

INTEGRATION OF ARTIFICIAL INTELLIGENCE IN THE INTERNAL MANAGERIAL CONTROL OF EDUCATIONAL INSTITUTIONS AND IMPLICATIONS ON INTERNAL AUDIT

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Abstract:

The research study is dedicated to the integration of Artificial Intelligence (AI) in the Internal Managerial Control System (IMCS) of educational institutions and analyzes the impact of this approach on internal audit. The main objective of the paper is to investigate how Artificial Intelligence technologies can be applied within the Internal Managerial Control System (IMCS) and in Internal Audit, in order to increase operational efficiency, transparency in resource management and the responsiveness of management structures to risks and non-conformities. The paper addresses both a theoretical and an applicative component, proposing concrete and empirically validated solutions. Specific applications of AI in the field of managerial control are presented – from risk identification and analysis to performance and compliance monitoring in the educational and financial activities of public entities in education. The research discusses the role and functionalities of Generative Artificial Intelligence (GAI) in Internal Managerial Control, its use in Internal Managerial Control in the field of education and the implications for internal audit. Technological solutions are also proposed as ways to use GAI in the implementation of Internal Managerial Control Standards in educational institutions.

Keywords: artificial intelligence, generative artificial intelligence (GAI), internal managerial control, internal audit, continuous audit, educational institutions, risks, compliance.

JEL Classification: M42 – Auditing

1. Introduction

In an era where technology is becoming increasingly ubiquitous and increasingly important for decision-making and management processes, educational institutions are faced with complex challenges in terms of resource management, performance monitoring and risk management. In this context, optimizing the Internal Managerial Control becomes essential to ensure an efficient and accountable internal audit in the education sector. The Internal Managerial Control System (IMCS) in educational institutions represents a fundamental element, providing an institutional and procedural framework for evaluating and improving internal audit and internal control processes. However, there are still significant challenges in implementing and streamlining the IMCS in educational institutions, including the lack of an integrated approach and the lack of adequate resources for implementation. By integrating AI (Artificial Intelligence) technologies into the Internal Managerial Control processes, the research study aims to provide innovative and effective solutions for

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improving internal audit in educational institutions. The aim is not only to identify and remedy existing deficiencies in current practice but also to anticipate and manage future risks associated with the management of educational resources.

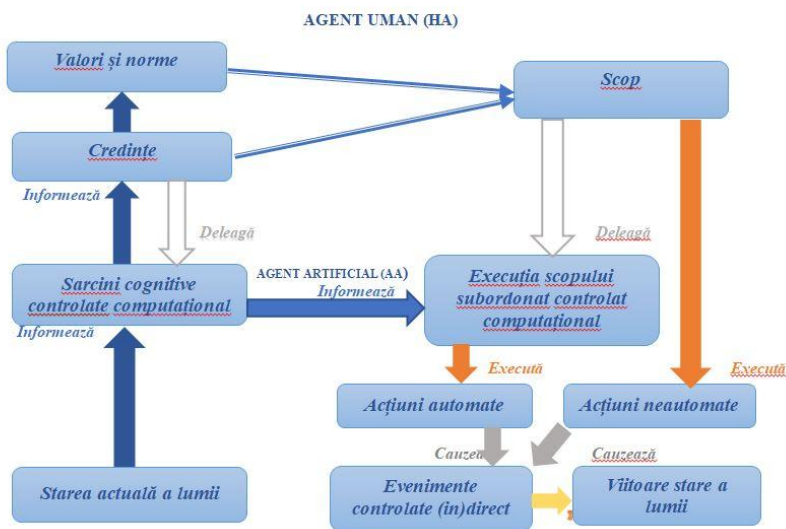
In the context of accelerated digitalization, Generative Artificial Intelligence (GAI) opens new horizons for optimizing Internal Managerial Control (IMC) and internal audit processes in educational institutions. GAI technologies offer advanced analysis and automation capabilities that can transform the way educational institutions manage and monitor internal activities, contributing to increased efficiency and improved organizational performance. The integration of Generative Artificial Intelligence into Internal Managerial Control in educational institutions represents a major opportunity for the transformation and optimization of internal processes, with a direct impact on internal audit, the quality of the educational act and resource management. As technology evolves, it is important that the research and implementation of these solutions continue, to ensure continued adaptability and efficiency in the face of emerging challenges.

2. Literature review

Artificial Intelligence (AI) refers to the ability of a system to process information from the external environment, learn from it, and apply the acquired knowledge to solve a variety of tasks (Zemánková, 2019) [1]. AI also involves the use of large data together with machine learning (ML) to make predictions about the future based on information from the past (Zhang et al., 2020) [2]. The ability of AI to perform tasks similar to those of humans is fueled by its ability to learn from mistakes and adapt to new input data. Through AI solutions, large volumes of data can be analyzed to identify recurring patterns in the data (Lee and Tajudeen, 2020) [3]. AI has gained popularity recently, with the increasingly widespread implementation of these solutions by various entities (Mann, D. L., 2023) [4]. AI solutions are considered sophisticated enough to replace human labor and speed up work processes and data accuracy. However, to be successful, organizations must overcome certain obstacles. AI is often perceived as expensive and risky to implement, as it is a new technology and managers do not always have the skills and knowledge to adopt it (Davenport and Ronanki, 2018). In addition, there are concerns about the possible negative effects of AI on society, such as job losses and increased unemployment. Adopting AI requires well-trained staff with the essential knowledge to implement these solutions so that they can continue to learn and make correct decisions (Sutton et al., 2018) [5]. In the field of accounting, AI leads to the reduction of repetitive tasks, the extraction of data from printed documents using technologies such as optical character recognition (OCR) or intelligent document processing (IDP) and their integration directly into accounting software (Sutton et al., 2016) [6]. It also generates a variety of financial reports, which help accountants become financial experts and support clients in making various business decisions, such as business expansion through mergers and acquisitions (Mihai, 2023) [7]. In accounting and auditing in educational institutions, the integration of Artificial Intelligence (AI) can represent a significant step towards modernizing and streamlining financial and Internal Managerial Control processes. By using advanced data analysis algorithms, AI can quickly identify anomalies, trends, or patterns that may be difficult to detect through traditional methods. This can lead to greater accuracy and reliability of financial information and more efficient management of the financial resources of educational institutions. In the context of changing concerns in social and political sciences,

