



**РОЛЬ ТА ЗНАЧЕННЯ
БУХГАЛТЕРСЬКОГО ОБЛІКУ,
ОПОДАТКУВАННЯ, АНАЛІЗУ ТА КОНТРОЛЮ
У ПІДТРИМЦІ ІННОВАЦІЙНО-ІНВЕСТИЦІЙНОЇ
АКТИВНОСТІ ПІДПРИЄМСТВ ДЛЯ СТВОРЕННЯ
ПРОДУКЦІЇ З ВИСОКИМ СТУПЕНЕМ ДОДАНОЇ
ВАРТОСТІ ТА СПРИЯННЯ ПІСЛЯВОЄННОМУ
ВІДНОВЛЕННЮ ЕКОНОМІКИ УКРАЇНИ**

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«Спілка економістів України»**

**Роль та значення бухгалтерського обліку,
оподаткування, аналізу та контролю у підтримці
інноваційно-інвестиційної активності
підприємств для створення продукції з високим
ступенем доданої вартості та сприяння
післявоєнному відновленню економіки України**

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Досліджено основні аспекти, пов'язані з бухгалтерським обліком, оподаткуванням, аналізом та контролем на підприємствах, та їх значення у підтримці інноваційно-інвестиційної діяльності підприємств у контексті створення продукції з високим ступенем доданої вартості.

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ПЕРЕДМОВА

В сучасних умовах помітно зростає потреба посилення ринкових позицій вітчизняних підприємств та підвищення їхньої конкурентоспроможності за рахунок інноваційно-інвестиційної активності. У свою чергу це вимагає модернізації управління інвестиціями та формування прибутків у процесі реалізації інноваційно-інвестиційних програм, і ставить нові вимоги до інформації, яка буде необхідна для такого управління. Важливою передумовою для оцінки інвестиційних рішень та формування обґрунтованої стратегії розвитку підприємства на інноваційних засадах є використання системного підходу, включаючи сучасні системи бухгалтерського обліку та фінансової звітності, оподаткування, аналізу та контролю.

Представлена монографія присвячена дослідженню основних аспектів, пов'язаних з бухгалтерським обліком, оподаткуванням, аналізом та контролем на підприємствах, та їх значення у підтримці інноваційно-інвестиційної діяльності підприємств у контексті створення продукції з високим ступенем доданої вартості.

У першому розділі «Облікові, контрольні, статистико-аналітичні та податкові інструменти у повоєнному відновленні економіки України» проведено дослідження методологічних засад у бухгалтерському обліку, контролі, оподаткуванні та статистиці, розвиток яких значно впливає на вимоги основних користувачів облікової інформації. Розкрито особливості використання ключових інструментів управління фінансовою та економічною діяльністю підприємств, які будуть мати вплив на відновлення вітчизняної економіки після війни. Досліджений інструментарій буде становити основу для обробки та аналізу облікових даних підприємств та перетворення їх на інформацію, корисну для різних категорій користувачів.

У другому розділі «Роль бухгалтерського обліку, статистики, контролю та оподаткування для ефективного

управління системою інноваційного виробництва в Україні» розглянуті теоретичні та практичні аспекти облікового, статистико-економічного та податкового забезпечення з урахуванням трансформації обліково-економічного середовища в умовах інноваційного розвитку. Особливу увагу приділено формуванню витрат, яке стає важливим питанням у процесі впровадження новітніх інноваційних технологій. Також висвітлені питання організації центрів бюджетування фінансової відповідальності та особливості облікового відображення об'єктів інноваційної діяльності.

У третьому розділі «Цифровізація облікового та контрольно-аналітичного забезпечення управління діяльністю суб'єктів господарювання: нові можливості для України» досліджуються практичні вимоги якісних характеристик інформаційних потоків, що генеруються в системі бухгалтерського обліку та аналізу, а також перспективи сучасних трендів цифровізації обліку, механізмів контролю та податкового адміністрування. Це дослідження дозволяє досягти принципово нових результатів в обліковій практиці та формуванні необхідного базису для інтеграції учасників господарського процесу.

