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ACCOUNTING OF WAGES WITH THE USE OF BIOMETRICS TO ENSURE CYBERSECURITY OF ENTERPRISES

Abstract. Modern conditions of growing cyber threats caused by the hybrid conflicts around the world and looming biological threat of the COVID-19 pandemic necessitate the introduction of biometric authentication of employees, leading to the transformation in the methodology and organization of accounting at enterprises. The procedure for accounting and control of time worked and wages of the employees is the first to undergo changes due to the forcibly limited access of employees to the enterprise data and premises, which determines the topicality and aims of this research.

The aim of the article is to investigate the prospects for monitoring the working time and movement of employees on the premises (facilities) of the enterprise with the use of biometric technology in order to develop the methodology of automation of the accounting of payments made to employees and to ensure the cybersecurity of economic entities.

The prospects of using an automated employee checkpoint system based on biometrics for the purposes of accounting and control are explored. The paper improves the methodology of accounting and control over the working time and wages of employees based on the automated employee authentication system using data on the time spent on premises and performance of job functions. Recommendations are made on ensuring biological and cyber security of enterprises in terms of categorizing the enterprise premises and equipment according to their functions and level of access to information and material flows. The research examines the prospects of accounting for the employee costs, as well as accurate distribution of overhead and other costs based on data of the biometric employee authentication system.

It is advised to conduct further research into the peculiarities of methodology and organization of accounting under conditions of distance and isolated job performance by accounting employees, as it raises the requirements to cybersecurity of enterprises.

Keywords: accounting, working time, wages (salary), biometrics, employee authentication, automation of accounting and control, cybersecurity, COVID-19.

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ОБЛІК ОПЛАТИ ПРАЦІ З ВИКОРИСТАННЯМ ТЕХНОЛОГІЇ БІОМЕТРІЇ ДЛЯ ЗАБЕЗПЕЧЕННЯ КІБЕРЗАХИСТУ ПІДПРИЄМСТВ

Анотація. В умовах зростання кібернетичних загроз унаслідок міжнародних гібридних конфліктів і біологічних загроз через пандемію COVID-19 зростає потреба запровадження технологій біометричної ідентифікації працівників, що призводить до трансформації методики та організації обліку на підприємстві. Першочергово змін зазнає порядок обліку й контролю робочого часу і заробітної плати працівників через обмеження доступу працівників до інформації й території підприємства, що визначає актуальність і мету наукового дослідження.

Мета статті полягає в дослідженні перспектив контролю робочого часу і переміщення персоналу по території (приміщеннях) підприємства з використанням технології біометрії для розроблення методики автоматизації обліку виплат працівникам і забезпечення кібербезпеки суб'єкта господарювання.

Досліджено перспективи використання системи автоматизованого пропуску працівників на принципах біометрії для цілей обліку і контролю. Удосконалено методику обліку та контролю відпрацьованого часу і заробітної плати персоналу із застосуванням системи автоматизованої ідентифікації працівників на основі даних про час перебування на території підприємства і виконання функціональних обов'язків. Розроблено рекомендації щодо забезпечення біологічної та кібербезпеки підприємства в частині класифікації приміщень підприємства та обладнання за функціональним призначенням і рівнем доступу до інформаційно-матеріальних потоків. Досліджено перспективи обліку витрат, пов'язаних з утримуванням і харчуванням персоналу, достовірного розподілу загальновиробничих та інших витрат на основі інформації зі системи біометричної ідентифікації працівників.

Дальших досліджень потребують особливості методики та організації обліку в умовах дистанційного та ізольованого виконання обліковими фахівцями посадових функцій, що підвищує вимоги до кіберзахисту підприємств.

***Ключові слова*:** облік, робочий час, заробітна плата, біометрія, ідентифікація працівників, автоматизація обліку і контролю, кіберзахист, COVID-19.

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Introduction. Business entities often use a checkpoint system to allow employees to enter the premises. Establishing a checkpoint mechanism at the enterprise provides control over the

presence of personnel at the workplace and prevention of fraud or theft of material values. In the conditions of digitalization of accounting and management of economic activity, the automated checkpoint system is used for granting admission to personnel, allowing entry to vehicles or permitting movement of materials through checkpoints to zones with restricted access [1]. The technical elements of the automated checkpoint system include regular and wall mount turnstiles; turnstiles for passage in corridors; man-trap cubicles; automatic doors; rotary turnstiles; revolving doors; road blockers; barriers; parking systems; round sliding doors; full height turnstiles; sliding turnstiles, video surveillance cameras, etc. [1], which are installed at the intersection of the enterprise or functional premises. The system operates on the principle of personalized identification of personnel at the time of crossing the information-spatial boundaries of the enterprise. A unique identifier in most cases is an individual chip card with personal data of the employee.