new Internal Managerial Control practices have emerged, while technological advances such as computers and the Internet have introduced new technologies for Internal Managerial Control. With recent advances in Artificial Intelligence (AI), especially in Machine Learning (ML) and Large Language Processing (LLP), it is unlikely that accounting and auditing activities will retain their current form and practice in the next decade. In the face of these recent advances, the question for Internal Managerial Control and accounting professionals is not whether the subject matter of study will change, but where and how it might be interesting to study changes within Internal Managerial Control. Although automation is not a new concept, the nature of the tasks that are now targeted and the scalability of the automation process may be different (Susskind, R. E. & Susskind, D. (2015).) [8]. Therefore, automation remains a critical topic for accounting and auditing research. For accounting professionals, potential areas of interest for critical research include, for example: what new tasks and coordination concerns arise around automated processes (Samiolo et al., 2023) [9], what types of tasks are automated (Korhonen et al., 2020) [10], what are the forms and sources of resistance to automation (McDaid et al., 2023) [11], “what happens to the boundaries and relationships between accounting and other professions” (Armstrong, 1985) [12], and documenting and critically analyzing the impact of automation on accounting practices, both inside and outside organizations (Salijeni et al., 2019), [13]. Although concerns about automation have dominated the debates, the more significant aspects of AI development revolve around machine learning (ML) models and Large Language Processing (LLP). Because ML technology offers new analysis possibilities, it also brings a significant change in practice - the analysis process is, at least partially, automated and is becoming increasingly advanced. Here, the introduction of Artificial Intelligence raises questions about a new type of coordination in accounting and auditing practice, namely how to align “machine intelligence” with the knowledge and tacit judgment of people in the organization (Kilfoyle et al., 2013) [14]. While it is recognized that managers rely on different sources of information outside of accounting (Hall, 2010), [15], the introduction of ML tools puts entity leaders (or the Internal Managerial Control System) in a position where they must coordinate different epistemological forms of analysis. The topic of automation and the role of AI in decision-making processes is closely related to the development of Generative Artificial Intelligence and AI applications in various fields. While the use of LLPs for building chatbots remains an interesting topic, the main focus has shifted to the ways in which deep learning models can be used for data analysis and to assist in decision-making. Because these approaches can involve chatbots as discussion partners, the automation of decision-making by delegating cognitive and decision-making functions from human agents to artificial agents is becoming a central concern in the evolution of Artificial Intelligence and human-machine interaction. By automation of decision-making, we understand the delegation of a subordinate cognitive or decision-making function from an agent capable of responsibility, i.e. a human, to a non-biological form of information, a process that was designed by a human specifying specific calculation rules. The human agent (HA) can delegate either cognitive tasks or the execution of subordinate tasks, or both, to an artificial agent (AA). In the field of accounting and auditing, the HA exercises direct control over its own actions and, at the same time, indirectly controls the actions of artificial agents (AA), establishing general objectives that govern the parameters and boundary conditions for their activity. Thus, the HA has the responsibility to ensure that the AA implements only the established accounting and

auditing requirements and standards, ensuring the integrity and accuracy of financial information. Figure 1 represents an idealized process of automation (Michele Loi, Matthias Spielkamp, 2021) [16] of both cognitive and executive functions. Blue arrows indicate information flow. White arrows indicate delegation. Gray arrows indicate causality. Arrows with oblique stripes denote execution.



Glossary:

AGENT UMAN (HA)- HUMAN A

Valori și norme - Values and norms

Scop - Goal

Credințe - Beliefs

Informează - Informs

Delegă - Delegates

Sarcini cognitive controlate compu
Computationally controlled cognit

AGENT ARTIFICIAL (AA) - ART
AGENT (AA)

Execuția scopului subordonat contr
computațional - Execution of subor
computationally controlled goal

Execută - Executes

Acțiuni automate - Automatic actio

Acțiuni neautomate - Non-automat

Starea actuală a lumii - Current stat
world

Cauzează - Causes

Evenimente controlate (in)direct -
controlled events

Viitoare stare a lumii - Future state

Figure 1. Decision-making automation process
Source: Michele Loi, Matthias Spielkamp, 2021.

3. Research methodology

The methodology used in the research to investigate the optimization of Internal Managerial Control and, implicitly, internal audit, through the use of Artificial Intelligence technologies in educational institutions is summarized in choosing a mixed approach, combining theoretical research and applied research to obtain a comprehensive understanding and to validate the proposed solutions. Type of research: qualitative and quantitative research to examine the theoretical and practical aspects related to Internal Managerial Control, internal audit and the use of Artificial Intelligence in the context of accounting in educational institutions. The instruments used for data collection in the study were structured questionnaires, semi-structured interviews and document analysis (Figure 2).

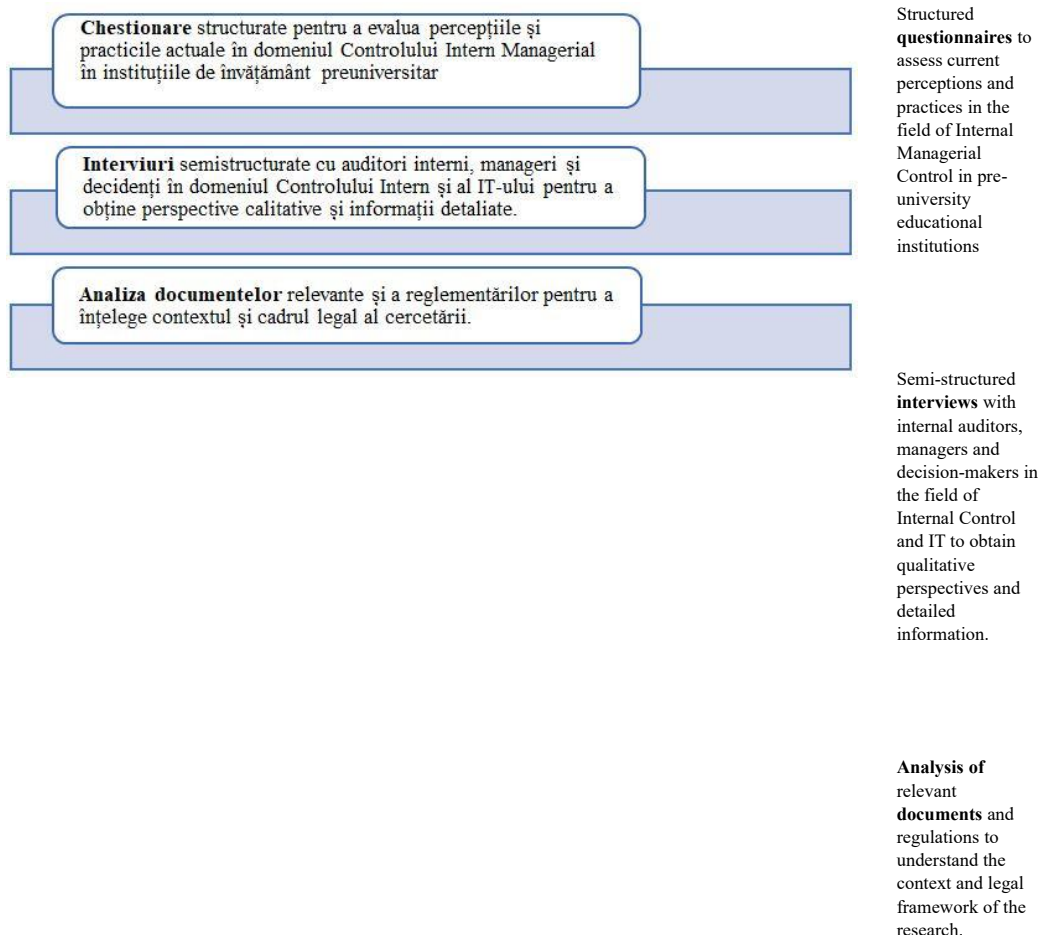
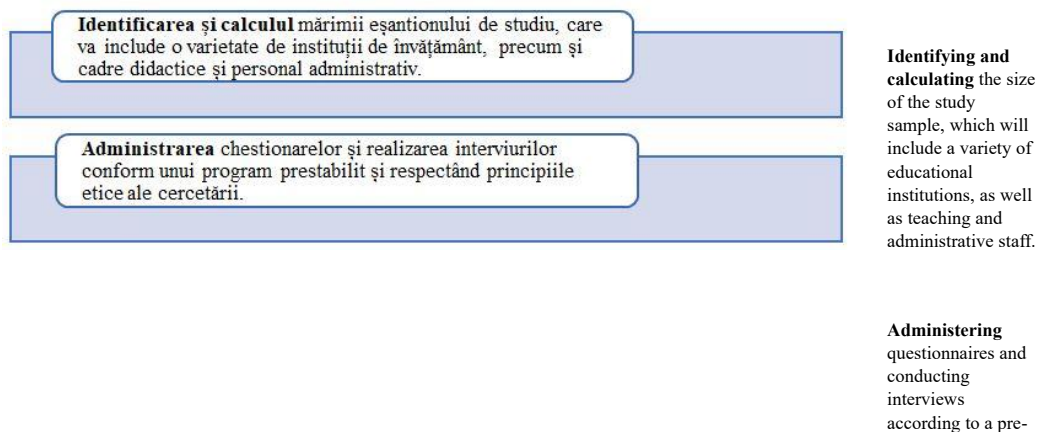


Figure 2. *Data collection instruments*
Source: own design

The data collection procedure consisted of identifying the study sample, administering questionnaires and interviews and collecting responses (Figure 3).



established schedule and respecting the ethical principles of research.