У четвертому розділі «Євроінтеграція та посилення економічного співробітництва як передумови розвитку інвестиційних процесів та відновлення економіки України» висвітлено місце України в євроінтеграційному просторі, обґрунтовано інтеграційний вибір нашої держави як передумови розвитку інвестиційних процесів та відновлення економіки України, а також чинники, що впливають на представлення інформації системою бухгалтерського обліку. Таке представлення особливо стосується звітності та структури і мети формування облікової політики підприємства. Автори монографії звертають увагу на те, що з посиленням інформаційної глобалізації зростають вимоги до пошуку та розробки нових підходів до нормативно-правового та

РОЗДІЛ 3. ЦИФРОВІЗАЦІЯ ОБЛІКОВОГО ТА КОНТРОЛЬНО-АНАЛІТИЧНОГО ЗАБЕЗПЕЧЕННЯ УПРАВЛІННЯ ДІЯЛЬНІСТЮ СУБ'ЄКТІВ ГОСПОДАРЮВАННЯ: НОВІ МОЖЛИВОСТІ ДЛЯ УКРАЇНИ

3.1. Accounting engineering and digital tools for modeling the accounting and analytical support system for environmental safety management

In the focus of a three-dimensional model of sustainable world development, priority vectors of the implementation of ecological dimensions are the preservation and rational use of natural resources, protecting biodiversity, reducing pollutant emissions and the development of technologies with the use of renewable energy sources to meet current needs and well-being of modern society. The problematic aspects of nature conservation and the creation of a stable future for all residents of the planet determines the need for international cooperation in the field of ecology and requires the development of effective environmental security strategies at all levels of the world economy. In this context, the issues of management of environmental safety of enterprises and qualitative information support of this process are becoming increasingly important, given the existing challenges of today.

Through Russian military aggression and conflict, we have serious consequences for the environment and ecosystems of most regions in Ukraine. Military operations have caused and continue to do destructive losses and losses. The worst influence on the environment and provoke the emergence of crisis in the economy of destruction of natural landscapes and ecosystems. Explosions and destruction have changed the natural landscape, led to the destruction of the fertile soil layer, contamination of hazardous substances and the emergence of large volumes of military waste containing ozone -deductible substances. This caused the

degradation of vegetation, increased wind and water erosion, soils contamination of fuel and lubricants and other petroleum products. The soils reduce water permeability, oxygen is supplanted, biochemical and microbiological processes are disrupted. As a consequence - the water and air regimes and the cycle of nutrients deteriorate, the root nutrition of plants is disturbed, which causes their death. The disappearance of endemic plant and animal species will have catastrophic consequences for planetary biodiversity. And unfortunately, this is only part of the overall problem of deterioration of the environmental situation and vital casualties that are caused by the natural environment and population of Ukraine and humanity as a whole.

Systematic solution to certain problems is seen in the cessation of environmental hazards in combat, compensation for losses and the prospect of restoring ecological equilibrium on an innovative basis within the European green course. Their successful solution requires appropriate information support and determines the feasibility of modeling the accounting and analytical support of environmental safety management tools for accounting engineering tools and business processes.

The concept of modeling a strategically oriented system of accounting and analytical support for environmental safety management is to form a qualitatively new information environment that can meet the tactical and strategic information needs of different levels of enterprise management. As the studies have shown, existing methods of obtaining data from traditional accounting system are currently not quite complying with strategic environmental safety inquiries. Therefore, it is appropriate to find innovative approaches, mechanisms, technologies and methods of providing information with a focus on strategic environmental accounting and ensuring quality analysis, control and forecasting of the environmental potential of the enterprise and its changes.

The powerful methodological approach to the design of an intellectual strategically oriented system of accounting and analytical support for environmental safety management is

accounting engineering. Its application allows you to substantiate new or modernize existing accounting information technologies for the rapid generation of accounting information of a strategic nature, improving the efficiency of the accounting system and ensuring its compliance with the growing information needs of users.

Monitoring of scientific sources proves that most researchers consider accounting engineering as a new technology of accounting and information support of management, which generates the use of a range of accounting methods, tools and methods, forms a complex of elements of information support of accounting and analytical support¹⁶³. Yes, Chumak O.V. and Nagorna I.V. Accounting engineering is treated as "a new system of methods of determining the financial condition of the enterprise and a stock of its stability, in particular as a tool for managing cash flows, reserves, risks of the enterprise, and most importantly, financial stability"¹⁶⁴. Yukhimenko-Nazaruk I.A. The term "accounting engineering" is interpreted as "a set of management actions aimed at ensuring the compliance of economic activity of the enterprise with requirements that provide other accounting reflection that meets the chosen strategy and management goals"¹⁶⁵.

We believe that accounting engineering is a technology of optimization and improvement of processes and procedures of accounting, analysis and control of enterprise activity, which is based on engineering approaches and strategies and accounting-control methods and instruments that form elements of information

¹⁶³ Matkov G., Tytska N., Mironchuk Z. (2021) Teoretichni aspekti buhgalterskogo inzhiniringu [Theoretical aspects of accounting engineering]. *Bulletin of Lviv National University of Environmental Management*. Pp. 102-106.

¹⁶⁴ Chumak O. V., Nagorna I. V. (2017) Mehanizm inzhiniringu pri formuvanni informacijnogo pidgruntya analizu finansovoyi stijkosti pidpriyemstva [The mechanism of engineering in the formation of an information basis for the analysis of financial stability of the enterprise]. *Business Inform*, No.12. Pp. 359-364.

