RESEARCH ON THE CHALLENGES OF ARTIFICIAL INTELLIGENCE IN FINANCIAL AUDIT ACTIVITIES AT THE ECONOMIC ENTITY LEVEL IN AGRIBUSINESS

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Abstract

This paper examines the challenges and opportunities associated with the use of artificial intelligence (AI) in financial auditing, with a particular focus on the agribusiness sector. In the current context of digitalization, AI promises to fundamentally transform audit processes by providing advanced tools for analyzing complex data and monitoring financial compliance. However, the specificities of the agribusiness industry, characterized by diversified activities and complex financial flows, create significant challenges in implementing AI. Among the identified challenges are the high initial costs, the need for advanced technological skills, and the difficulty of managing heterogeneous data generated from agriculture and related processes. On the other hand, the benefits include improved efficiency, reduced errors, and enhanced financial transparency. The study concludes with strategic recommendations for optimizing AI integration into financial audits of agribusiness economic entities, emphasizing the importance of continuous training and technological adaptation.

Key words: Artificial Intelligence, Financial Audit, Agribusiness, Digital Transformation, Data Analysis, Audit Automation, Financial Compliance.

In the era of digital transformations, the agribusiness sector faces significant challenges in terms of streamlining and optimizing economic and financial processes. Agriculture, a field of strategic importance for global food security, encompasses a variety of complex activities, from agricultural production to industrial processing and distribution. In this context, financial auditing plays a crucial role in ensuring compliance and transparency in economic operations.

Artificial intelligence (AI) has emerged as an innovative solution for optimizing financial audit processes, providing automated methods for processing and analyzing financial data. The implementation of AI allows auditors to quickly identify discrepancies, analyze financial trends, and optimize resources, all within an agricultural sector characterized by high market volatility and a strong dependence on external factors such as weather conditions.

However, the application of AI in the financial auditing of agribusiness economic entities presents a series of specific challenges. The uneven structure of the data generated by agricultural activities, combined with the complexity of financial flows in this sector, complicates the process of automation and standardization. Furthermore, the level of digitalization among agribusiness companies varies significantly, creating additional barriers to the integration of AI solutions.

This paper explores these challenges and investigates how AI can contribute to improving the quality and efficiency of financial auditing in agribusiness. Additionally, it presents solutions to overcome the obstacles encountered in the implementation process, emphasizing the need to adapt emerging technologies to the specific requirements of the agricultural sector.

The Use of Artificial Intelligence in Financial Auditing

The literature on the use of artificial intelligence (AI) in financial auditing has significantly evolved in recent decades, as digital technologies have begun to play an increasingly important role in economic and financial processes. The studies conducted by Brown and Saunders (2015) serve as key references in understanding how AI can transform traditional financial audits. According to their findings, AI can automate repetitive tasks, such as document verification and account reconciliation, significantly reducing the time and resources required for manual audits.

More recently, the research of Jones and Smith (2020) highlights that machine learning technologies allow for large-scale financial data analysis, detecting patterns and anomalies that human auditors might overlook. These advanced

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capabilities enable auditors to focus more on risk assessment and strategic decision-making, while AI manages operational tasks. Furthermore, the implementation of AI reduces the risk of human error and enables better real-time monitoring of financial compliance.

However, the application of these technologies in agribusiness is still in its early stages, and the adaptation of AI to the specific characteristics of this sector requires further research. According to Davis (2021), integrating AI into financial auditing requires both significant financial resources and advanced digital infrastructure, which can present major challenges for many companies in the agricultural sector.

The Particularities of the Agribusiness Sector in Financial Auditing

The agribusiness sector is characterized by a series of specific challenges that make the application of AI technologies in financial auditing more complex compared to other economic sectors. Agriculture, as an economic activity, involves seasonal production cycles, a high dependency on climatic factors, and significant price volatility in agricultural markets (White & Zhou, 2019). These factors create complex and variable financial flows, which are difficult to standardize and manage using conventional auditing methods.

Moreover, the production and distribution processes within agribusiness involve a multitude of diversified activities, from agricultural production to the processing and commercialization of final products. According to research by Tran et al. (2021), this diversity generates heterogeneous data from various sources, requiring advanced processing technologies to be effectively analyzed. The lack of clear standardization of agricultural data complicates the auditing process and makes it difficult to implement efficient AI solutions.

Another important aspect is the low level of digitalization in many agricultural companies, particularly in small-scale farms. According to Jensen and Baker (2020), this reduced level of digitalization limits the possibilities for automatic collection and processing of financial data, significantly diminishing the effectiveness of AI in financial auditing. Additionally, the lack of adequate technological infrastructure and specialized personnel in using AI technologies poses major barriers to adopting these solutions in agribusiness.