Figure 3. *Data collection procedure*

Source: own design

The analysis of the collected data was carried out through specific analysis programs (Figure 4).

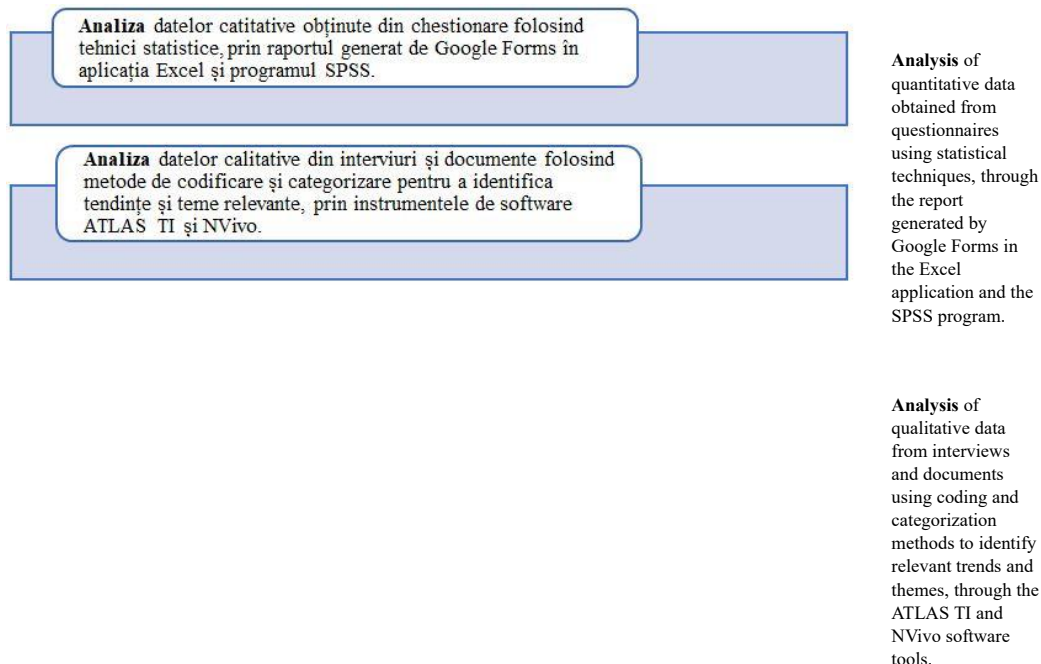
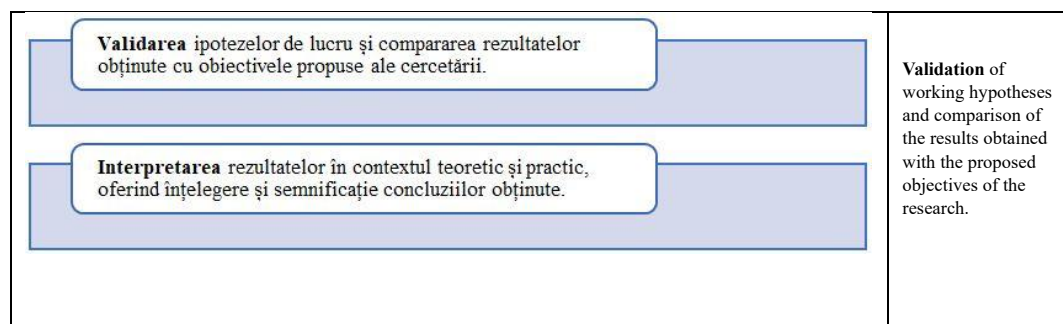


Figure 4. *Data analysis methods*

Source: own design

Validation or invalidation of hypotheses was a fundamental process in research that involved assessing the degree to which the collected and analyzed data support or contradict the statements formulated in the research hypotheses (Figure 5).



	<p>Interpretation of the results in the theoretical and practical context, providing understanding and significance to the conclusions obtained.</p>
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Figure 5. *Validation and interpretation of data*

Source: own design

4. The need to integrate AI into the Internal Control of educational institutions

Internal Control is essential for good governance and the efficient functioning of an educational institution. The integration of intelligent technologies into Internal Control could represent a significant advance for educational institutions. Through AI, they can strengthen their ability to identify and manage risks, to comply with internal and external regulations and policies, and to improve their overall performance. In the context of educational institutions, where organizations operate in complex and rapidly evolving environments, the importance of effective Internal Control is essential. This control represents the backbone of risk management, financial integrity, and regulatory compliance. The emergence of Artificial Intelligence (AI) presents an unprecedented opportunity to revolutionize Internal Control mechanisms, leveraging AI’s analytical prowess, pattern recognition capabilities, and automation potential to enhance effectiveness and efficiency. Internal Control is a comprehensive framework designed to ensure the achievement of organizational objectives by mitigating risks, increasing operational efficiency, and safeguarding assets. Integrating AI into Internal Control processes can bring substantial benefits in various areas: *Data Analysis and Pattern Recognition*: AI excels at analyzing large amounts of data quickly and accurately. It can identify patterns, correlations, and anomalies in financial transactions, flagging potential issues that might be missed by manual analysis. *Predictive Analytics*: By leveraging historical data, AI can predict potential risks and trends, allowing institutions to proactively address emerging challenges before they escalate. *Automate routine tasks*: AI-powered automation can streamline repetitive tasks such as data entry, reconciliation, and report generation. This not only reduces human error, but also frees up human resources for strategic efforts. *Fraud detection*: Advanced AI algorithms can analyze financial data for suspicious transactions and behaviors, playing a critical role in early fraud detection. *Natural Language Processing (NLP)*: NLP equips AI to analyze unstructured data such as emails, contracts, and textual information. It helps identify compliance violations, unethical behaviors, and unusual communication patterns. *Continuous monitoring*: AI enables real-time or near-real-time monitoring of transactions and processes, ensuring prompt identification of irregularities and deviations. *Customizable alerts*: “Organizations can configure AI systems to generate alerts based on predefined criteria, ensuring that exceptions are promptly brought to attention” (V. Gaddam, 2024). Implementing Artificial Intelligence in Internal Control in educational institutions is essential for streamlining administrative processes and effectively managing resources. With the help of AI, institutions can quickly identify potential problems, such as financial management or absenteeism monitoring, and make more informed and faster decisions. *Implementing AI in Internal Control processes requires*

a strategic approach (Figure 6.), which involves: *Needs Assessment*: Identifying areas where AI can have the most significant impact, whether it is automating manual tasks, strengthening data analysis, or improving fraud detection. *Data Preparation*: Clean, structured, and accurate data is essential for AI effectiveness, and its quality must be ensured before being introduced into AI models. *AI Solution Selection*: Opting for AI solutions that align with the institution's needs and capabilities could involve developing internal solutions or purchasing third-party applications. *Training and Integration*: Training AI models with historical data to adjust their predictions can seamlessly integrate AI into existing systems and workflows. *Continuous Improvement*: Regularly evaluating the insights generated by AI and adapting models as the business landscape evolves, as well as continuously refining AI performance through feedback loops.