¹⁶⁵ Yuhimenko-Nazaruk I. A. (2017) Buhgalterskij inzhiniring v sistemi kreativnogo obliku [Accounting Engineering in the Creative Accounting System]. *Materials International. scientific-practical. conferences "Development of socio-economic systems in geo-economic space: theory, methodology, organization of accounting and taxation"*. Pp.165-166.

space of the system of accounting and analytical support Management (sources and channels of information transmission, data, information systems, human resources, etc.) on the terms of fair value of property.

The implementation of accounting engineering technology in the context of modeling of a strategically oriented system of accounting and analytical support of environmental security management of the enterprise provides a gradual implementation of a complex of functional procedures that will allow to optimize the processes of accounting and control, submission and analysis of reporting, taking into account environmental requirements and involvement of appropriate tools. A defined modeling sequence is presented in figure 1.

The main tools of accounting engineering in the field of formation of objective, relevant and useful information for internal and external users (enterprise management, investors, creditors, regulators, etc.), its further analysis and control are:

- tools for improving the accounting policies of the enterprise that contribute to the improvement of accounting and analytical support in terms of accounting for environmental protection costs, namely: methods for determining environmental protection costs; methods of distribution of costs for environmental activity; methods of writing off expenses from emergency events, etc.;

- tools for accounting and estimation of environmental protection costs that allow businesses to effectively manage their costs, namely: cost management systems; methodology of accounting for costs of environmental activity; methods of assessing the effectiveness of environmental protection measures;

- tools for analyzing the effectiveness of environmental protection measures that help the management of the enterprise to make timely reasonable decisions on ensuring environmental safety and improving the public's confidence in rational nature management measures, namely: methods of analyzing the effectiveness of environmental measures; tools of financial analysis; information systems and technologies)¹⁶⁶.

¹⁶⁶ Gerasimovich I.A. (2017) *Mehanizmi ta instrumenti buhgalterskogo i finansovogo inzhiniringu v upravlinni pidpriemstvom* [Mechanisms and tools of accounting and financial engineering in enterprise management]. *Accounting and finance*. № 1. Pp. 26–32.

Modeling a strategically oriented accounting and analytical security management system

Definition of strategic goals of management that will take into account the target parameters of environmental and rational use, opportunities and risks to the enterprise

Assessment of environmental aspects of business and current state of accounting and analytical system, determination of weaknesses and needs for improvement

Identification of opportunities and justification of economic feasibility of using engineering methods of modeling taking into account the ecological dimension of sustainable development

Synthesis of accounting, analysis and control and digital solutions of the latest information technologies in order to create models that describe the impact of business processes on the environment and allow you to track, record and report on environmental indicators

Integration of elements of intellectual environmental monitoring systems, including emission control methods, efficient use of resources and analysis of environmental risks to assess compliance with environmental safety standards, identify violations and take the necessary measures to eliminate them

Designing a model of strategically oriented system of accounting and analytical support of environmental safety management by means of accounting engineering

Assessment of the efficiency of the accounting and analytical support system and implementation of changes to improve it and provide practical recommendations for improving the quality

Fig. 1 Modeling of a strategically oriented system of accounting and analytical support of environmental safety management by means of accounting engineering

Source: built by the author

It should be noted that the choice of specific accounting engineering tools depends on the needs of the enterprise and avoids financial problems, fraud and mistakes that can cause serious

damage, lead to loss of profit, reputation loss and even bankruptcy of the enterprise. In order to optimize accounting and control processes, along with special methods and techniques of accounting engineering, fixing the results of business operations of the enterprise, their analysis and control, the latest digital solutions and information technologies of data generation and processing are widely used. In the complex, this enhances efficiency and ensures the efficiency of infocommunication interaction at all stages of the environmental safety management process.

Therefore, to solve the strategic problems of management of environmental safety of the enterprise is seen for the expedient to integrate different methods, namely:

- methods of regulation of accounting display of the results of business processes (rules, standards and procedures that regulate and determine the method of accounting and presentation of reporting, taking into account environmental dimensions);

- methods of measuring, analyzing and forecasting environmental safety parameters on the basis of accounting data (environmental monitoring, detection of patterns of change, identification of potential threats to the environment, analysis of the likelihood of their occurrence and determination of possible consequences);

- methods of assessing the risks related to environmental protection (method of expert assessments, which involves conducting a survey of experts in order to obtain their probability assessments and consequences of possible environmental risks;

- script analysis methods for the development of scenarios of possible environmental risks and evaluation of their consequences; a method of sensitivity analysis in order to determine how environmental risk depends on certain changes; a method of analysis of decision tree, which helps to determine the optimal way to manage environmental risk, to develop a strategy for ensuring environmental safety);

- methods of management of environmental risks (implementation of measures aimed at preventing environmental

risks to control emissions, waste management and natural resources protection);

mitigation method, involves the implementation of measures aimed at reducing the likelihood and consequences of possible environmental risks, such as early detection and response systems to environmental risks;

the method of accepting environmental risks that cannot or disadvantage or mitigate, for example, taking the risk of environmental pollution related to the activity of the enterprise if the costs of preventing or mitigating this risk are too high).

