at the enterprise	-0.91	0.29	0.79
Average costs per 1 employee	0.66	-0.67	0.07
Share of total costs for time optimization	0.93	0.26	0.08
Total costs for time optimization	0.66	0.56	0.067
Part of investments in the development of safety potential	0.66	0.56	0.007
Level of socioeconomic activity of employees	0.83	-0.41	0.07
Part of the work plans fulfilled	0.45	0.82	0.058
Total dispersion	9.17	3.3	
Part of the total dispersion	0.65	0.23	

It should be noted that the specific value of the calculated integral index or indices characterizing individual aspects does not have an economic interpretation - its dynamics and comparative value are important. Therefore, the developed model of a comprehensive assessment of such a system allows, based on a comparative analysis, to assess the effectiveness of the current time management system at selected enterprises. The procedure for calculating the comprehensive assessment for 2019–2023 was carried out using the EXEL processor. The calculated estimates by groups of characteristics are shown in Table 3.

Table 3. Initial data for a comprehensive assessment of time management effectiveness at selected enterprises (normalized values, averaged together across three enterprises).

Indicators	2019	2020	2021	2022	2023
Productivity					
Number of employees per 100	1	0.97	0.89	0.84	0.79
Total labour costs	1	0.87	0.86	0.85	0.75
Part of the employees who were only hired in the last year	1	0.97	0.98	0.97	0.99
Part of the employees who were laid off	0.2	0.16	0.02	0.056	0.05
Part of the employees responsible for safety at the enterprise	0.41	0.38	0.39	0.11	0.35
Economy					
Average costs per 1 employee	0.75	0.82	0.92	1	0.73
Share of total costs for time optimization	1	0.98	0.91	0.89	0.88
Total costs for time optimization	1	0.98	0.91	0.89	0.84
Part of investments in the development of safety potential	1	0.94	0.78	0.76	0.64
Effectiveness					
Level of socioeconomic activity of employees	0.91	0.93	0.97	0.93	0.96
Part of the work plans fulfilled	0.86	0.77	0.81	0.9	0.83

To finalize the results of Table 3, it is necessary to determine the integral final assessment for all three categories: Productivity; Economy and Effectiveness. This is done on the basis of normalized indicators and corresponding weighting coefficients. Weighting coefficients calculated by formula (2) were applied to each indicator. Based on the main data and indicators from Table 3, for each year in 2019–2023, summary efficiency indices were calculated within each of the three

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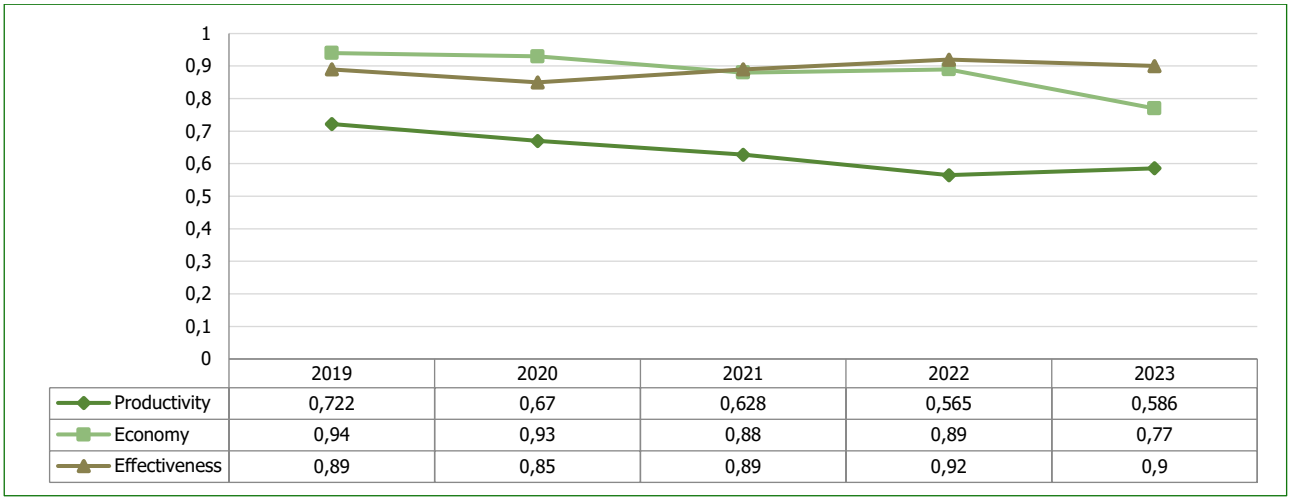
categories, which reflect the dynamics of changes in time management effectiveness. Therefore, Figure 1 will display the final values of the integral indices for each of the three categories obtained on the basis of: normalized data from Table 3; weighting coefficients from Table 2 and from the calculation of the summary index through the sum of the products of the indicators on the scales (Figure 1).