The automated system registers the arrival and departure of the worker and thus calculates his actual working time. In practice, as noted by A. V. Yanchev, various methods of automated collection and processing of information on labour and wages accounting are used. Their choice largely depends, on the one hand, on the type of production, the peculiarities of its organization and technology; organization and forms of remuneration; applied forms of primary documents and their templates; systems of centralized, decentralized or mixed accounting, forms of accounting; on the other hand, on the type, class, hardware of the used computers and accessories; methods of organizing information support; degree of digitalization and automation of normative-planned calculations, etc. [2, p. 217].

However, the effectiveness of such accounting remains questionable in the case if an employee is present on the company premises, but is not performing their functional duties. The employee may be in a location that does not directly fall within the scope of his competence. In other words, the presence of a person at work does not guarantee the performance of his professional duties, which cannot be considered an effective way of accounting for time worked and wages. Additionally, individual card of an employee may be used by another person, thus violating the principle of personal employee authentication. To avoid organizational and functional limitations of automated personnel authentication for the purposes of accounting of working time and wages, it is advisable to use modern biometrics technology. Biometrics is a set of automated methods and means of human identification based on their physiological or behavioural characteristics [3].

Literature review and problem statement. Biometric authentication technology is gaining considerable popularity in commercial use. According to a study that Global Biometrics in Workforce Management Market conducted in 2019 among companies in North America and Europe that use modern computer and communication technologies, 62% of respondents use biometric authentication capabilities (with 86% projected in 2021). Most businesses (51%) use biometrics through smart phones. However, systems of time clocks (20%), smart locks to premises (18% — access to server equipment and 14% — access to office premises), portable devices as items of clothing (5%) and others are increasingly used (*Fig. 1*).

Other business entities, when planning the introduction of biometric authentication technologies for employees, take into account organizational and functional barriers and risks (*Table*). According to the IT experts surveyed by Global Biometrics in Workforce Management Market, the most significant barriers are significant cost of technology (67%) and reliability (59%), while the biggest risks are the possibility of false positives (64%) and fraud with replication of identifier (57%). These limitations in the implementation of biometrics are solved with further scientific and technical development of the technology. However, overcoming the next barrier (the need for biometric data management — 47%) and risk (lack of standards and methods of data use — 50%) requires research in the field of practical use of biometric authentication technologies, in particular for business purposes.

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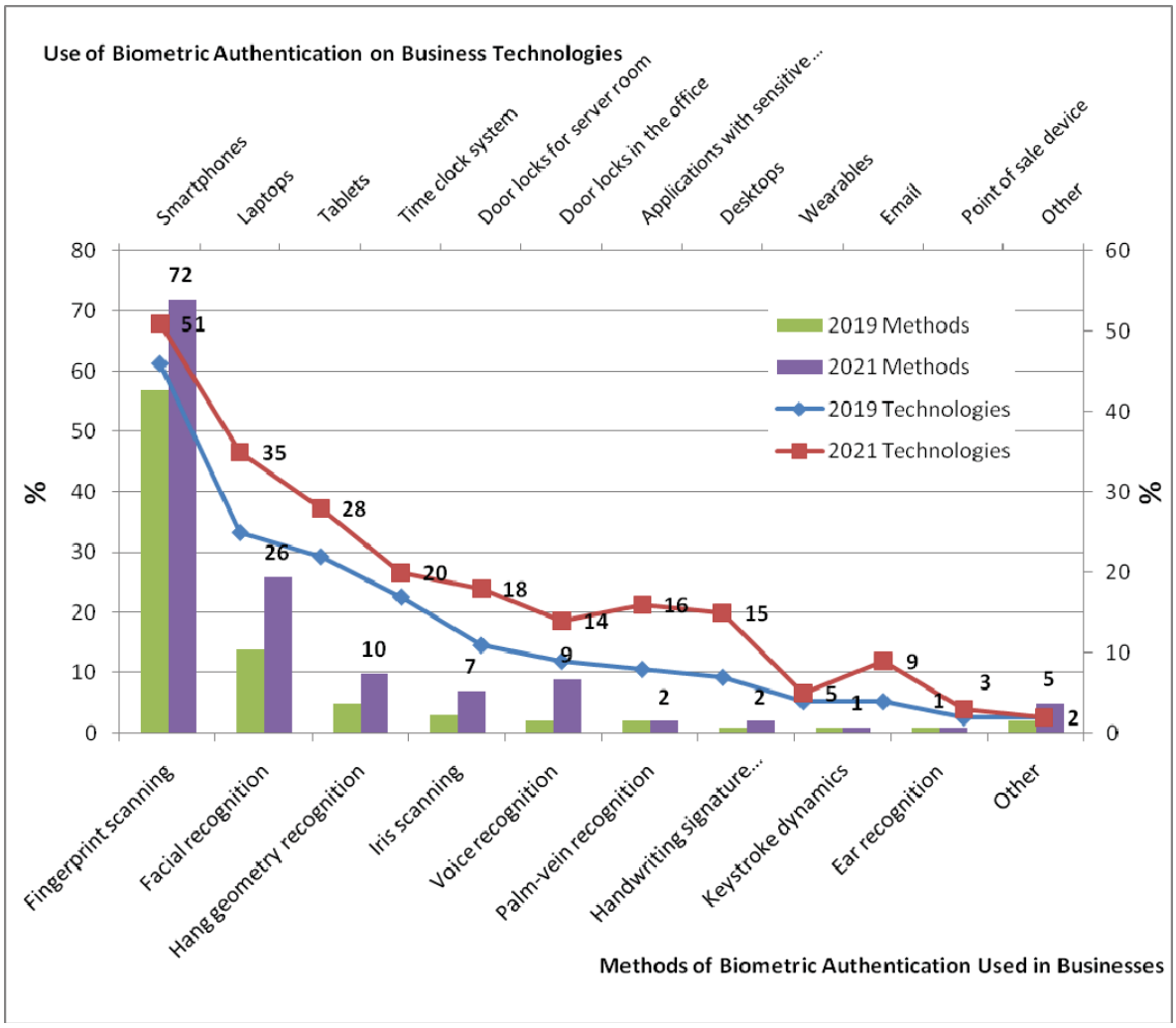