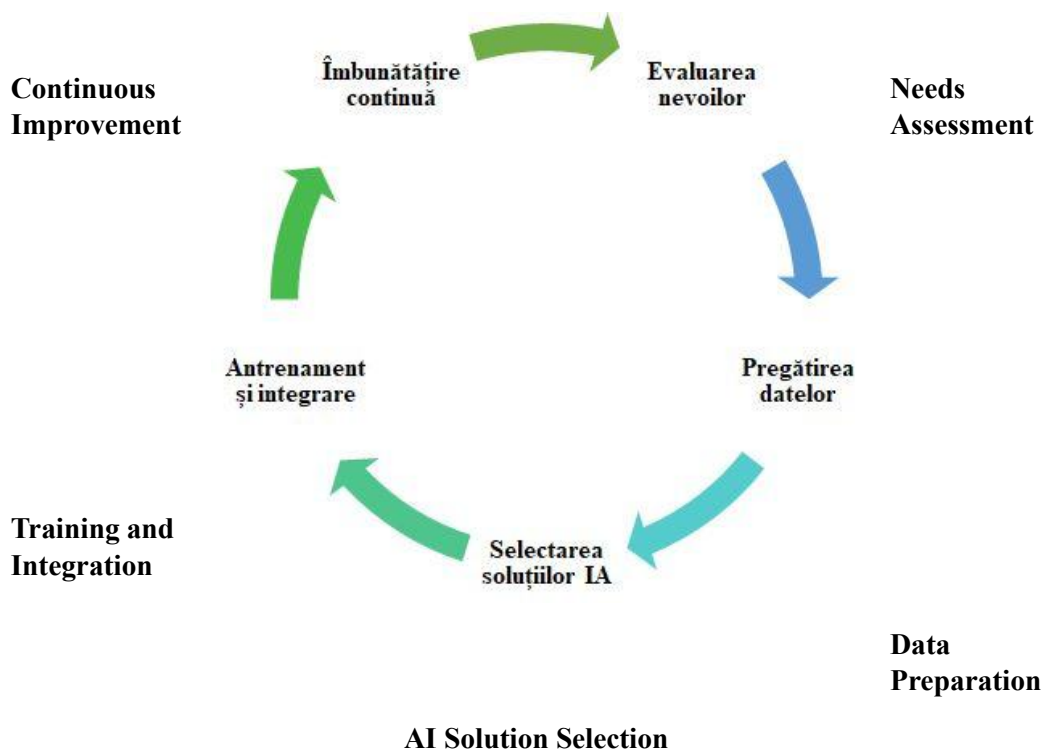


Figure 6. *Strategic Approach to Implementing AI in Internal Control*
Source: Own design

Integrating Artificial Intelligence into Internal Control processes is akin to introducing a revolutionary agent that improves accuracy, efficiency, and foresight. The fusion of AI capabilities – data analytics, predictive analytics, automation, and more – with the core principles of internal controls is a powerful formula for addressing the complexity of the educational institution environment in the digital age. While AI offers immense promise, it should be seen as an augmentation rather than a replacement for human judgment, vigilance, and ethics. By embracing the potential of AI and fostering a culture of vigilant

oversight, organizations can truly revolutionize their Internal Control landscapes for the better (Gaddam, 2023) [17].

4.1. The Contribution of Artificial Intelligence in Achieving the Objectives and Goals of IMCS in the Context of Digitalization of Education

Adapting education to Artificial Intelligence (AI) is a vital process in modern society; involving not only the integration of digital technologies into educational processes but also a reconfiguration of the way in which education and training are designed, delivered and evaluated. In this context, the contribution of Artificial Intelligence (AI) in the Internal Management Control System (IMCS) is becoming increasingly relevant, offering significant opportunities for optimizing administrative and managerial processes in educational institutions. Adapting the education and training system to technological evolution is a complex process, essential for the preparation and improvement of human resources and for the development, modernization and innovation of society. The integration of new digital technologies makes school more attractive for students, more adapted to their needs and lifestyle and more efficient in developing skills, promoting lifelong learning. The impact of digital transformation on society, the labor market and education and training systems is becoming increasingly evident. The digital transformation in education is driven by advances in connectivity, the widespread use of digital devices and applications, the need for individual flexibility and the increased demand for digital skills. “The Covid-19 crisis has transformed educational practices from face-to-face interaction to the online environment, underlining that teaching, learning and emerging technology must be approached holistically in the future of digital education. This has highlighted the importance of digital education as a central objective for high-quality, accessible and inclusive teaching, learning and assessment, as well as the need for a strategic approach to the acquisition of digital skills throughout life for all participants” (SMART-Edu, Strategy for the Digitalization of Education in Romania 2021-2027). The digital transformation in education, accelerated by the Covid-19 crisis, has highlighted the need for an integrated and strategic approach in adopting emerging technologies to meet the needs and requirements of contemporary education. It is important that adaptation to technological evolution also extends to related or bordering areas, such as the Internal Managerial Control System (IMCS) in digital education, which must also be digital in its turn. When referring to the digitalization of education, it is essential to recognize that this does not only represent a transition to online teaching but also a fundamental transformation of educational processes. In this sense, the integration of AI in the educational IMCS can facilitate the efficient management of data and administrative processes, contributing to the optimization of resources and the improvement of the quality of educational services. Starting from the digitalization of education, the mission of the educational institution, as well as its objectives, must ensure the need for the technologization of education in all its aspects, so that IMCS is an essential tool for managing a school towards fulfilling its mission and achieving the established objectives, ensuring efficient, transparent and responsible management of the institution's resources and activities. The concretization of a school's mission is done through a set of measurable and verifiable objectives that allow for the evaluation and control of performance. From a time perspective, the objectives are classified, according to Figure 7.

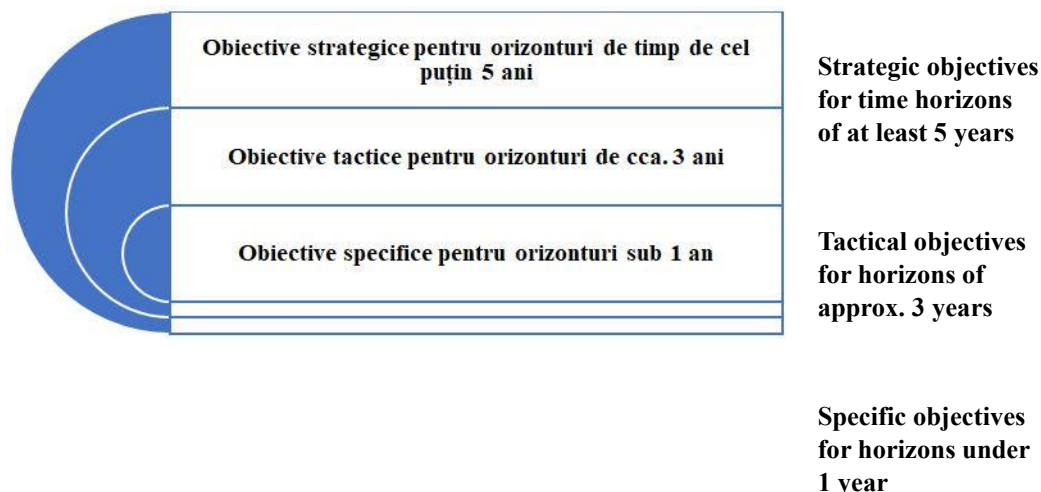


Figure 7. *Classification of objectives by duration*

Source: own design

Within educational units, objectives target certain functional areas whose detailed enumeration provides a comprehensive perspective on the various aspects that must be managed for the proper functioning of the institution. In the context of the Internal Managerial Control System (IMCS), these areas become essential for ensuring the coherence, efficiency and effectiveness of administrative and managerial processes:

1. FUNCTIONAL AREA: MANAGEMENT

- Ensuring managerial coherence at the level of the school unit through specific steps;
- Increasing the efficiency of the activity of functional departments in the school unit;
- Efficient functioning of the education quality management system in the school unit.