Significant attention when modeling a strategically oriented system of accounting and analytical support for environmental safety management should be paid to the construction of environmental accounting and reporting. In the world practice, four main areas of environmental accounting development are most commonly considered: financial accounting; management accounting (accounting of production costs); accounting of natural capital; environmental reporting. The allocation of an environmental component in accounting is caused by a number of factors, namely:

- environmental accounting accounts of the enterprise should reflect its attitude to the environment, as well as provide objective information about the financial condition of the enterprise, since the impact of environmental processes on the financial aspect is practically not studied;

- the allocation of individual environmental indicators enables users of different levels, including investors, to make informed decisions on the capabilities of this enterprise and to determine their investments in its infrastructure;

- visual reflection of the environmental factor greatly facilitates the process of objective checking the enterprise;

- environmental measures are also the subject of management accounting, so it is necessary to identify and redistribute environmental costs in such a way that environmental products are properly estimated and investment solutions are based on real costs and benefits;

– external users of environmental reporting (legislation, investors, banks, public) and competition (in particular, international) are increasingly stimulating reporting on the results of environmental measures and their efficiency.

The main characteristics of environmental accounting based on accounting engineering technology are:

– inability to function without the initial operator (accounting balance);

– use of new cuts for qualification and grouping of facts of economic life by using structured account plans;

– use of the system of initial and end accounting units (net assets and net liabilities), as well as aggregated business operations to reduce the complexity of accounting engineering procedures;

– mandatory use of information and computer technologies as an organizational and technological basis for the implementation of accounting engineering in practice;

– application of different types of estimates depending on the needs of users of engineering reporting;

– use of engineering and hypothetical business operations, which involves the expansion of the accounting subject in space (external environment) and in time (future);

– formation of derivatives of balance reports of different types;

– orientation to the needs of strategic management and for specific goals and requests of management staff¹⁶⁷.

Considering that accounting policy is considered a methodological basis of environmental accounting, which determines the architecture of accounting data in the system of accounting and analytical support of environmental safety management, in the conditions of implementation of accounting engineering

– to form sections on financial and management accounting;

¹⁶⁷ Brukhansky R F. (2014) Analiz pidhodiv do pobudovi modelej buhgalterskogo inzhiniringu [Analysis of approaches to the construction of models of accounting engineering]. *Bulletin of ZhDTU*. № 3 (69). Pp. 27-33.

– use as accounting elements: megarihods, in particular the national account system; components and sections of the balance sheet; a group of separate balance sheet items or its individual indicators; sections of the National Accounting Accounting Plan; a set of specific indicators of sustainable development, determined by the management of the enterprise; interactive methods of financial calculations; balanced evaluation information; assessment of intellectual capital; evaluative information of net liabilities and capital; zero (introductory) and derivative balances, grouping of derivatives of the balance sheet into the system of environmental safety indicators.

The entry balance is carried out on the basis of aggregated balances on the mega accounts and adjust them to "regulated" operations (losses, damaged inventories, marriage, events after the balance sheet date, low -value items, auditors, balancing and off -balance sheet records that affect environmental protection) by compiling corrective correspondence with a subsequent fair assessment of balance sheet items. At this stage, the assessment assumes that all property is subject to sale, and all obligations – repayment.

Considering external and internal factors, the purpose of using engineering technology, its tools can influence the processes of efficient functioning and sustainable development, prevention of environmental safety risks, identification of reserves, promote reengineering of economic operations or processes, take into account inflationary processes, predict the expediency procedures¹⁶⁸.

Such construction generates information about the property and capital of the enterprise at historical and fair (market) value, which allows to objectively assess the real situation in the enterprise and attract tools "units-economic" (sectoral, entrepreneurial and market analysis) to evaluate and monitor the achievement of targets.

¹⁶⁸ Kashcheny N. B. (2021) Buhgalterskij inzhiniring v oblikovo-analitchnomu zabezpechenni upravlinnya ekonomichnoyu aktivnistyu pidpriyemstv torgivli [Accounting engineering in accounting and analytical support for the management of economic activity of trade enterprises. *Ukrainian Applied Economy Journal*. Vol. 6. № 1. Pp. 330-336.

environmental safety parameters. The above argues that the elements of the accounting and analytical support system are in a tight relationship and interaction and are modified under the influence of various factors of the business environment. The productivity of their interaction is determined by the technology of accounting engineering, which is focused on generating quality accounting and analytical information for management of environmental safety through innovative technologies of data processing of Figure 2.