Fig. 1. **Technologies and methods of biometric authentication in business**

Note: compiled by the author on the basis of data from [4].

Table

Barriers and Concerns (Lacks) to Adopting Biometric Authentication in the Workplace

Biggest Barriers to Adopting Biometric Authentication in the Workplace	% interviewers	Security Concerns About Using Biometric Authentication in the Workplace	% interviewers
Cost of technology	67	Risks of false positives	64
Reliability concerns	59	Identifiers can be replicated	57
Management of biometric data	47	Lack of standards and using methods	50
System upgrade requirements	42	Risks of stolen biometric data	48
Employee push back	42	Compliance risks	37
Complexity of transition	40	Identifiers cannot be revoked	35
End user training requirements	38	Other	6

Note: compiled by the author on the basis of data from [4].

Studying the possibilities of economic use of biometric authentication technology, scientists have determined that developments in the field of collecting data on working hours and location of the company's staff are particularly promising. For example, I. Fubara-Manuel investigated the method of using biometric authentication technologies to control the movement of personnel of enterprises, the entrance (exit) beyond the perimeter of various premises or areas [5]. B. Li, G. Ponson, Y. Ezzahi investigated the security aspects of identifying the spatial movements of personnel and its impact on access to information and material resources, which determine the relevance of biometrics in ensuring cybersecurity of the enterprise [6]. In continuation of

cybersecurity research, S. Sinno and C. Hawley scientifically explained the means of controlling access to information based on biometric authentication in terms of monitoring the work of employees [7]. Similarly, Sun, Zhenjun, Li, Qi, Liu, Yunfan and Zhu, Yuhao highlight the potential of using personal authentication for more than merely monitoring movement within the premises – for determining the actual time of functional duties' performance [8]. This research was continued by S. Boonkrong, who identified the features of remuneration based on the monitoring of employees' access to computer equipment through logins and passwords [9].

Biometric authentication is actively used in software and hardware of working time control systems and to ensure compliance with labour discipline. The main functions of such systems include:

- establishing work schedules of the enterprise (organization) as a whole, its structural subdivisions and employees;
- calculating the amount of time worked by employees according to their work schedules;
- identifying deviations from work schedules (abnormal situations);
- controlling access of employees to the enterprise premises, etc. [10, p. 4].

However, both working time control systems and scientific works of researchers on personal biometric authentication do not consider the possibility of automating the accounting and control of working hours and salaries of employees of business entities. At the same time, scholars ascertain new trends in the automation of accounting for employee payments caused by the development of communication technologies and remote mode of work precipitated by the pandemic. In particular, L. Ocheretko and H. Udovychenko consider the transformation of the work process and the peculiarities of wage accounting in a time of global pandemic [11]. G. Neil identified the main trends in non-monetary wages, which involves the transition to teleworking and remuneration in electronic currencies, along with the automation of payroll [12]. The main trend in the workflow is the implementation of information and communication technologies to ensure remote or isolated performance of functional responsibilities. J. Fletcher, D. Gillum, R. Moritz, and A. Schwartz also emphasize the need to restrict access to the company's premises to ensure employee biosecurity, which requires changes in accounting and workflow management [13].

W. Gupta has developed a unique model for determining the amount of potential salary based on the assessment of professional and personal characteristics of applicants on the list of vacancies on employment sites [14]. Similarly, based on the technology of «deep learning», Kuo Jong-Yih, Liu Chien-Hung and Lin Hui-Chi proposed a method of automated determination and accounting of wages based on a number of variables for arbitrary periods of time [15].

According to V. I. Revenok and O. S. Mamchur, something all scientists share is the attempt to outline the requirements for an accounting system of wages and working time that uses computer communication technologies:

- integration of personnel accounting, labour accounting and its payment into a single whole;
- centralization of processing of information on labour accounting and its payment;
- automated collection of information about employees' work and time worked by them;
- automation of typical payment transactions;
- automated control over the movement of employees on the enterprise premises and access to information [16, p. 22].

