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FUNCTIONAL FEATURES OF AN INTELLIGENT INTERNAL AUDIT SUPPORT SYSTEM

Abstract. This article discusses the main aspects of developing an intelligent system to support the internal audit of a business entity. Over time, a business entity accumulates more and more data, and their analysis becomes an extremely difficult task. The article provides a brief conceptual characterization of the algorithm for developing internal audit support systems, with a statement of the main difficulties in selecting components. An intelligent system can help to increase the efficiency of audit processes and provide more accurate results of automation and application of analytical tools. The development of an intelligent system to support internal audit is an important and necessary task, as internal audit plays an important role in ensuring effective management and control of a business entity. An intelligent system can quickly process large volumes of data, identify trends, anomalies and risks that allow for more informed decisions, and it can detect unusual transactions or shortages that may indicate the possibility of fraud or error, and can provide auditors with valuable information and analytics to make informed decisions to improve management processes and ensure effective control mechanisms. This will help prevent potential financial losses and preserve the reputation of the business entity. Some steps of the system's algorithm are considered on the basis of a brief comparative analysis of mathematical support methods.

Keywords: intelligent internal audit support system; business entity; steps of the algorithm; audit support system.

INTRODUCTION

An intelligent internal audit support system should provide automatic collection and integration of data from various sources, such as financial systems, HR systems, CRM systems, etc. This helps to avoid manual data collection and reduces the likelihood of errors. In addition, the intelligent system should have functionality for analyzing big data to identify anomalies, unusual transactions or patterns that may indicate rule violations, data inaccuracy or risks. Some audit tasks may be routine and repetitive. An intelligent system can automate these processes so that auditors can focus on more complex and strategic aspects of their work.

In general, the development of an intelligent system to support internal audit will improve the quality of audit processes, reduce risks, ensure compliance with standards and requirements, and save time and resources of the entity. The intelligent system should generate reports with audit results, identified issues, recommendations and measures to improve transparency and

management efficiency. The system should have access control mechanisms, data encryption and other measures to protect information.

This paper describes only a few examples of intelligent systems used by business entities to support internal audit. It is important to obtain the needs and specifics of a particular entity when selecting the most appropriate system. The choice of a specific IAS depends on the needs, size and nature of the entity, as well as the volume and complexity of data to be processed and analyzed during audit procedures.

OBJECTIVE

The purpose of this paper is to describe the functioning of the algorithm of the internal audit system of a business entity to help the entity achieve its goals, provide an objective assessment of the effectiveness of internal control and risk management, and provide recommendations for improving processes and optimizing resources.

ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

The concept of audit has existed in various forms for many centuries, it has been developing and improving, but to this day its concept is interpreted differently by scientists. The audit was studied by Alborov R.A. [1], who believes that internal control is actually an internal audit. And Kamenska T. [2] notes that internal control is a mechanism by which the management and the supervisory board of an enterprise gain some confidence that the enterprise will achieve its goals with the specified efficiency.

Management must be responsible for the state of internal audit, which means formulating a strategic policy for the development and operation of an effective system — an intelligent system to support the internal audit of an entity.

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Today, there are various Internal Audit Support Systems (IASS) for business entities. Some of them may be designed specifically for specific industries or types of organizations, while others are of general application. Here is a list of some of the existing IASS.

1) TeamMate [3]. This is one of the popular systems designed to automate and support internal audit. This IASS is designed specifically for internal audits and allows you to automate various audit processes, including audit planning, performing audit tasks, generating reports and managing deficiencies. It ensures efficient management of audit processes, storage of audit documents, and tracking of recommendations and actions.

2) Arbutus Analyzer [5]. Is a tool that allows auditors to analyze large amounts of data, locate anomalies, check accuracy and perform risk-based audits and is designed for data analysis, which is often used to verify financial statements and identify anomalies.

3) Wolters Kluwer TeamMate+ [4]. Another popular system aimed at supporting internal audit. It provides opportunities for planning audits, performing tasks, tracking recommendations and ensuring compliance with regulatory requirements, and has a wide range of tools for planning audits, performing audit processes and generating reports.

4) ACL GRC [6]. It is an integrated risk and internal audit management system, one of the most advanced and powerful SPVAs that allows auditors to analyze large amounts of data, identify anomalies, conduct audit testing and generate reports. It enables risk monitoring, fraud detection, data analysis and reporting. This is not a complete list of existing systems of this type, but it is still necessary to develop the development of modern intelligent systems.