2. FUNCTIONAL AREA: CURRICULUM

- Designing the curriculum in accordance with the methodological requirements in force.
- Diversifying teaching-learning-evaluation methods in order to apply the curriculum in the classroom based on modern techniques with the aim of individualizing and differentiating learning with the aim of acquiring key European competences.
- Periodic evaluation of school progress and school performance and using the results to increase the quality of the teaching process.
- Designing a flexible and attractive SCD (School-Decided Curriculum) offer, correlated with the options/interests of students and the possibilities of professional insertion on the labor market.
- Designing an offer of extracurricular educational activities appropriate to the training needs of young people.
- Increasing the degree of participation of teachers and students in training programs for school performance, formal and non-formal education;
- Increasing the degree of school integration of students from disadvantaged social groups.
- Correlating the annual school plan with the options/interests of students and with the possibilities of professional insertion on the labor market.

3. FUNCTIONAL AREA: HUMAN RESOURCES

- Correct application of legal provisions regarding the employment of qualified teaching, auxiliary and non-teaching staff.
- Promoting human resources management that ensures the increase in quality and the efficiency of the overall activity of the school unit.
- Ensuring access of school personnel to training appropriate to the application of the requirements of the education system and its adaptation to the European one.
- Improving internal and external communication.
- Strengthening the Internal Managerial Control System.
- Identifying and resolving problematic situations among students, by ensuring specific psycho-pedagogical counseling services, school and professional orientation.

4. FUNCTIONAL AREA: MATERIAL RESOURCES

- Continuing the efforts to modernize and preserve the school infrastructure, creating its specific facilities.
- Monitoring the updating of the teaching and material base in the school, in accordance with the standards of the curricular efforts.
- Efficient management of existing resources.
- Involving local public authorities in activities to improve the school infrastructure.
- Submitting financing projects for the development of material and human resources.
- Developing material resources in order to make the educational process more efficient.

5. FUNCTIONAL AREA: COMMUNITY AND PARTNERSHIP RELATIONS (EDUCATIONAL PROJECTS AND COMMUNITY PROGRAMS)

- Strengthening collaboration with the local public authorities: Town Hall and Local Council, Police, Gendarmerie, ISU, NGOs, Parents' Association, trade union, in order to ensure an attractive, safe and functional school environment.
- Development of educational projects by promoting formal and non-formal educational activities aimed at developing intercultural, entrepreneurial education, health education and those that can provide the necessary support in promoting school desegregation and equalization of opportunities.
- Increasing institutional capacity and ability to develop and manage projects financed by community programs for human resources development, through projects/grants financed by structural funds and through projects of the Ministry of Education and Research in order to develop institutional and create optimal conditions for the development of lifelong education and the diversification of educational offers and services.
- Enhancing the activity of the Commission for International Partnerships and Programs by developing skills in project drafting and project management.
- Streamlining the activity of the Commission for School and Extracurricular Educational Programs.
- Managing the image of the institution, promoting its image through institutional and educational marketing.
- Developing the school-family partnership. (System Procedure for Setting School Objectives, 2018).

By adopting AI technology, educational institutions can benefit from a number of advantages that allow them to better align with the current needs and requirements of

students, teachers and the community as a whole. AI can contribute to achieving specific objectives in the functional areas of a school and thereby support IMCS processes:

1. *Efficient management*: AI can be used to optimize school resource management processes, including human and material resources. By analyzing data and usage patterns, AI can provide recommendations for a more efficient allocation of resources and to identify opportunities to improve efficiency in different departments and school activities.
2. *Adapted and diversified curriculum*: The use of AI can allow the curriculum to be personalized according to the individual needs and interests of students. By analyzing their performance and preferences, AI can suggest personalized content and teaching methods, thus contributing to increasing engagement and academic performance.
3. *Continuous monitoring and evaluation*: AI can facilitate the process of monitoring and evaluating the academic progress of students and the performance of teachers. By analyzing data obtained from various sources, AI can identify relevant trends and patterns, providing feedback and recommendations for improving individual performance and educational processes as a whole.
4. *Improved communication and collaboration*: The use of AI can facilitate communication and collaboration between different stakeholders within the school community, including students, teachers, parents and local authorities. Through AI-based platforms and applications, tools and facilities can be provided that allow for more effective communication and closer collaboration in order to achieve common educational goals.
5. *Community and partnership relationship management*: AI can contribute to the development and strengthening of collaborative and partnership relationships between the school and the various organizations and institutions in the community. By analyzing data and identifying opportunities for collaboration, AI can facilitate initiatives to involve the community in educational activities and support the school's objectives.

4.2. Application of Generative Artificial Intelligence in internal managerial control in educational institutions

4.2.1. The Role and Functionalities of Generative Artificial Intelligence in Internal Managerial Control in Educational Institutions

The possibility of integrating Generative Artificial Intelligence (GAI) into the Internal Managerial Control of educational institutions brings to light multiple benefits, starting with streamlining processes, improving communication and providing constant support for all those involved in the school community. By analyzing the benefits and potential of GAI in this context, we will outline a complete picture of the contribution of these emerging technologies (chatbots) to the modernization and streamlining of Internal Managerial Control in education. A chatbot is a computer application specialized in simulating conversations with human users, predominantly via the internet. These systems rely on technologies such as Artificial Intelligence and machine learning to interpret and respond to user questions and requests. When used within the framework of Internal Managerial Control activities, chatbots, as tools of GAI, bring multiple benefits, including: *Increased efficiency*: Chatbots can handle a large volume of questions and requests in a short time, freeing up staff time for other activities. *Improved accessibility*: Users can interact with the chatbot at any time of the day or night, without being restricted by personal schedules or staff availability. *Consistent responses*: Due to their automated nature, chatbots provide consistent and accurate answers to frequently asked questions, eliminating possible

discrepancies or human errors. *Continuous improvement*: By learning from previous interactions, chatbots become more efficient and accurate in providing answers as they accumulate more data and experience. “The key elements of GAI are: interaction: communicates with users via text or voice. automation: automatically generated responses, without constant human intervention. adaptability: learns from interactions to improve future responses. How a chatbot works: Input: the user enters a question or command. Processing: the chatbot analyzes the request using NLP (Natural Language Processing) algorithms. Response: generates an appropriate response based on the analysis performed. Technological leaps that have led to more sophisticated chatbots: Advanced Algorithms: the refinement of algorithms that allow chatbots to understand and process human language with increasing accuracy. Learning capabilities: machine learning has allowed chatbots to adapt and improve based on previous interactions. Multidimensional interaction: current chatbots can handle multiple tasks and provide almost human conversational experiences” (Andrei Pojoreanu, 2023) [18].