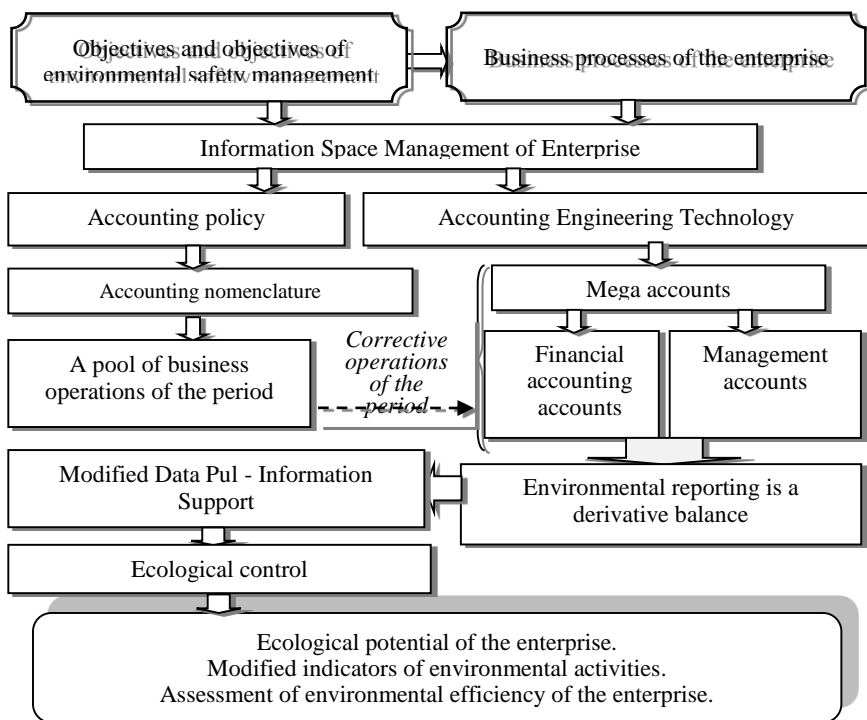


Fig. 2 Reference model of strategically oriented system of accounting and analytical support of environmental safety management of the enterprise on the basis of accounting engineering

Source: developed on the basis¹⁶⁹

¹⁶⁹ Kashcheny N. B. (2021) Oblikovo-analitichne zabezpechennya upravlinnya ekonomichnoyu aktivnistyu pidpriemstv torgovli: teoriya, metodologiya, praktika : monografiya. [Accounting and analytical support for the management of economic activity

The model of strategically oriented system of accounting and analytical support of environmental safety management contains correlation between the environmental potential and evaluation of the environmental efficiency of the enterprise and accounting engineering tools, such as the technologies of structuring the information space of management. This relationship allows you to determine and substantiate the expediency of using accounting engineering in achieving current or strategic goals, which shapes the basis for increasing the importance of the accounting system in identifying economic effects from management decisions made.

The proposed model, unlike the existing, in a single circuit of the management information system through the synergy of the interconnections of integral functional systems of environmental accounting and controlling, combines the processes of data introduction, their processing and transmission to interested persons, which in the complex provides the formation of the necessary accounting and analytical information for decision -making and implementation of the concept of formation of a single information space of environmental safety management of the enterprise.

The necessary prerequisites for implementation of the model of strategically oriented system of accounting and analytical support of environmental safety management are:

- availability of information systems and technologies of data processing in the process of environmental accounting, taxation and controlling;

- the possibility of integration of existing accounting-analytical and control processes in a single circuit of the management information system of the enterprise;

- development of effective accounting policy on conducting basic economic operations on the results of environmental activities of the enterprise, in particular in the part of production of

environmental products;

control over environmental accounting and analysis of the environmental activity of the business entity using Dester analysis, SWOT analysis and PEST analysis;

use of the latest methodological tools for evaluating the environmental efficiency of the enterprise and its environmental potential with the involvement of information and analytical systems and technologies¹⁷⁰.

Environmental accounting information systems are responsible for the collection, storage and processing of accounting and economic data used to make internal management decisions on the environmental safety of the enterprise. In order to cover the environmental accounting system of all relevant information based on business entity transactions, it is necessary to link resources to each other to enter information, to send information to the correct addressee (another computer or user) for processing and, finally, a party that requires processed data for management decisions, formation of environmental reporting or controlling.