The topic, aim and objectives of this article were motivated by the modern trends in the development of computer communication technologies in the field of biometric authentication of employees and the necessity of ensuring cybersecurity, remote and isolated performance of functional duties in the conditions of the COVID-19 pandemic.

The aim of the article is to investigate the prospects for monitoring the working time and movement of employees on the premises (facilities) of the enterprise with the use of biometric technology in order to develop the methodology of automation of the accounting of payments made to employees and to ensure the cybersecurity of economic entities. In order to achieve the aim of the research, several objectives must be fulfilled, including:

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- determining the prospects of using the automated checkpoint system for employees on the principles of biometrics for accounting purposes at the enterprise;
- improving the methods of accounting and control of time worked and salaries of staff using an automated authentication of employees based on data of time spent within the enterprise premises and performance of functional duties;
- making recommendations on cyber security and biological security of the enterprise in terms of categorizing enterprise premises and equipment by functional purpose and level of access to information and material flows;
- optimizing communication with employees, state regulatory organizations, medical institutions and banking institutions aimed at informing them about the payroll;
- exploring the peculiarities of accounting for other costs associated with staff retention, based on the system of biometric authentication of employees.

Research results. Biometric scanners are the technical component of the automated checkpoint system; they are installed at the intersection of the designated areas of the enterprise, production and office premises. Production equipment and computerized workplaces are also equipped with biometric authentication of employees. Each unit of fixed assets is assigned a list of responsible persons who are given access to information and performance of official duties. An automated employee authentication system in most cases is used for security reasons.

It is proposed to also use the information on the authorized access to the enterprise premises and equipment in order to record the time worked by staff. Biometric authentication of employees in the process of using machines and tools is regarded as the performance of official duties. Time spent operating equipment can be recognized as working time of the employee, which affects the calculation of wages. A similar principle of estimating time worked is already applied in automated workstations of computer specialists, whose working day (clocking in and out) is determined through personal identification.

The main problem in the automation of time tracking is the control over the work of employees who may be at their workstations, but are not performing functional duties. The use of video surveillance is quite effective in this case. Visual identification provides control over the movement of workers between locations and time spent at the enterprise to ensure its cyber security.

In addition, an automated checkpoint system based on biometric authentication of personnel is useful for demarcating human flows within the premises of the enterprise in order to provide biological protection. Controlling overcrowding and personal hygiene indoors is an important component of preventing and avoiding biological threats in a COVID-19 pandemic.

The list of constant and variable data on the movement of personnel within the premises and buildings of an enterprise obtained using biometrics technology for the purposes of accounting and cybersecurity is given in the information model in *Fig. 2*.

It is advisable to use a single database as the basis of an automated system of time worked accounting. The integrated database should contain all information about the company's employees: age, experience, qualifications, education, job title, job responsibilities, authorization to access information, methods of calculating wages, available wage tax benefits, special conditions that determine the right to bonuses or compensations. All documents related to personnel policy are entered into the information system.

To ensure the reliability and timeliness of accounting and control procedures in enterprises that use biometric authentication systems, it is recommended to choose the minute as the basic unit of measurement of time worked. Minute of working time is the optimal unit of calculation that allows for a more efficient accounting of wages. In addition, the use of minute-by-minute accounting enables detailed control over worker delays, absences from workstations or unauthorized access to restricted areas of the enterprise during working hours. At the end of the reporting period, based on data on total unproductive loss of working time, it is recommended to automatically deduct wages.