SUMMARY OF THE MAIN MATERIAL

Internal audit of a business entity — the process of independent evaluation and verification of the activities of a business entity or enterprise in order to ensure effective management, achieve its goals and increase the degree of confidence in the reliability of financial and operational reporting

The main objectives of internal audit include the following aspects:

1) *Ensuring internal control. The internal audit is aimed at verifying the existing control systems, their effectiveness and compliance with internal policies and procedures by the personnel of the entities.*
2) *Risk assessment. The auditors analyze possible risks that may affect the achievement of the entity's goals and develop plans for their management.*
3) *Improving efficiency and effectiveness. By analyzing processes and making recommendations for their improvement, internal audit helps to increase the efficiency of the entity and optimize the use of resources.*
4) *Confidence in reporting. Auditors review financial statements and other types of reporting to ensure that they are accurate, reliable and comply with legal requirements and standards.*
5) *Compliance with internal and external rules. Internal audit is aimed at verifying the organization's compliance with internal policies, procedures, and external laws and regulations.*
6) *Prevention of fraud and irregularities. The auditors identify possible cases of fraud, irregularities or lack of good faith, which allows them to take appropriate measures to prevent them in a timely manner.*

Internal audits are performed by independent and objective auditors who have no direct interest in the results of the audit and the continuation of the controlled activity. It may be performed by an internal department of the entity or by external audit firms. They must act objectively and professionally, following international standards for internal audit. Auditors usually provide the results of internal audit in the form of a report and recommendations to the highest level of management — the entity's management, supervisory bodies and other stakeholders for further implementation of measures to improve the entity's activities and to improve the management processes and activities of the entity.

Intelligent Internal Audit Support System

An Intelligent Internal Audit Support System (IIASS) is software that uses artificial intelligence and analytical technologies to automate and improve the internal audit process. These systems help auditors to effectively analyze data, identify risks, detect inaccuracies and inconsistencies, and provide recommendations for improving management and control systems in business entities (Fig. 1).

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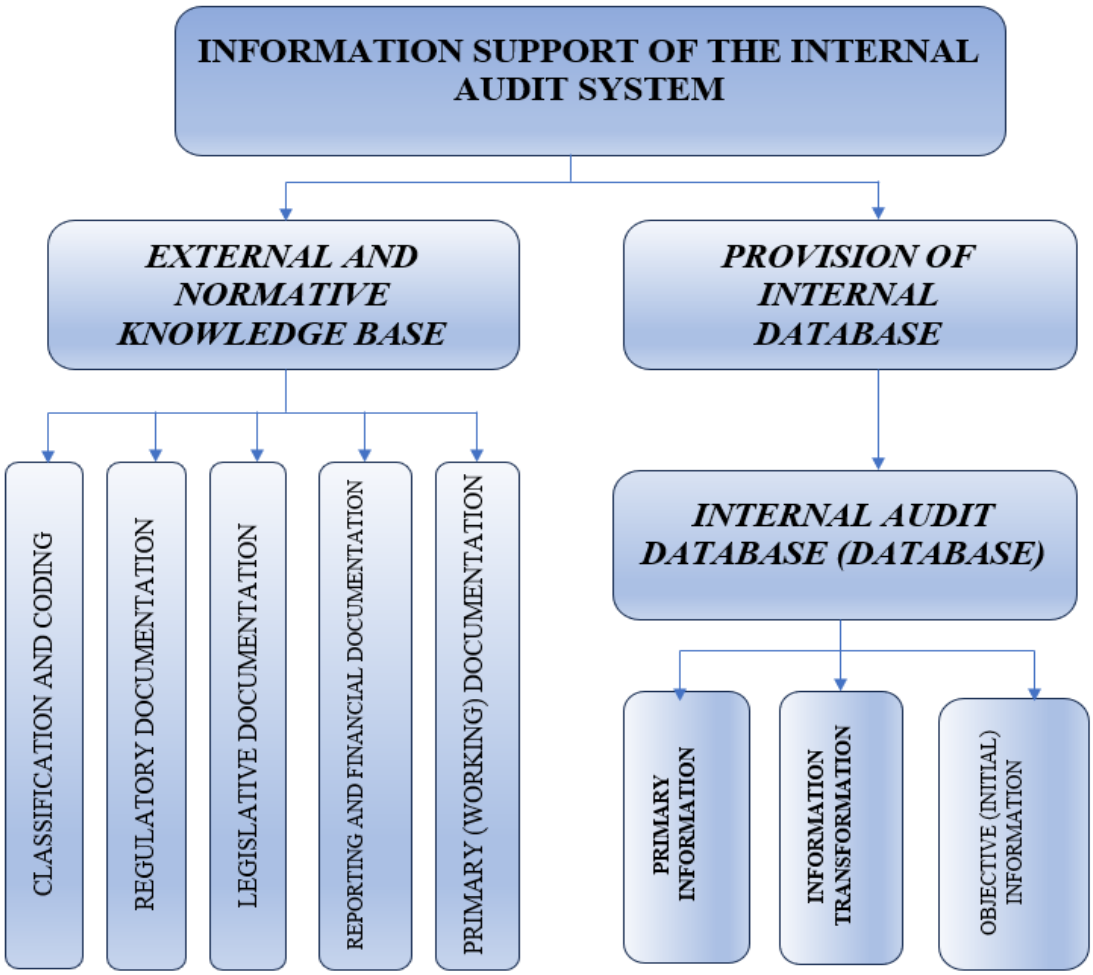