The key elements of a chatbot and its functionalities can be adapted for use in Internal Control in the field of education in several ways, as follows: *Standard 12 – Information and communication. Adapted interaction*: the chatbot can communicate with teachers, students and parents via text or voice, giving them the opportunity to ask questions, receive information and request assistance on various issues related to school administration. *Standard 9 – Procedures. Automation of administrative processes*: the chatbot can automate administrative processes, such as filling out forms, managing appointments for meetings or providing information on the internal procedures of the educational institution. *Standard 8 – Risk management. Adaptability and lifelong learning*: by using machine learning algorithms, the chatbot can learn from previous interactions and improve its responses according to the needs and preferences of users, developing measures for existing risks. *Standard 10 - Supervision. Efficient management of requests and complaints*: the chatbot can process and direct requests and complaints received from users to the relevant departments within the educational institution, ensuring that they are resolved in a reasonable and efficient time. *Standard 11 – Business continuity. Assistance for the online learning process*: in the context of distance learning, the chatbot can provide technical assistance and information about online learning platforms, accessing educational resources and using digital tools. *Standard 15 – Evaluation of the Internal Managerial Control System. Generation of reports and analyses*: the chatbot can generate the annual evaluation report using the feedback received and the problems identified, providing the leaders of the educational institution with valuable information to improve internal processes. "Considering the contribution of GAI in process management, it has become a fundamental tool in the arsenal of any modern entity, not just a technological trend, but an effective way to improve various aspects of monitoring a system, by integrating a chatbot into the Internal Control of educational institutions, communication, information management and feedback collection can be streamlined, thus contributing to improving transparency and accountability in educational administration" (Andrei Pojoreanu, 2023) [18]. Among the existing chatbots, ChatGPT stands out for its remarkable performance in natural language processing and its advanced adaptability and continuous learning capabilities, making it an ideal choice to be integrated into the Internal Control of educational institutions. “ChatGPT is an artificial intelligence language model developed by OpenAI. GPT stands for generative pre-trained transformer. A transformer is a specific class of neural networks that

is pre-trained, meaning trained on huge amounts of past observations. Being generative refers to the step-by-step generation of ChatGPT tokens (a group of characters, such as a word or part of a word. (<https://platform.openai.com/tokenizer>) (Figure 8.). This is to see how words are divided into tokens, the units that ChatGPT works with, to build sentences, paragraphs, or entire articles of text based on the learned predictive distribution of tokens (previously generated or provided tokens). Chat means that the transformer has been optimized for conversational chat. ChatGPT was launched on 11/30/2022 and had one million users in five days (by comparison, Instagram took two and a half months to reach the same user base), making it the fastest growing consumer app to date” (M.Hofert, 2023) [19].

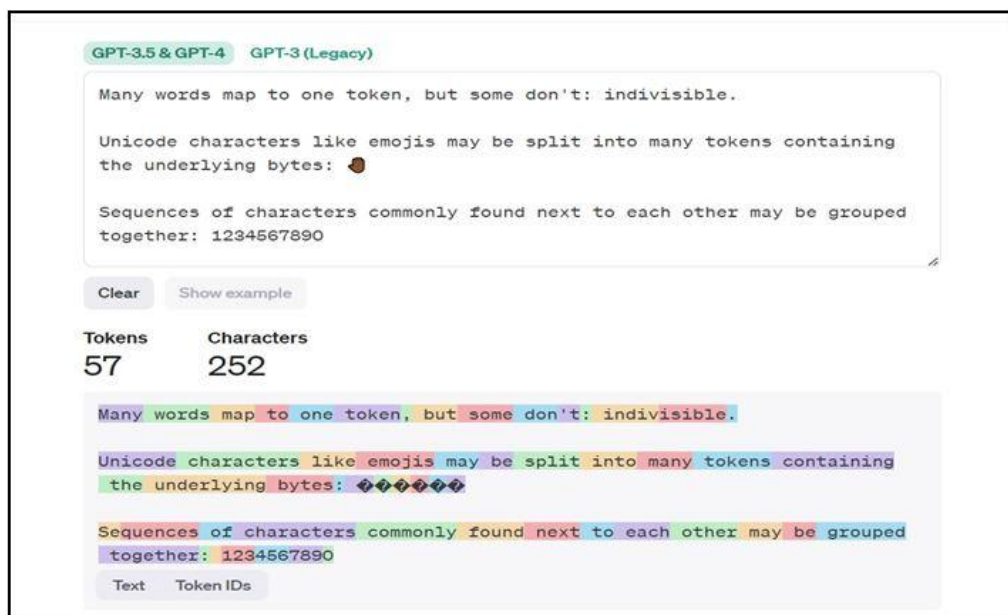


Figure 8. *Tokenizer Example*
Source: OpenAI

To highlight the contribution that ChatGPT can make to the implementation and compliance of *Standard 8 – Risk Management within an educational institution*, the results of the case study *ChatGPT Competencies Assessment in Quantitative Risk Management*, conducted in May 2023, by Marius Hofert [19], were analyzed. The study investigates to what extent ChatGPT can understand concepts in the field of risk, risk measures, time series, extremes and dependence. The study’s conclusions show that non-technical aspects of risk (such as explanations of different types of financial risk, the factors underlying the 2007-2009 financial crisis, or a basic introduction to the Basel Framework²) are well understood by ChatGPT. More technical aspects (such as mathematical facts) are often inaccurate or wrong, sometimes in quite subtle ways. Guidance is provided on the types of applications for which consulting ChatGPT can be useful in improving knowledge about quantitative risk management in actuarial practice and those for which ChatGPT should not be invoked

² Basel is an international regulatory framework that aims to strengthen regulation, supervision, and risk management in the banking sector.

are highlighted (M.Hofert, 2023) [19]. Based on the conclusiveness of the results of this study, we will consider the main conclusions about the use of ChatGPT in risk management, in order to serve the present research, by adapting it to the needs of IMCS in school education. Analyzing the results of the presented study, we conclude that the ChatGPT Generative Artificial Intelligence technology can make a significant contribution to the identification of unknown risks and in risk management in the educational field. Due to its ability to be trained on sources covering risks that educational institutions have not previously encountered or cannot anticipate, ChatGPT can detect those unknowns that may represent latent threats to institutions. This approach is similar to the introduction of operational risk loss databases in the financial industry, where companies use this data for internal stress tests, in order to identify and effectively manage risks. Using ChatGPT in this context, of implementing and complying with Standard 8, is more accessible not only to large institutions but also to smaller institutions. Institutional leaders seeking an impartial perspective on measures can request recommendations from ChatGPT. Although the answers generated by GAI may sometimes be inconclusive, the introduction of these aspects into risk management brings a new and necessary perspective, thus contributing to a holistic approach to risk management in education.

4.2.2. Similarities between the use of Generative Artificial Intelligence (GAI) in finance and that of Internal Managerial Control in educational institutions

GAI use in finance:

Financial virtual assistants, known as chatbots, are programs based on Generative Artificial Intelligence that interact with customers via text or voice and provide financial services. These chatbots are useful for banks and other financial institutions, allowing them to provide 24/7 customer service, automate repetitive tasks, and improve user experience. Some common applications of chatbots in finance (Table 1) include account management, providing customer service, and offering investment advice. In general, chatbots in the financial sector help companies reduce costs, improve efficiency, and provide a more pleasant experience for their customers. These are just a few examples of how chatbots are being used in the financial industry to provide convenient and efficient services to customers” (Geerling, Mateer, Wooten, & Damodaran, 2023) [20].