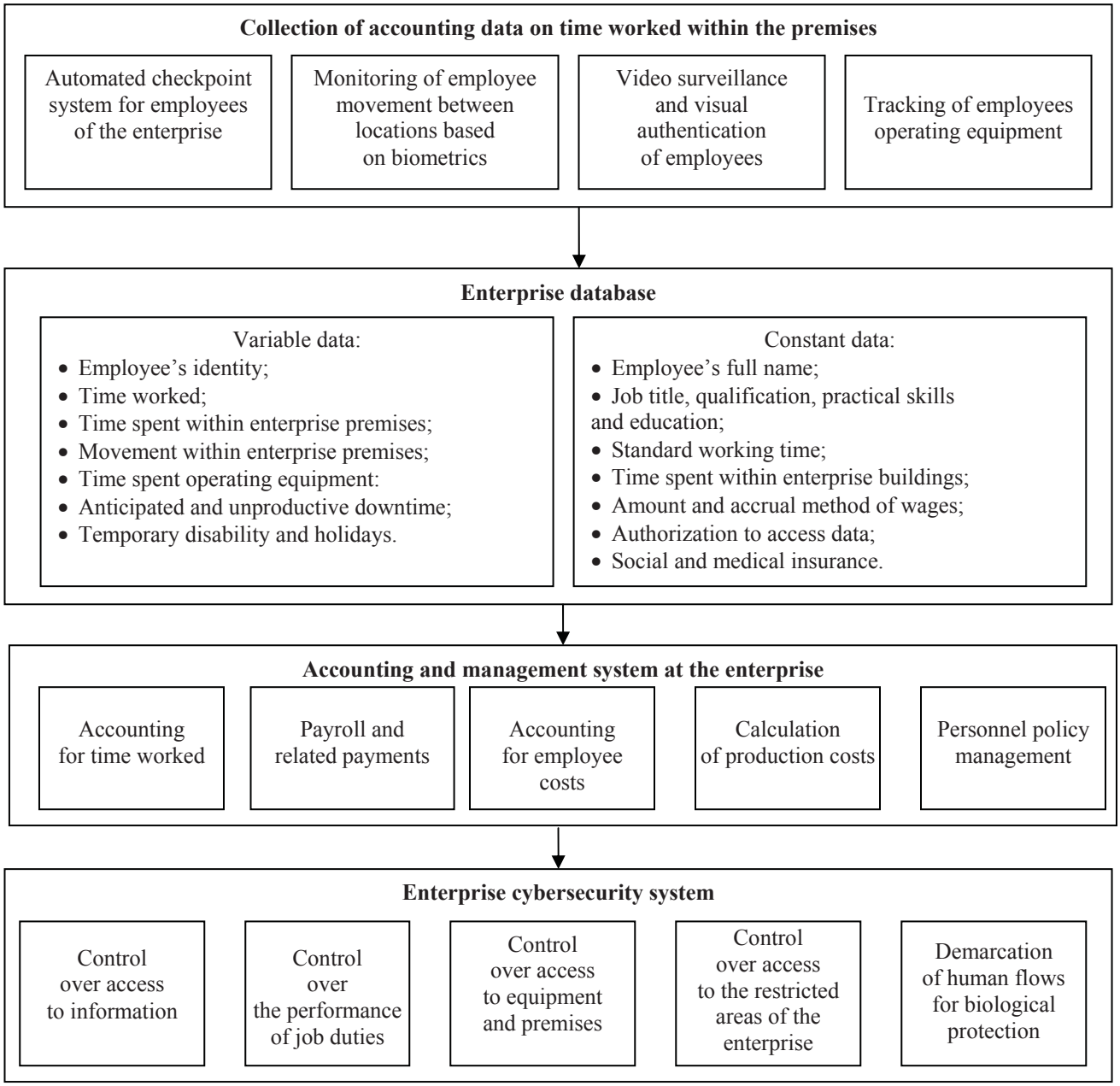

Fig. 2. **Information model of automated accounting of time worked and wages based on biometric authentication systems to ensure cybersecurity**

Information on the personal deviation of the working time from the normative indicators should be promptly sent to staff. Every employee has the opportunity to self-correct and adjust working hours. The possibility of an employee manipulating the accounting information is minimized by eliminating independent filling of time-sheets and thus rounding up to full working hours. The biometric authentication system can automatically record the start and end time of an employee's working time, which ensures a fair determination of wages and minimizes conflicts between employees and employers.

Accounting of working time in minutes can be used to stimulate productivity of employees with a regulatory working time. Per-minute accounting of time worked is relevant for employees whose wages depend on a combined performance of different types of work within the planned time period. In particular, there is a possibility of reliable accounting and control of working hours for employees with irregular hours working from home with hourly wages during the COVID-19 pandemic. The employee independently monitors and determines the duration of the work shift.

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Additionally, biometric authentication of employees makes it possible to record the time worked accurately even if there are gaps between shifts, which is relevant for companies with three-shift operation. Employees can leave the premises of the enterprise (including to perform tasks from home) or step out of the production buildings for a certain time. The system will identify the fact of relocation and calculate the total time of performing direct functional duties. It is necessary to keep separate records of employee downtime that is caused by the technological process or the specifics of the enterprise. In the time regulations of the automated accounting system it is necessary to prescribe that there may be stretches in the production process when the employee is not perming their functional duties, which do not constitute loss of working time. For example, after the production of a certain volume of products, it takes time to cool the equipment, load a new portion of raw materials and so on. In other words, after the end of the production cycle, the employee in accordance with job descriptions can leave the workstation or production premises and use the forced downtime for their own needs.

Automated control is provided over personal unproductive losses of time, tracking of deviations from the normative indicator of time necessary for performance of one production task, production of one unit of finished goods by the employee, rendering of services, etc. Each fact of deviation should be recorded in a single database in different analytical sections. Accumulated data are the basis for identifying the instances of reduced productivity of each employee, which may be a signal to review their working conditions or prompt retraining.

It is possible to automatically calculate the salaries of staff based on the information about the time spent within the enterprise premises or at home. To automate the accounting and control of wages, it is advisable to pre-fix the tariff for the unit of time worked for each type of production facility, as well as remote performance of functional duties. Thus, it is necessary to set the basic tariff rates for employees for each minute of stay in a certain type of premises (at home), for which it is recommended to divide the enterprise premises into several areas. In addition, it is necessary to restrict the access of personnel to certain types of buildings or territory of the enterprise to ensure cyber and biological security.