Fig. 1. Information support of the internal audit system

Key functions and features of an intelligent internal audit support system:

1. Data analysis. The system is able to process a large amount of data from various sources, including financial reports, transaction logs, customer databases, etc.
2. Anomaly detection. Artificial intelligence algorithms help identify unusual and suspicious patterns that may indicate possible financial or operational risks.
3. Automation of tasks. AIASS help automate routine tasks such as internal control reviews, data collection, and report generation
4. *Risk-oriented approach. The* system helps to identify key risks and directs auditors' attention to the most significant areas for audit intervention.
5. Real-time monitoring. IIASS can provide reports and analysis in real time, which allows you to quickly respond to changes and problems.
6. Analytics and data visualization. The system can provide auditors with a user-friendly interface for data analysis and visualization of results.
7. Ensuring compliance. IIAS can help verify an organization's compliance with legal and regulatory requirements.

The use of intelligent internal audit support systems can improve the efficiency of the audit process, reduce audit time, reduce the risk of errors and provide more objective results. However, it is important to note that IASS should be used in conjunction with the professional expertise of auditors, and not replace their role completely.

Algorithmic steps of an intelligent internal audit support system

Creating a full-fledged algorithm for an intelligent internal audit support system for a business entity is a complex task that requires the use of various technologies and methods of artificial intelligence. It is a very interesting and extensive task, as it requires detailed development of algorithms, use of specialized tools and customization of AI components.

Below is a general description of the algorithm that can be used in such a system:

Data collection and preparation. The system accesses data on the business entity's activities, such as financial data, operational records, logs, reports, etc. This data is subject to pre-processing, cleaning and aggregation for further use.

Data analytics and machine learning. Using machine learning techniques, the system can automatically detect anomalies, unusual trends, and identify potential risks and problems. This may include data classification, clustering, forecasting, etc. Big Data processing Big Data requires special approaches due to the volume, variety, and speed of data collection. It involves working *with* large amounts of information that can be structured, semi-structured, or unstructured.

Expert systems. Expert systems can be created for rule-based internal audit. These systems use knowledge and rules established by auditors to analyze data and make decisions.

Reinforcement learning. An intelligent system can learn with reinforcement through experimentation and interaction with users. It can predict the effectiveness of different audit strategies and improve its approaches over time.

Automatic report generation. After analyzing the data, the system can generate reports for auditors that contain identified issues, recommendations for improvement, and additional analysis.

Integration with other systems. IIASS can be integrated with other internal systems of an entity to gain access to additional information and provide more complete analysis. The pre-processing of "Big Data" usually requires integration of all information that may be collected from different sources and in different formats. During data integration, these diverse sources are combined into a homogeneous structure for further analysis.

Interpretation of the results. The last stage involves interpreting the analysis made in the previous stages. The results of the analysis can provide new knowledge, answers to questions, or recommendations for further action. Graphs, charts, infographics, and other data visualization methods are used to make the results understandable and accessible.

Ensuring data security. Given the sensitivity of the data that internal audit works with, the system must ensure a high level of security and protection of information.

It is important to note that the algorithm of the IIASS will depend on the specific needs of the business entity and the available technological resources. The development of such a system requires collaboration between internal audit experts, data engineers, and artificial intelligence specialists. Given the volume of "Big Data" and the complexity of the analysis, the development and implementation of the appropriate infrastructure may require a great deal of effort and specialized knowledge in data processing and information technology.

The general description of the IIASS algorithm of a business entity, from the author's point of view, includes the following steps, which are presented in Fig. 2.

Developing and implementing an intelligent internal audit support system is a major task that requires specialized knowledge in the areas of audit, data analytics, and artificial intelligence. It is also necessary to ensure that the system meets the requirements of security, confidentiality and ethics in data processing.