Usually data consists of three main subsystems¹⁷¹:

– transaction processing system that supports daily business operations;

– general system of environmental accounting and environmental reporting;

– management reporting system.

The transaction processing system is responsible for supporting daily business transactions that can be grouped into three cycles: income cycle, cost cycle and transformational cycle. The

¹⁷⁰ Vasilyeva T., Samusevych Y., Babenko V., Bestuzheva S., Bondarenko S., Nesterenko I. Environmental Taxation: Role in Promotion of the Pro-Environmental Behaviour. *WSEAS Transactions on Business and Economics* this link is disabled. 2023. Vol. 20. P. 410–427. DOI: 10.37394/23207.2023.20.37

¹⁷¹ Nesterenko I.V. (2023) Buhgalterskij inzhiniring yak metod pobudovi ekologo-orientovanoi sistemi obliku [Accounting engineering as a method of building an ecological-oriented accounting system]. Financial-Credit and Accounting and Analytical Support for Post-War Recovery of the Ukrainian Economy: Proceedings of the International Scientific and Practical Conference, October 5-6, pp. 296-299.

second component - the general system of environmental accounting and environmental reporting and controlling, should be considered as two closely related systems, one of which is devoted to the generalization of transactional cycle operations, and the other – their measurement and disclosure in the state reporting, usually in the state of resources, as a rule in the form of financial or tax reporting, which is mostly for external users. The management reporting system usually offers the formation of information resources of environmental safety management and contains the information necessary for making operational management decisions, such as the development and production of new environmental products, budget planning of environmental activities, forecasting, etc.

Digital transformation is an important trend that has considerable potential for positive changes and allows you to optimize and harmonize the accounting processes of the enterprise, frees resources for their development. Digital transformation evaluation proves that modern economic science is departing from this established look, using a more modular approach and considering information systems as a domain, where new technologies, such as intellectual business analysis systems (Business Intelligence Bi) or BSC-BSC), play an increasingly important role¹⁷².

Using digital technologies, it is possible to analyze large amounts of data, to obtain new knowledge about the activity of the enterprise, taking into account the economic dimension, to make more sound management decisions in order to: reduce environmental impact; ensuring compliance with the requirements of the legislation; improving the reputation of the enterprise; reduction of costs. Therefore, in order to ensure a high level of quality of information for environmental management, a strategically oriented system of accounting and analytical support of the enterprise must

¹⁷² Kashchena N, Nesterenko I. Digitalization of the innovative development management information service of the enterprise. Mechanisms for ensuring innovative development of entrepreneurship. Monograph. Tallinn: Teadmus OÜ, 2022. P. 238-254. <https://repo.btu.kharkov.ua/handle/123456789/31559>

contain digital solutions for digital support of such elements as: environmental safety policy; risk management plans; procedures and instructions; monitoring and control.

In order to provide useful information to make correct decisions and increase their effectiveness, the accounting information system should be characterized by the following: high level of accuracy and timeliness of data, corresponding and synchronized information with decision -making, simplified and understandable information, sufficient flexibility for changes and development of environmental potential of the enterprise. However, in the traditional architecture of the information system of accounting, there is still no block that will be responsible for the formation of information on environmental safety and contribution of the enterprise to achieve sustainable development goals in the environmental sphere. Therefore, the answer to the economic and ecological challenges of today is the introduction of digital solutions of environmental accounting, monitoring, analysis and control.

The breadth of the range of modern information technologies allows you to supplement and integrate the latest digital solutions and tools in the landscape of environmental accounting information systems. An important task is to optimize and find the correspondence of modern information technologies to business processes of the enterprise.

According to the degree of digitalization, accounting tools can be divided into hand tools that do not use information technologies and digital tools based on the implementation of information technologies for automation of processes of accounting and analysis of environmental protection costs. The latter include accounting software that automate the main accounting tasks, such as data entry, accounts, reporting and analysis. Software also allows you to analyze large amounts of data to gain new knowledge of the environmental activity of the enterprise and intellectual systems based on artificial intelligence to automate tasks, such as fraud, demand forecasting and inventory management. The use of cloud computing allows businesses to access the software and data through

the Internet (for example, cloud software can be used to manage emissions tracking systems or to manage waste management systems). Cloud calculations can be an effective tool for managing environmental safety to improve environmental impact¹⁷³.

The complexity and importance of ensuring the achievement of sustainable development goals by the ecological component requires the determination of the prospects for their solution in terms of identifying the most important current trends and problems of environmental accounting and controlling, respectively related to technological approaches that should give adequate answers to globalization environmental challenges (Fig. 3).