	2019	2020	2021	2022	2023
Productivity	0,722	0,67	0,628	0,565	0,586
Economy	0,94	0,93	0,88	0,89	0,77
Effectiveness	0,89	0,85	0,89	0,92	0,9

Figure 1. Final assessment of time management effectiveness in three categories.

We will calculate the estimates in order to establish the influence of factors on the formation and implementation of the time management system in the context of ensuring the personnel security of the enterprise, a PEST analysis was carried out. In the first, the degree of influence of factors is determined in the form of relatively normalized weight coefficients (3-4). In the second, the assessment of the probability of the influence of the factors is weighted by the obtained weight coefficients (according to formulas 5-6). As a result, we obtain a matrix of PEST analysis of factors that influence the formation and implementation of the time management system at a modern enterprise (Table 4).

Table 4. PEST analysis of factors of formation and implementation of time management system in the enterprise.

Political factors (P)	Average expert rating	Normalized value
Introduction of martial law and mobilization measures	2.7	0.32
State regulation of labour relations in wartime (simplification of dismissals, reservation of employees)	2.7	0.32
Instability and uncertainty of state policy (frequent changes in regulations)	1.7	0.2
Risk of escalation of hostilities, threat to the physical safety of employees	1.3	0.16
Economic factors (E)		
Economic downturn, reduction of enterprise income	2.3	0.32
Disruption of logistics chains, increase in costs	2.1	0.29
Inflation and depreciation of salaries, budget restrictions on HR programs	1.5	0.21
Loss of investments, curtailment of development projects	1.3	0.18
Social factors (S)		
Decline in employee morale and motivation	2.7	0.36
Increased stress and burnout	2.5	0.33
Demographic changes: imbalance of personnel (lack of young specialists, outflow of talents abroad)	2.3	0.31
Technological factors (T)		
Attacks on IT infrastructure, cybersecurity	1.7	0.31
Need to transition to remote work	1.3	0.24
Accelerated digitalization of business processes	1.3	0.24
Introduction of new technologies to save time (process automation)	1.1	0.21

The conducted PEST analysis shows that political and social factors are the most critical for ensuring personnel security in war conditions. In particular, mobilization and martial law (P) had the greatest significance and had a direct impact on the number and structure of personnel. Thus, a large number of qualified workers were involved in the army or were forced to leave the regions of active military operations. This situation leads to a shortage of personnel and the loss of irreplaceable specialists. No less serious is the threat posed by social factors (S), such as mass migration and increased stress levels. As a result of the manifestation of these factors, enterprises can lose key employees and those who remain work under significant physical and psychological stress.

In the final case, we will form a final vision of the mechanism of applying the proposed model to assess the effectiveness of time management in the system of ensuring personnel security of the enterprise (Figure 2).