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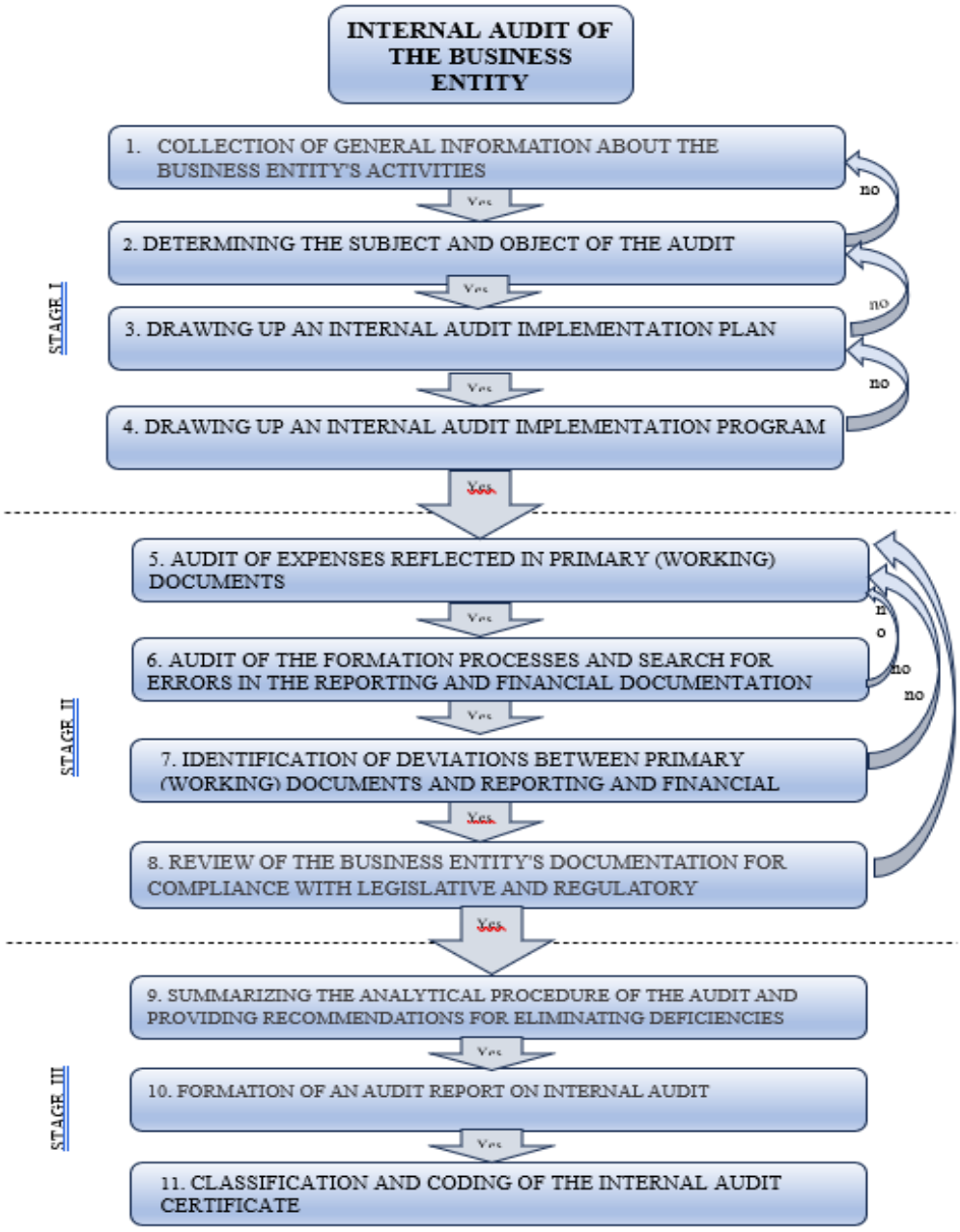

Fig. 2. Stages of the algorithm of internal audit of an economic entity by information system

The economic activity of a business entity is a complex multi-criteria cause-and-effect relationship, and the development and implementation of IIASS encourages the developer to formalize a certain set of business processes of the results of audit observations for the purpose of their preliminary processing. For this purpose, we will select the main (most valuable) ones from the set of complex intertwinations and interactions of many causes and effects.

The value of observation is that we have the ability to record facts in real time, but it is advisable to use it to create an intelligent system together with other mathematical and logical methods of IT.