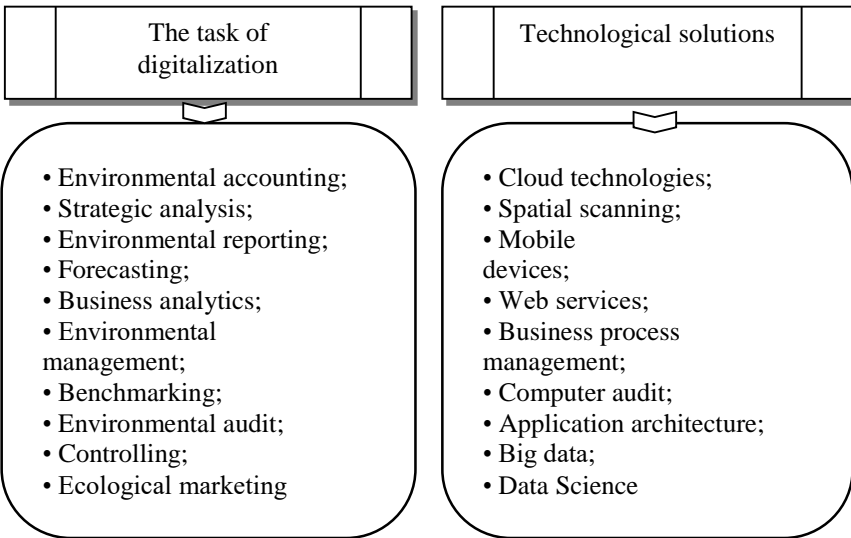


Fig. 3 Diazhital-services of environmental safety of the enterprise

Source: Author's development

¹⁷³ Chumak O.V. (2019) Ekonomichna dijajlnistj pidprijemstv: sutnistj, konceptualjna paradyghma, rehuljuvannja [Economic activity of enterprises: essence, conceptual paradigm, regulation]. *Economic discourse*. Vol. 2, pp. 104-112.

The specificity of the digital services of environmental safety at enterprises is that most of the accounting information is formed and partially processed by engineering, technical and auxiliary services, which maintain operational accounting at the production and places of actual provision of a complex of services, which creates additional threats to the integrity of information.

At the stage of documentation of the process of production of eco-products and the provision of eco-services of business entities, controlling should ensure the information security of the enterprise by analyzing information risk indicators. In order to carry out internal inspections of environmental activities of enterprises, it is advisable to use such technical support configurations as multi-user workstations, local computer networks, centralized data warehouses and virtual workstations.

The next stage of designing a digital environmental safety system is the choice of software. When making this choice, a potential user needs to compare a large number of non-identical characteristics of computer programs and their capabilities. Therefore, the development of formalized techniques for comparing different packages of application programs, which allow to reduce the subjective factor in conducting independent examination, is of great applied importance for the design of a multifunctional digital information ecological-oriented accounting system. The coordination and effectiveness of this mechanism is determined by the chosen technology of the digitalization of economic activity of the enterprise and accounting-analytical and control processes, which allows to integrate and optimize information flows when solving functional problems -analytical data for management of environmental safety, tools and levers of managerial influence, which in a single complex provides the possibility of effective info communication interaction of the object and the subject of accounting and analytical support at all levels of management.

With the rise of innovative movement in the economy, one of the priority areas of development is the use of artificial intelligence. It is the analysis and monitoring systems that use these algorithms

that make it possible to effectively predict the possible consequences of the enterprise's decisions and actions on the environment, as well as to identify potential environmental risks in a timely manner. Such innovative risk analysis approaches allow the enterprise to more effectively identify, evaluate and manage environmental risks, and the use of software systems for automatic collection and processing of data on the impact of the enterprise on the environment simplifies the accounting of emissions, the use of resources and the determination of other environmentally important indicators¹⁷⁴.

Management of environmental safety and sustainable development is not possible without the formation of electronic reporting for the collection, analysis and reporting on the impact of the enterprise on the environment and measures that contribute to sustainability. The introduction of digital platforms for sharing data and information on environmental impact allows to provide accessibility and exchange of data between interested parties, and the use of blockchain technology to confirm the authenticity and transparency of environmentally oriented information, directly affects the consistency of documentation and reporting. The use of digital analytical tools to ensure the management of environmental safety of the enterprise, such as various software and methods, optimizes all business processes. Yes, the software of the monitoring and reporting system allows you to collect emissions, use resources, water, energy and form reports in compliance with environmental standards.

Big Data Analytics tools accelerate the processing of large volumes of data in time to make management decisions related to the environment. Geoinformation systems (GIS) make it possible to visualize environmental data on map to localize threats, and modeling and forecasting tools by presenting the effects of actions on the environment, avoid problems and reduce environmental risks. At the same time, it is the interactive reporting platforms that provide

¹⁷⁴ Blockchain and accounting. Nexia DK. 2017. URL: <https://nexia.dk.ua/blokchein-ibukhhalterskyi-oblik/>.

access to accounting and analytical information on environmental safety.