Wages should be calculated taking into account the functional purpose of the premises and the professional responsibilities of the employee. Quite often, the area of the enterprise, which is the main workstation of one employee, can be ancillary to another. Therefore, the enterprise territory should be divided into separate functional areas for each group of staff. It is also necessary to develop a timetable for each employee of the enterprise by determining the impact on the payroll of time worked, productive and unproductive downtime. As a result, the employees can receive detailed timed instructions for performing functional duties, moving around the company and working from home. Regulating time parameters of work helps to avoid excessive concentration of workers on the enterprise premises, thus minimizing biological threats (especially the risk of contracting COVID-19).

It is also useful to automatically compare time standards and indicators of actual time worked. In case of overtime work, it is advisable to automatically accrue additional pay to employees. If the length of a working day is fixed, it is advisable to offer compensation for overtime work. Similarly, the enterprise management can use extra pay in addition to wages to stimulate remote performance of functional duties from home. In this case, both biological risks and employee costs are reduced.

The use of a minute as a calculation unit should start with the second hour of overtime. Since in the first minutes after the end of the working day employees may spend time on interpersonal communication or personal hygiene, it is impractical to classify the delay in leaving the workplace as overtime. Therefore, incentive payments should be made for the full first hour and subsequent minutes of overtime.

The work of employees at night and on weekends is also subject to monitoring. It is advisable to automatically calculate the basic and additional wages by comparing the actual time of employees spend in the workplace (remotely performing their functional duties from home), at their workstation or operating equipment.

Similarly, it is possible to control the performance of functional responsibilities from home through permanent monitoring of all operations occurring from remote workstations. The time the employee spends working in specialized software or performing tasks on the Internet (provided for by their job description) is subject to control. Time of long downtimes, consuming entertainment, using social media, etc. is excluded from the total employee working time and wages.

Primary documents like timesheets and payroll can be filled out electronically using the accounting data from the system of biometric employee authentication. It is recommended to send payment slips automatically to the employee workstations or personal emails in order to inform them about the method of calculating wages and deductions from it.

The very fact of forming payroll registers can start the automatic process of making payments to employees. It is advisable to form the appropriate bank documents with a pre-set time lag after registration of information on accrued wages in the system. After receiving electronic approvals from the officials responsible for such transactions, payment documents are automatically sent to the executor through the banking communications system. More details about the methodology of monetary transactions and features of their accounting in the digital economy are disclosed in the scientific work [17]. The bank transfers funds to personal salary accounts of employees, which completes the cycle of accrual and payment of wages.

In addition to the company's staff, information about the working time and wages from the biometric employee authentication system should be automatically sent to interested stakeholders. Accounting information in addition to internal purposes can be used for: verification of sick leaves when calculating compensation under the terms of social and medical insurance; formation of generalized statistical arrays of data on the number of employees and wages; confirmation of the accuracy of taxes and contributions to social insurance funds, etc.

It is also recommended to use the biometric authentication system to account for the company's employee costs. Prior to the beginning of the COVID-19 pandemic, the costs of social, residential and recreational support for employees were increasing [18]. Innovative enterprises actively created common use areas, which, in addition to corridors, toilets, and bathrooms also included playrooms, lecture halls, meeting rooms, etc. The structure of employee costs has changed with the increase in remote and isolated performance of functional responsibilities. It is also incorrect to account for the cost of maintaining premises for employees who perform functional duties remotely. Given the free access of all employees to common areas, as well as the transfer of workstation of some employees outside the company, it is difficult to effectively distinguish the employee costs from production, administrative, marketing or other costs.

If the total number of specialists who were physically present in the common use areas is identified, the employee costs can automatically be distributed between different groups of specialists. In other words, the total cost of operating the premises at the end of the reporting period can be grouped in proportion to the number of visitors from production, administrative, sales and other groups of personnel during the reporting period. The employee costs for those working outside the company premises is not taken into account.

Information from the biometric authentication system on the number and positions of employees who visited the dining area is the basis for automated accounting of employee costs. The cost of food in canteens, bars, cafes that is fully or partially funded by the company should be automatically attributed to several groups by specialization. After the end of the work shift or calendar day, it is recommended to categorize the total cost of food into different types in proportion to the number of visitors and their positions. Using biometrics technology provides reliable cost accounting without the need for fictitious distribution among all employees (including those at home) or attribution to only one group (item) of costs.

Information from the biometric authentication system on the time worked by production workers and their wages can also be used as an optimal basis for the distribution of overhead costs. The need to accrue wages to employees who simultaneously work in several positions, for example in different production units for the manufacture of several types of products, is problematic for the accounting departments of enterprises. Both parallel and remote (from home) performance of

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functional duties negatively affects the reliability of the distribution of overhead costs in proportion to the wages of production staff. On the other hand, biometric authentication of employees that records their performance of exclusively production duties contributes to the optimization of accounting and distribution of overhead costs in the enterprise. Similarly, automation can be introduced for all costs associated with the sustenance and operations of employees at the enterprise after they are derived from the automated system of biometric employee authentication.