Table 1. *Examples of chatbots in the financial industry*

The name of the chatbot	The financial utility
<i>HSBC's Amelia</i>	A virtual assistant that can help customers with account management, money transfers, and investment advice.
<i>Chase's CoiN</i>	A chatbot that helps customers with account questions, card activation, and fraud alerts.

<i>Citi's Virtual Assistant</i>	A chatbot that helps customers with account management, balance inquiries, and bill payments.
<i>Erica from Bank of America</i>	A virtual financial assistant that helps customers manage their accounts, pay bills, and make budget plans.
<i>Capital One's Eno</i>	A chatbot that helps customers check account balances, view transactions, and receive fraud alerts.
<i>Ally Assist</i>	A virtual assistant offered by Ally Bank that helps customers with account management, bill payments, and investment advice.
<i>TD Ameritrade Chatbot</i>	A virtual assistant that provides real-time market information and investment recommendations.
<i>American Express Virtual Assistant</i>	A chatbot that helps cardholders manage their accounts, track rewards, and get customer service.
<i>Fidelity Virtual Assistant</i>	A chatbot that helps customers with investment advice, account management, and research.

Source: own design

In the context of an accelerated digital transformation, “numerous uses for Generative Artificial Intelligence can be found in the different areas of the financial sector, along the entire value chain, from back-office to middle-office to front-office. Some applications aim to improve the customer experience (e.g. biometric authentication), while others aim to optimize and/or transform processes in the different stages of the provision of financial services (e.g. using new data sources for investment selection or determining risk premiums). Combining Generative Artificial Intelligence with other technologies (such as distributed ledger technology and smart contracts) can further increase the possibilities. Without being exhaustive, the following examples of the use of Generative Artificial Intelligence in the financial sector can be highlighted: *Chatbots and virtual assistants*. They allow users to resolve common doubts and, in some cases, provide product recommendations or carry out certain transactions (e.g. order transfers, open accounts).

Customer communication channels thus become automated, meaning they are available 24/7 and, in addition, data on user interactions is automatically collected. *Personalization of end products and services.* Based on information obtained from customers, financial institutions are able to offer a personalized user experience, possibly even beyond banking services in the strictest sense of the term (for example, sending account balance alerts if geolocation services detect that customers are making purchases). *Anti-money laundering and fraud prevention controls.* The ability to analyze a larger volume of data and combine this data with new sources of information allows for the detection of anomalies or patterns that would otherwise have gone unnoticed. It also significantly reduces the number of false alarms, making fraud and anti-money laundering control tasks faster and more accurate, with less customer disruption. *Credit scoring.* Increased analytical capacity can improve credit assessment and accelerate credit origination. In addition, the use of unstructured data can increase the number of eligible customers, making this analysis easier for new financial institutions or those operating in new markets about which little information is available. *Regulatory compliance.* The greater analytical capacity offered by artificial intelligence tools makes it easier to comply with certain regulatory requirements (e.g. risk management, reporting obligations) and also to monitor regulatory changes” (Fernández, 2019) [21]. Starting from the examples of use of GAI in the financial field, we can highlight its potential in Internal Control in educational institutions, by implementing Internal Managerial Control standards in several ways, according to Table 2.

Table 2. *Ways of using GAI in the implementation of Internal Managerial Control Standards*

<i>Components of Internal Managerial Control</i>	<i>Internal Managerial Control Standards</i>	<i>Examples of using GAI in the implementation of standards</i>
Control environment	<i>STANDARD 1 ETHICS AND INTEGRITY</i>	Artificial Intelligence can be used to monitor employee behavior and identify potential violations of the code of ethics.
	<i>STANDARD 2 ATTRIBUTES, FUNCTIONS, TASKS</i>	Artificial Intelligence systems can help to assigning tasks and responsibilities effectively, ensuring that each team member has the right role and responsibilities.
	<i>STANDARD 3 COMPETENCE, PERFORMANCE</i>	Artificial Intelligence can assess employee competencies and provide recommendations for their professional development based on the specific needs of the organization.
	<i>STANDARD 4 ORGANIZATIONAL STRUCTURE</i>	Artificial Intelligence systems can analyze and optimize the organizational structure to ensure effective communication and equitable distribution of responsibilities.

Performance and Risk Management	<i>STANDARD 5 OBJECTIVES</i>	Artificial Intelligence can contribute to defining and monitoring organizational objectives, automatically identifying discrepancies and suggesting necessary adjustments.
	<i>STANDARD 6 PLANNING</i>	Artificial Intelligence systems can assist in developing action plans and allocating resources based on identified priorities and risks.
	<i>STANDARD 7 PERFORMANCE MONITORING</i>	Artificial Intelligence can automatically monitor the organization's performance and generate periodic reports for high-level management.
	<i>STANDARD 8 RISK MANAGEMENT</i>	Artificial Intelligence systems can automatically identify and assess potential risks, as well as provide recommendations for measures to manage them.
Control Activities	<i>STANDARD 9 PROCEDURES</i>	Artificial Intelligence can automate internal processes and procedures, ensuring their consistent and accurate application.
	<i>STANDARD 10 MONITORING</i>	Artificial Intelligence systems can monitor the organization's activities in real time and can automatically alert on any anomalies or deviations from established procedures.
	<i>STANDARD 11 BUSINESS CONTINUITY</i>	Artificial Intelligence can contribute to the planning and implementation of business continuity measures, automatically identifying vulnerabilities and proposing backup solutions.
Information and communication	<i>STANDARD 12 INFORMATION AND COMMUNICATION</i>	Artificial Intelligence systems can facilitate internal and external communication through chatbots and other voice or text-to-speech assistance technologies.
	<i>STANDARD 13 DOCUMENT MANAGEMENT</i>	Artificial Intelligence can efficiently manage organizational documents, including their automatic indexing, searching and archiving.
	<i>STANDARD 14 ACCOUNTING AND FINANCIAL REPORTING</i>	Artificial Intelligence Systems can automate the financial and accounting reporting process, ensuring accuracy and compliance with accounting standards.
Evaluation and Audit	<i>STANDARD 15 EVALUATION OF THE INTERNAL MANAGERIAL CONTROL SYSTEM</i>	Artificial Intelligence can evaluate the efficiency and effectiveness of the Internal Managerial Control System by analyzing operational data and performance indicators.

	<i>STANDARD 16 INTERNAL AUDIT</i>	Artificial Intelligence Systems can assist internal auditors in identifying risks and deviations, as well as in developing recommendations for improving organizational processes.
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Source: own design

4.2.3. The Use of Generative Artificial Intelligence in Internal Managerial Control in Education and Implications for Internal Audit

In recent years, the use of Generative Artificial Intelligence (GAI), especially ChatGPT, has become increasingly widespread in a variety of fields, this technology bringing with it a series of benefits and challenges for education, research and the business environment. ChatGPT has been applied in a variety of academic and non-academic fields to analyze contributions and risks and to take appropriate measures. For example, it can be used to monitor patients remotely by analyzing data from sensors or other monitoring devices, providing real-time information about a patient's health status. In other research, it can improve the productivity and efficiency of accounting professionals by transforming their work systems. Also, some researchers have highlighted the ability of ChatGPT to generate short stories based on the information provided by the user. Entities have used ChatGPT to improve the way people work by automating repetitive tasks and providing more engaging interactions with users. Institutions have integrated ChatGPT into various aspects of their operations, including creating marketing content, generating unique ideas, writing computer code, automating steps in the sales process, providing customer aftercare, translating text between languages, and increasing customer engagement.