The use of cloud technologies in the management of environmental safety of the enterprise can be very useful and effective due to a number of opportunities, such as: storage of large volumes of environmental data; access to data and tools for environmental monitoring from anywhere in the world (working together and fast information exchange); scalating data processing capacities depending on needs that can be useful in processing a large amount of data in environmental research and monitoring¹⁷⁵. Cloud technologies allow: reduce the cost of equipment and support of IT infrastructure, as well as provide a high level of protection and backup of the credentials; optimize the use of resources and reduce the negative impact on the environment; improve environmental safety management processes; Ensure that the completeness and integrity of the generated accounting information is maintained.

Effective management of environmental safety of the enterprise is impossible without awareness and increasing the level of interest of business entities in solving environmental issues. Therefore, the use of advanced reality and virtual reality technology allow you to feel the danger and extent of environmental problems. Thus, AR and VR creates an immersion learning environment for employees with real environmental impact, and helps to improve the use of resources. VR also allows you to create interactive models of environmental systems for the study of the impact of certain environmental actions. AR visualizes pollution data, energy resources and other environmental performance on site that is a basis for implementing the Enterprise Environmental Security Management Strategy¹⁷⁶.

Thus, the use of the concept and tools of accounting

¹⁷⁵ Markova O.M. (2015) Hmarni tehnologiyi navchannya: vitoki. [Cloud learning technologies: origins]. *Information Technologies and Teaching Means*. № 2 (46). Pp. 29–44. URL: <http://journal.iitta.gov.ua>

¹⁷⁶ IT-Enterprise. Virtual reality (VR). URL: <https://www.it.ua/ru/articles/virtualnaja-realnost-vr-luchshie-praktiki>

engineering in accounting and analytical security management allows businesses to implement new accounting and reporting methods that meet the requirements of modern business processes and users of accounting information. This approach helps to improve the efficiency of enterprise environmental management, reduce the costs of environmental protection, and increase the economic efficiency of environmental protection measures. It should be noted that the innovative transformations of the accounting and analytical management system involve the introduction of new technologies, approaches and methods in the analysis, collection and interpretation of financial and economic information.

In modern conditions of rapid scientific and technical development and large flow of information, an effective system of accounting and analytical support of management of ecological safety of the enterprise should combine the latest tools and methods for collecting, processing, analyzing data related to the impact of the enterprise on the environment and providing environmental safety. The introduction of artificial intelligence, machine learning, analytics of large data and other innovative technologies for the analysis and promotion of collection processes, interpretation of environmental data and environmental safety of the enterprise requires the transformation of the system of accounting and analytical support for the management of environmental security of the enterprise. The use of cloud technologies, blockchain for transparency, expanded reality and virtual reality in the activities of enterprises is a requirement of today, which helps to improve the methodology of measuring influence on ecology, improves environmental practices and interaction with the environment. It is innovative approaches that allow you to adapt to changes, respond quickly to new requirements and conditions of the market, contribute to the more accurate and effective management of financial activity and environmental safety of the enterprise, through the digitalization of business processes, improvement of communication and cooperation, creation of flexible management systems, use of analytical models and prognostic tools for building enterprise

development strategies.

The prospect of further research is the development of the components of the system of accounting and analytical support for the management of environmental safety means of Digitalization and the tools of accounting engineering with a focus on adaptation of environmental financial accounting to the needs of strategic management. In particular, the development of a strategic structured plan of accounts, justification of directions of corrective records, formation of a set of strategic and engineering accounting, development of a strategic derivative of the balance sheet, as well as methods of analysis and interpretation of the obtained strategic accounting indicators of environmental safety.

3.2. Цифрові інновації та ефективний контроль в сфері публічних закупівель: визначення шляхів до транспарентності і ефективності

У сучасному світі, коли цифрові технології проникають у всі сфери суспільного життя, поняття цифрових інновацій в публічних закупівлях стає все більш актуальним. Суттєвий вплив на наше розуміння та підхід до контролю в сфері публічних закупівель мають цифрові інструменти, які відкривають нові можливості та трансформують процеси у цій сфері.

В епоху цифрової трансформації пріоритетом публічних закупівель є забезпечення державними органами більшого обсягу та вищої якості публічних електронних послуг¹⁷⁷.

Інновації в публічних закупівлях розширюють можливості у виявленні корупції та нечесних угод через використання цифрових інструментів, забезпечують конкуренцію та оптимальне використання публічних коштів.

¹⁷⁷ Ткаченко Н. Б. Електронні публічні закупівлі: досвід країн ЄС та впровадження в Україні. *Актуальні проблеми економіки*. 2016. Вип. 184. С. 471-477.

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