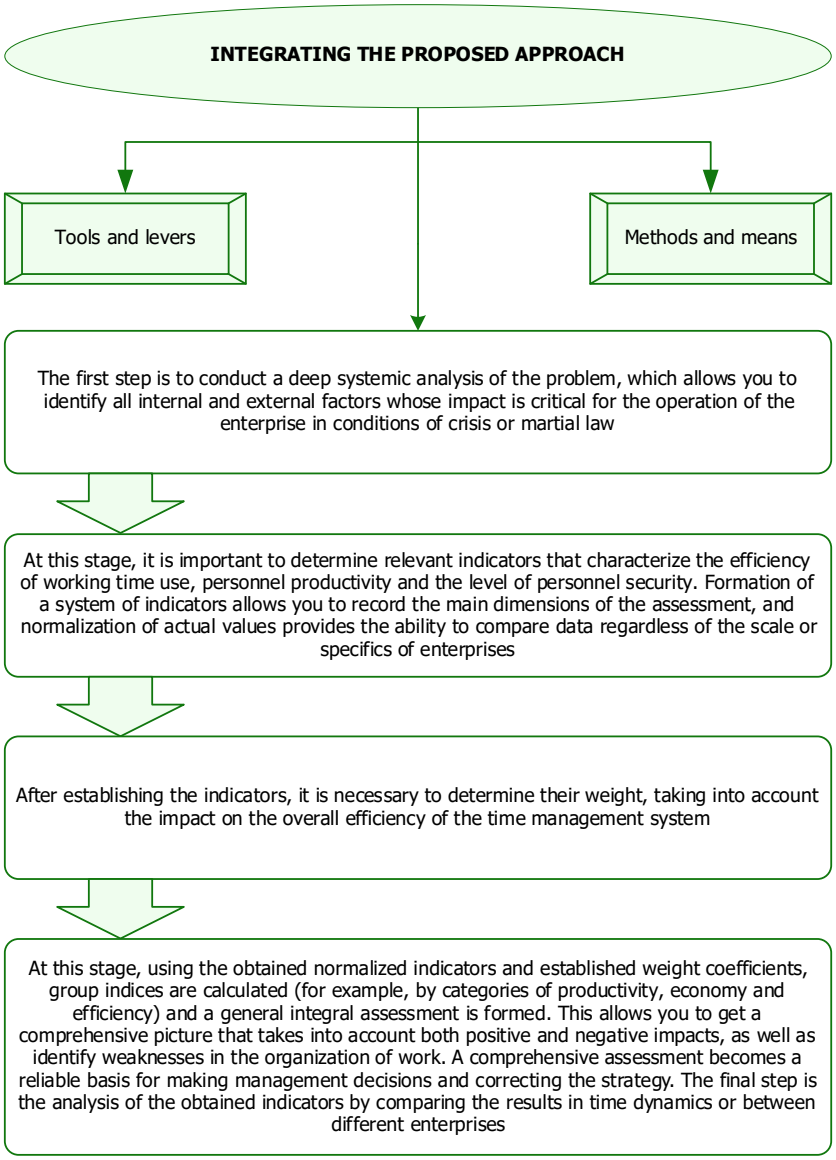


Figure 2. Mechanism of applying the proposed model to assess the effectiveness of time management in the system of ensuring personnel security of the enterprise.

This consistent mechanism allows not only to assess the current state of time management, but also to create a flexible system for its further development in the face of constant challenges and changes, which is critically important for ensuring the safety and efficiency of personnel work.

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DISCUSSION

Analyzing similar studies, Choudary et al. (2021) focus on the general principles of time management in the context of increasing employee productivity at an enterprise. To do this, they used an empirical method (a survey of personnel) while setting normal operating conditions as a basis. Comparing their results, our study focuses on crisis conditions, which in our case is due to martial law. In addition, our study involves the formation of mechanisms for integrating time management into the existing personnel security system. Methodologically, we used system analysis and hierarchical modelling, while Choudary et al. Limited themselves exclusively to a monomethodological basis - statistical analysis of surveys. Of interest is the work of Kopytko et al. (2023), which focused on the formation of an integrated personnel management system as a key factor in ensuring economic security at an enterprise in the context of digital transformation. To do this, they used the Delphi method and hierarchical threat analysis. As a result of applying these two methods, they identified the main internal and external threats to personnel. This work is similar to ours since we also used hierarchical modelling as the basis of the methodology. But at the same time, the difference in our study is that the main attention in the work of Kopytko et al. was paid specifically to internal threats in stable conditions, while we focused on finding opportunities to evaluate the effectiveness of the time management system.

At the same time, Lobanova (2009) analyzes the essence of personnel security in her work, defining it as an important component of economic security, paying attention to theoretical aspects and the formation of general measures to optimize personnel. The methodology chosen by the author was purely descriptive and analytical and reflected the conditions of the pre-crisis period. Our work is distinguished by the fact that it takes into account time management as a key component of personnel security. Dachner et al. (2019) resorted to an analysis of the issue of personnel development and management of promising employees while offering a broad conceptualization of employee training in the modern environment. To do this, they used a comprehensive literature review and strategic planning for the development of human capital in such conditions as the transition to more flexible models. The work of Troger (2021) paid special attention to rethinking the concept of management in times of crisis. In this work, such a crisis factor as a pandemic was chosen. The author noted the importance of the adaptability of HR processes, changes in the age structure of employees and the actualization of the use of modern management approaches. Our work differs in that we use a narrower focus. Thus, the orientation of the results is focused on both the assessment of internal factors (efficiency assessment) and external ones (through the use of PEST analysis).