Conclusions. To ensure control over the access of employees to information and material flows, automated checkpoint systems are used to admit employees to the premises and buildings of the enterprise. The operation of the system mainly involves the implementation of security functions. However, modern conditions of growing cyber threats caused by the hybrid conflicts around the world and looming biological threat of the COVID-19 pandemic necessitate the introduction of biometric authentication of employees, leading to the transformation in the accounting and control over time worked by the employees, accrual of basic and additional wages, as well as creation of digital primary documents and reports consequently sent to stakeholders.

Biometric employee authentication should be used when they cross between separate functional areas of the enterprise and its individual buildings. The entire territory of the entity should be divided into different functional areas for different groups of staff in order to restrict access to confidential information, which will help ensure a sufficient level of cyber security of the enterprise. It is recommended to pay wages in accordance with the time spent within the areas that correspond to the functional duties of the employee or the time spent operating equipment connected to their official duties (including from home). For the purposes of automated accounting and control, functional and time regulations for the implementation of functional responsibilities and stay in certain types of premises are developed in advance for each employee. Regulating the time parameters of employees' work helps to avoid overcrowding on the premises of the enterprise, which helps to minimize biological threats (COVID-19 infection).

It is advisable to introduce one minute as the measure unit to ensure effective accounting and control of the time worked. The use of a more detailed unit of measure creates an opportunity to account for and control deviations from the standards of working time, ensure self-management of employees, and increase their productivity. Failure to comply with the work schedule may be grounds for review of working conditions or the need for professional retraining of the relevant specialist. On the other hand, information on overtime work (including remote performance of official duties from home) should lead to the accrual of additional compensation and incentive payments to employees.

Information from the system of biometric employee authentication on the performance of functional duties at the employees' workstations at home or work can be used to help optimize the accounting of employee costs. Automation can also be used in accounting for the cost of food, operation of common areas, overhead costs with a clear distribution between production, administrative, marketing and other costs. Information on time worked and wages created by the system of biometric employee authentication is summarised in electronic form and sent to internal and external stakeholders.

Prospects for further research and development. It is advised to conduct further research into the peculiarities of methodology and organization of accounting under conditions of distance and isolated job performance by accounting employees, as it raises the requirements to cybersecurity of enterprises.

Література

1. Автоматизована система контролю доступу : матеріал з Вікіпедії — вільної енциклопедії. URL : https://uk.wikipedia.org/wiki/Автоматизована_система_контролю_доступу.
2. Янчев А. В. Електронний облік праці та її оплати – основа державної стратегії формування людського капіталу. *Вісник ХНАУ ім. В. В. Докучаєва. Економічні науки.* 2015. № 2. С. 212—221.
3. Біометрія : матеріал з Вікіпедії — вільної енциклопедії. URL : https://uk.wikipedia.org/wiki/Біометрія.
4. Global Biometrics in Workforce Management Market 2019. Data Snapshot: Biometrics in the workplace commonplace, but are they secure? URL : https://community.spiceworks.com/security/articles/2952-data-snapshot-biometrics-in-the-workplace-commonplace-but-are-they-secure.

5. Fubara-Manuel I. Biometric Capture. *African Diaspora*. 2020. № 12. P. 1—25.
6. Li B., Ponson G., Ezzahi Y. Biometrics Security. 2020.
7. Sinno S., Hawley C. How biometrics can save companies from «fire and forget». *Biometric Technology Today*. 2020. № 7. P. 5—8.
8. Zhenjun S., Qi L., Yunfan L., Yuhao Zh. Opportunities and Challenges for Biometrics. *China's e-Science Blue Book 2020*. 2021. P. 101—125.
9. Boonkrong S. Biometric Authentication. Authentication and Access Control. 2021. P. 107—132.
10. Система обліку робочого часу «STOP-Time 4.0». Київ : ТОВ «Кард-Сістемс». 2016. 62 с.
11. Ocheretko L., Udovychenko H. Improvement of Salary Accounting at the Enterprise. *Efektyvna ekonomika*. 2020. № 12.
12. Neil G. Accounting for Employee Benefits. Counting the Poor: New Thinking About European Poverty Measures and Lessons for the United States. 2012.
13. Fletcher J., Gillum D., Moritz R., Schwartz, A. Demographic and Salary Trends of the 2020 Biosafety Workforce. *Applied Biosafety*. 2020. № 3.
14. Gupta W. Salary Estimator using Data Science. *International Journal for Modern Trends in Science and Technology*. 2020. № 6. P. 319—322.
15. Jong-Yih K., Chien-Hung L., Hui-Chi L. Building Graduate Salary Grading Prediction Model Based on Deep Learning. *Intelligent Automation & Soft Computing*. 2021. № 27. P. 53—68.
16. Ревенок В. І., Мамчур О. С. Основні аспекти інформаційних систем з обліку нарахування заробітної плати. *Молодий вчений.* 2015. № 2 (17). С. 22—25.
17. Zadorozhnyi Z., Muravskyi V., Shevchuk O. Management accounting of electronic transactions with the use of cryptocurrencies. *Financial and Credit Activity: Problems of Theory and Practice*. 2018. № 3 (26). P. 169—177.
18. Semenyshena N., Sysiuk S., Shevchuk K., Petruk I., Benko I. Institutionalism in Accounting: a Requirement of the Times or a Mechanism of Social Pressure? *Independent Journal of Management & Production*. 2020. № 11 (9). P. 2516—2541.