“While the media and blogs have covered various aspects of the use of ChatGPT in education, a systematic review of the impact of the technology on multiple aspects of education and research is needed” (Cribben and Zeinali, 2023) [22]. In the 2023 case study, titled “The benefits and limitations of ChatGPT in business education and research: a focus on management science, operations management and data analytics,” the researcher examines the use of ChatGPT by both faculty and students. In terms of education, ChatGPT can be a versatile tool for teachers and students. Teachers can use it to create course materials, curricula, tests and exams, and to assist in student assessment and understanding. For students, it can provide explanations of complex concepts and help them with various tasks, such as writing and debugging code or preparing for exams. In general, ChatGPT's abilities in writing and debugging code, as well as in assessment, are considered its strengths in the field of education and research. However, the use of Artificial Intelligence has generated controversy in the academic environment, as it seems to change the current way the education system works. “It is essential to establish clear guidelines to maximize the benefits of this tool in the academic environment, including guiding teachers in its appropriate use and their role in guiding students in the appropriate and responsible use of the platform, also considering ethical aspects, such as the possibility of bias and plagiarism” (Cribben and Zeinali, 2023) [22].

In the context of Internal Managerial Control in educational institutions, the use of ChatGPT can bring significant benefits. Teachers and teaching staff can use this technology to streamline management and evaluation processes. Through ChatGPT, they can create course materials, study programs and evaluation tools, thus contributing to ensuring

managerial coherence and the efficiency of the activity of functional departments in the educational unit. ChatGPT can also be useful in identifying unknowns in the context of Internal Managerial Control. Through its ability to understand and answer various questions, ChatGPT can help identify potential risks or generate solutions to the problems faced by the educational unit. This can contribute to strengthening the Internal Managerial Control System and improving the efficiency of Internal Audit. The use of ChatGPT in Internal Managerial Control also raises some ethical and practical issues that need to be addressed. It is important that teachers and teaching staff are prepared to use this technology responsibly and guide students in its appropriate use. It is also necessary to have clear guidelines for the use of ChatGPT in the educational context, so as to maximize its benefits and minimize the associated risks. Given the aspect of using chatbots in the teaching-learning-evaluation process, the Internal Managerial Control System of educational institutions should consider, by complying with the Internal Control Standards, adapting both the objectives and the existing operational procedures to respond to the imposed changes. Of course, the inclusion of chatbots in the IMCS implementation can be considered, in order to improve control activities. For example, involving the help offered by Generative Artificial Intelligence (GAI) in the application of *Standard 14 - Financial and accounting reporting* in educational institutions, can bring significant benefits in streamlining processes and improving the quality of financial reports. By using GAI in this context, educational institutions can perform faster and more accurate analyses of financial data, more easily identifying trends and anomalies, thus providing a clearer and more comprehensive picture of their financial situation. “The use of Artificial Intelligence techniques in the provision of financial services can increase efficiency, reduce costs, improve quality, increase the level of satisfaction of beneficiaries and stimulate financial inclusion, mainly due to the possibilities they offer for automating operational processes and increasing analytical capacity. Techniques such as natural language processing or image recognition allow institutions to automate repetitive or low-value-added tasks, such as answering frequently asked questions. Through automation, the potential for human error is reduced, productivity is increased and the costs associated with these tasks are reduced. As a result, the level of satisfaction of GAI users increases, as they receive more efficient services, with shorter response times and higher service availability. By saving costs through automation, institutions can also offer certain services that were traditionally available only to a limited number of beneficiaries, now being extended to a wider range of users. This expansion of access to services can contribute to increasing user satisfaction and improving institutional efficiency. Thanks to Artificial Intelligence tools, institutions are able to analyze a much larger volume of structured and unstructured data much faster. In addition, the increased number of variables increases the quality of the analysis, as the knowledge of the beneficiaries is greater and the results obtained are more accurate. All of the above is to the advantage of all the factors involved, as it allows institutions to provide better services, in compliance with regulations. In addition, a greater analytical capacity allows institutions to exploit all the data (both internal and external) to which their beneficiaries have access, to learn more about their preferences. In this way, they are able to develop personalized products and services and even anticipate needs, improving the user experience” (Fernández, 2019) [21]. One of the main advantages of integrating GAI into financial and accounting reporting is its ability to process and analyze large volumes of data in a much shorter time than a human team could. Machine learning algorithms can

identify patterns and correlations in financial data, helping to detect fraud or accounting errors and thus providing additional assurance that financial reports are accurate and reliable. GAI can also be used to automate repetitive processes within financial reporting, such as reconciling accounts or generating standardized reports. By eliminating manual and repetitive tasks, accounting staff can be freed up to focus on value-added activities, such as data analysis or developing financial strategies. Another benefit of integrating GAI into financial and accounting reporting is its ability to provide predictive analytics and data-driven recommendations. By analyzing historical data and identifying trends, GAI can help educational institutions better anticipate and manage financial risks and make more informed decisions regarding budget planning and investments. However, integrating GAI into financial and accounting reporting also poses some challenges for Internal Audit. First, auditors need to adapt their approaches to assess the effectiveness of using GAI in institutional processes. This includes verifying the accuracy and reliability of data generated by GAI, ensuring that these technologies are used ethically and responsibly, and assessing their impact on existing internal controls. In addition, the audit must ensure that data used by GAI is protected in accordance with security and confidentiality standards and that the risks associated with the use of this technology are appropriately managed. Integrating IAG into the Internal Managerial Control processes of educational institutions, including financial and accounting reporting, thus brings both considerable benefits and new challenges that need to be carefully managed by Internal Audit. It is essential that auditors to update their methods and knowledge to be able to effectively oversee the use of these technologies and to ensure that they contribute to improving the governance and performance of institutions.

5. Conclusions

The research highlighted that, in most educational institutions, IMCS and Internal Audit are implemented in a formal and traditional manner, but not sufficiently efficient. Although there are documented procedures and established organizational frameworks, modern automation and monitoring tools are lacking. This reality generates high resource consumption, operational risks not identified in time and a limited capacity to react to non-conformities. Artificial Intelligence technologies, especially Generative AI (GAI), have proven their potential to contribute significantly to the optimization of IMCS and Internal Audit. By analyzing the data obtained from IT specialists and accountants, the idea that AI can automate repetitive tasks, identify patterns and irregularities difficult to observe through conventional methods and support data-driven decision-making was clearly outlined. Thus, AI brings considerable added value to decision-making and control processes. AI can actively support the achievement of IMCS objectives by strengthening the capacity of institutions to assess risks, anticipate deviations and implement effective corrective measures. The use of AI in internal audit has demonstrated increased accuracy in detecting errors and fraud, as well as a superior capacity to analyze financial flows, compared to classic methods. This contribution is essential for increasing the robustness of control systems and strengthening institutional accountability. The integration of AI into audit processes has led to a visible streamlining of activities. The research validated the fact that AI allows for a rapid, complete and permanent verification of documents and financial processes, favoring the transition from a reactive to a continuous audit. This transformation

is particularly important in the current context of the digitalization of public administration and the need to adapt educational institutions to modern governance standards.

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