One of these methods is mathematical and statistical modeling, which is preceded by setting goals for solving the problem, analyzing the data content in accordance with the goal, using the latest technologies of engineering logic (artificial intelligence). It is advisable to:

- to study the collected data of internal audit observations, classify and summarize them, turning them into professional knowledge about the object of information technology research — a business entity.
- to define and formulate goals and objectives and research methods for the development of IIASS based on the formed data sample, which should have an accurate quantitative measurement. Clean the data from errors and duplicates.
- conduct a preliminary mathematical analysis of the observation results. If possible, by qualitative and quantitative indicators. In a qualitative analysis, each factor should be meaningful and theoretically sound, have an independent value and not duplicate others.

The sample set *n* is justified and the sufficiency of the data is checked to develop mathematical models of a given accuracy and reliability. According to Lyapunov's theorem, for different independent samples of a sufficiently large set *n* drawn from the same population, the arithmetic $\bar{Y}$ mean obeys the normal distribution law with a variance σy^2 equal to $1/n_i$ of the variance of a random variable. The maximum deviation is the sample mean of the general mean $\bar{Y}$, and is called the standard error:

$$\bar{Y} = t_a \sqrt{\frac{\tau y^2}{n}}, \quad (1)$$

where t_α — a variable value is in the standardized scale.

$$t_a = \frac{Y_i - \bar{Y}}{\tau y}, \quad (2)$$

is determined by the Laplace integral function.

$$n = \frac{t_a{}^2 \times \tau y^2}{\varepsilon^2}, \quad (3)$$

n — number of observations.

If observations are found that differ significantly from the bulk of the sample data, i.e. when $\bar{Y}_i$ are distributed according to the normal law, the largest deviation from the mean value exceeds $3\sigma y^2$, then all observations are placed in the interval:

$$\bar{Y} - 3\tau_y \le y_i \le \bar{Y} + 3\tau_y. \quad (4)$$

Then this set of observations can be used in further data processing.

Evaluate the degree of agreement between the theoretical curve and the observed data. The degree of agreement between the theoretical curve and the observed data is assessed using the following criterion χ^2 — "X_i-squared" Pearson, which is a specially selected random variable:

$$\chi'^2 = \sum_{i=1}^{k} \frac{(m_i - \bar{m})^2}{\overline{m_i}}, \quad (5)$$

k — number of intervals of the variable set, $\overline{m_i}$ — empirical theoretical frequencies.

CONCLUSIONS

The paper considers only the first steps of the algorithm for developing an intelligent internal audit support system, one of the significant advantages of which is integration with global technologies, which allows to have a single automation system that will include, among other things, quality control of internal audit [1], [2], [7].

Summarizing, it is worth highlighting a number of serious shortcomings of existing internal audit support systems that are present at the current stage of development of these technologies. The most significant drawback is the lack of uniform standards for IT systems. There are no regulated parameters for the choice of software. A significant drawback is the high cost of systems. There are certain problems associated with the variability of the world around us, which significantly complicate the data analysis algorithm to minimize problems [3] – [6].

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ФУНКЦІОНАЛЬНІ ОСОБЛИВОСТІ ІНТЕЛЕКТУАЛЬНОЇ СИСТЕМИ ВНУТРІШНЬОГО АУДИТУ

Анотація. В статті розглядаються головні аспекти розвитку інтелектуальної системи, яка може бути впроваджена для проведення внутрішнього аудиту суб'єкта підприємництва. Протягом певного часу суб'єкт господарювання накопичує велику кількість даних, які потребують проведення їхнього аналізу, що є складною задачею. Також розглядається алгоритм для проведення внутрішнього аудиту із застосування інтелектуальної системи та визначенні її компонентів. Інтелектуальна система підвищує ефективність проведення процесів збору, обробки та прийняття рішень з використанням додатків аналітичних інструментів. Розвиток та впровадження інтелектуальної системи внутрішнього аудиту на суб'єктах господарювання — це важливе та необхідне завдання, оскільки внутрішній аудит відіграє важливу роль в гарантії ефективного управління суб'єктом господарювання та в контролі фінансових потоків. Інтелектуальна система може доволі швидко обробити великі масиви даних, ідентифікувати тенденції, аномалії і ризики, це дозволяє прийняти більш інформативні рішення, і це може виявити некоректні угоди або нестачі, які, можливо, вказують можливість фальсифікації або помилки. Інформаційні інтелектуальні системи дають можливість на підприємстві запобігати потенційним фінансовим втратам і зберігають репутацію суб'єкта підприємництва. Деякі кроки алгоритму системи розглядаються на підставі короткого порівняльного аналізу математичних методів підтримки прийняття рішень.

Ключові слова: інтелектуальна система внутрішнього аудиту; суб'єкт господарювання; алгоритм послідовності; система внутрішнього аудиту.

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