The study by Ptashchenko et al. (2022) focused on assessing the level of personnel security and developing mechanisms to guarantee it in modern enterprises. The authors' approach was based on a comprehensive analysis of personnel management indicators and includes recommendations for personnel management policies. Our work is distinguished by the fact that we integrated the measurement of time as one of the indicators for assessing the effectiveness of time management.

Finally, Zhovnirchyk et al. (2023) studied the issue of implementing anti-crisis personnel management in the context of the economic security of the enterprise. In this work, a detailed analysis of the impact of crisis phenomena on the management of the enterprise's personnel was carried out, while outlining the most important external and internal risk factors. In our opinion, this approach is holistic and scientifically sound, but at the same time, it does not take into account the time factor, which was actively studied in our work.

CONCLUSIONS

In conclusion, we emphasize that the effective use of time resources is extremely important at the strategic level when it is necessary to make the right and timely decision. But in order to have an idea of whether it is effective, it should be constantly evaluated at the enterprise properly. The result of the PEST analysis proved that the effective operation of the enterprise depends on many external factors. However, at the same time, one of the internal ones is the art of properly managing time, because this is a resource that is inevitable and the irrational use of time can lead to negative consequences for the enterprise. Thus, it is the acceleration of socio-economic processes that encourages people to search for more effective methods of managing their own time, therefore, the use of scientifically based methods and practical techniques for using workers' time becomes a priority for increasing the efficiency of enterprises.

The proposed approach can be used as a basis for organizing ongoing monitoring of time management efficiency in order to identify problems and determine priority areas for overcoming them. Its application involves the implementation of the following stages:

1. Systemic analysis of the problem and construction of a hierarchical model.

2. Formation of a system of indicators and normalization of actual values of indicators.
3. Determination of weight coefficients.
4. Calculation of group and integral assessments of the effectiveness of the system.
5. Comparative analysis of the results obtained.

To implement the first and second stages, the methodology of quantitative assessments of social development processes is used. At the same time, this methodology has a number of advantages. Firstly, it does not limit the researcher's creative potential or his imagination of such a complex system as the mechanism for ensuring personnel security. This methodology is practically not limited by the number of input indicators, and it is also open to making any logical changes and additions. Therefore, it allows you to take into account the most relevant aspects of the time management system. Secondly, this methodology provides dynamic comparability of assessments, and takes into account the influence of both positive (stimulators) and negative (disincentives) factors. The advantage of this methodology is that each indicator of the system has an independent meaning and at the same time is a component of the generalizing indicator. In addition, it provides an intermediate stage - the calculation of generalizing indicators.

The developed system of indicators for assessing the effectiveness of the time management system allows, in the future, to create a mechanism that would ensure a high level of personnel security and serve as a basis for a thorough analysis of changes, as well as make it possible to develop appropriate, balanced measures to correct deformations, etc.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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МОДЕЛЬ ТАЙМ-МЕНЕДЖМЕНТУ В СИСТЕМІ ЗАБЕЗПЕЧЕННЯ КАДРОВОЇ БЕЗПЕКИ ПІДПРИЄМСТВА

Метою дослідження є підвищення рівня кадрової безпеки підприємства шляхом інтеграції моделей тайм-менеджменту, адаптованих до умов сучасних викликів та воєнного стану. У межах роботи використано методологію системного аналізу, що дозволило комплексно розглянути проблему та сформувати багаторівневу модель управління робочим часом. За результатами дослідження визначено ключові зовнішні і внутрішні фактори (політичні, економічні, соціальні, технологічні), які впливають на кадрову безпеку в умовах кризи. Доведено, що ефективний тайм-менеджмент дозволяє знизити рівень стресу персоналу і ризик втрати ключових працівників, тим самим зміцнюючи кадрову безпеку підприємства; встановлено взаємозв'язок між впровадженням ієрархічної системи пріоритетів у розподілі завдань і підвищенням стійкості підприємства до зовнішніх потрясінь (зокрема воєнних); охарактеризовано особливості застосування моделей тайм-менеджменту в умовах воєнного стану (гнучкість графіків, резервування часу на критичні функції, забезпечення комунікації та підтримки працівників). Визначено, що запропонована модель дозволяє своєчасно оцінювати ефективність поточної системи тайм-менеджменту та виявити зміни протягом певного періоду часу.

Ключові слова: тайм-менеджмент, кадрова безпека, системний аналіз, PEST-аналіз, діяльність підприємств

JEL Класифікація: M12, M54, H56, J24