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References

1. *Avtomatyzovana systema kontroliu dostupu: material z Vikipedii — vilnoi entsyklopedii [Automated access control system: material from Wikipedia — a free encyclopedia]*. (n. d.). Retrieved from https://uk.wikipedia.org/wiki/Автоматизована_система_контролю_доступу [in Ukrainian].
2. Yanchev, A. V. (2015). Elektronnyi oblik pratsi ta yii oplaty — osnova derzhavnoi stratehii formuvannia liudskoho kapitalu [Electronic accounting of labor and its payment is the basis of the state strategy of human capital formation]. *Visnyk KhNAU im. V. V. Dokuchaieva. Ekonomichni nauky — Bulletin of KNAU named after V. V. Dokuchaev, 2*, 212—221 [in Ukrainian].
3. *Biometriia: material z Vikipedii — vilnoi entsyklopedii [Biometrics: material from Wikipedia — a free encyclopedia]*. (n. d.). Retrieved from https://uk.wikipedia.org/wiki/Біометрія [in Ukrainian].
4. Global Biometrics in Workforce Management Market 2019. (n. d.). Data Snapshot: Biometrics in the workplace commonplace, but are they secure? Retrieved from https://community.spiceworks.com/security/articles/2952-data-snapshot-biometrics-in-the-workplace-commonplace-but-are-they-secure.
5. Fubara-Manuel, I. (2020). Biometric Capture. *African Diaspora, 12*, 1—25. doi:10.1163/18725465-01201002.
6. Li, B., Ponson, G., & Ezzahi, Y. (2020). Biometrics Security. doi:10.13140/RG.2.2.26699.41766.
7. Sinno, S., & Hawley, C. (2020). How biometrics can save companies from «fire and forget». *Biometric Technology Today, 7*, 5—8. doi:10.1016/S0969-4765(20)30095-3.
8. Zhenjun, S., Qi, L., Yunfan, L., & Yuhao, Zh. (2021). Opportunities and Challenges for Biometrics. *China's e-Science Blue Book 2020,* 101—125. doi:10.1007/978-981-15-8342-1_6.
9. Boonkrong, S. (2021). Biometric Authentication. Authentication and Access Control, 107—132. doi:10.1007/978-1-4842-6570-3_5.
10. *Systema obliku robochoho chasu «STOP-Time 4.0» [Working time accounting system «STOP-Time 4.0»]*. (2016). Kyiv: TOV «Kard-Sistems» [in Ukrainian].
11. Ocheretko, L. & Udovychenko, H. (2020). Improvement of Salary Accounting at the Enterprise. *Efektyvna ekonomika, 12*. doi:10.32702/2307-2105-2020.12.101.
12. Neil, G. (2012). Accounting for Employee Benefits. Counting the Poor: New Thinking About European Poverty Measures and Lessons for the United States. doi:10.1093/acprof:oso/9780199860586.003.0007.
13. Fletcher, J., Gillum, D., Moritz, R., & Schwartz, A. (2020). Demographic and Salary Trends of the 2020 Biosafety Workforce. *Applied Biosafety, 3*. doi:10.1089/apb.20.0066.
14. Gupta, W. (2020). Salary Estimator using Data Science. *International Journal for Modern Trends in Science and Technology, 6*, 319—322. doi:10.46501/IJMTST061259.
15. Jong-Yih, K., Chien-Hung, L., & Hui-Chi, L. (2021). Building Graduate Salary Grading Prediction Model Based on Deep Learning. *Intelligent Automation & Soft Computing, 27*, 53—68. doi:10.32604/iasc.2021.014437.
16. Revenok, V. I., & Mamchur, O. S. (2015). Osnovni aspekty informatsiinykh system z obliku narakhuvannia zarobitnoi platy [The main aspects of information systems for payroll accounting]. *Molodyi vchenyi — A Young Scientist, 2* (17), 22—25 [in Ukrainian].
17. Zadorozhnyi, Z.-M., Muravskyi, V., & Shevchuk, O. (2018) Management accounting of electronic transactions with the use of cryptocurrencies. *Financial and Credit Activity: Problems of Theory and Practice, 3* (26), 169—177. doi:10.18371/fcaptp.v3i26.144368.
18. Semenyshena, N., Sysiuk, S., Shevchuk, K., Petruk, I., Benko, I. (2020). Institutionalism in Accounting: a Requirement of the Times or a Mechanism of Social Pressure? *Independent Journal of Management & Production, 11* (9), 2516—2541. doi:10.14807/ijmp.v11i9.1440.

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