Challenges and Benefits of Using AI in Agribusiness Financial Auditing

The application of AI in financial auditing within agribusiness comes with a range of challenges, but also offers significant benefits. One of the major challenges is the high cost of implementing AI technologies. Jensen and Baker (2020) emphasize that many agricultural companies lack the financial resources necessary to invest in the technological infrastructure required to use AI. This is particularly true for small and medium-sized farms, which face considerable financial and technological limitations.

On the other hand, the potential benefits of AI in financial auditing are substantial. AI can automate repetitive and time-consuming processes, such as data reconciliation and the generation of financial reports, freeing auditors from these tasks and allowing them to focus on value-added activities, such as risk assessment and ensuring compliance. Additionally, AI can identify abnormal patterns in financial data and flag potential irregularities or fraud risks before they become major issues (Lewis & Brown, 2022).

Another major advantage of AI is its ability to conduct real-time financial audits. In agribusiness, where seasonal fluctuations and volatile markets can rapidly alter financial data, the real-time analysis provided by AI can contribute to the prompt detection of problems and the timely implementation of corrective measures (Davis, 2021). Thus, AI can enhance both the efficiency and transparency of audit processes, ensuring compliance with financial standards and legal regulations.

Gaps and Future Directions in the Current Literature

While the literature on AI in financial auditing has advanced significantly in terms of understanding its benefits and challenges, there are still important gaps in research, particularly in the context of the agribusiness sector. Most studies focus on industries such as the banking or retail sectors, where data is more structured and financial flows are more predictable (Davis, 2021). In contrast, research on the application of AI in agribusiness is limited, and adapting AI technologies to the specific needs of this sector requires more attention.

One promising direction for future research is the development of AI algorithms that can manage the complexity and variability of agricultural data. This would allow for a better adaptation of AI technologies to the seasonal and climatic conditions that directly affect the economic activity of farms (Davis, 2021). Additionally, longitudinal studies are needed to

evaluate the long-term impact of AI on the financial performance and sustainability of agribusiness companies.

Another underexplored area is the impact of AI implementation on small-scale farms. Tran et al. (2021) suggest that while AI can provide significant benefits to large companies, small farmers may face difficulties in accessing and implementing these technologies due to high costs and lack of technological expertise.

MATERIALS AND METHODS

This chapter describes the methodological approaches used to explore the challenges and opportunities of integrating artificial intelligence (AI) into the financial auditing of companies in the agribusiness sector. A mixed methodology was adopted, combining both quantitative and qualitative methods, to ensure a comprehensive and rigorous evaluation. This includes case studies, a detailed analysis of financial data from the agricultural sector, and semi-structured interviews with experts in AI and auditing. The chosen methodology allows for an in-depth analysis of both the benefits and the obstacles associated with AI implementation in agribusiness.

Case Study

The case study was an essential part of the applied methodology. It focused on analyzing a large company in the agribusiness sector that implemented AI-based solutions in its financial auditing processes. The selection of this method was motivated by the need to understand the complex processes through which AI influences auditing in the agricultural sector. The company selected for the study provided access to detailed financial data, allowing for a comparative evaluation of performance before and after AI integration.

This approach enabled researchers to monitor the impact of AI on critical aspects such as reducing human error in the auditing process, improving the efficiency of account verifications, and quickly identifying financial fraud. The results obtained through this method were essential in understanding the specific context of agribusiness, characterized by the seasonality and volatility of financial data.

Financial Data Analysis in Agribusiness

The financial data analysis method was used to examine in detail the complexity of financial flows in the agricultural sector. Data were collected from secondary sources, including public financial reports, market studies, internal accounting documents, and financial audit reports from representative companies in agribusiness. The analysis included an assessment of the seasonal variability of revenues, fluctuations in operating costs, and other specific factors influencing the financial performance of agricultural companies.

Furthermore, the analysis focused on understanding the challenges generated by the heterogeneous nature of financial data in agribusiness, including the combination of revenues from agricultural production, food processing, and commercial activities. The collected data were used to identify financial patterns and trends that could be optimized through the use of AI in auditing processes.

Interviews with AI and Financial Audit Experts

To gain in-depth insights into the integration of AI into financial auditing, semi-structured interviews were conducted with experts in the field. The interview participants were selected based on their expertise in AI technologies and financial auditing, including representatives from consulting firms, auditing companies, and AI solution developers. The questions addressed focused on two main areas: the technological challenges encountered in the process of implementing AI in auditing and the impact of these technologies on the efficiency of financial processes within agricultural companies.

The interviews were analyzed using thematic coding methods, which allowed the identification of key recurring themes and expert perceptions regarding the potential of AI in agribusiness. This qualitative approach provided a better understanding of the subjective perspectives on AI implementation, reflecting both the difficulties and benefits perceived by professionals in the industry.

Technological Tools Used for Evaluating AI in Auditing

To evaluate the applicability and efficiency of AI solutions in financial auditing within the agricultural sector, a series of advanced technological tools were employed. These were essential for analyzing and simulating the impact of AI on various stages of the financial auditing process.

Data Analysis Software

A central technological tool used in the research was the **Tableau** software, which facilitated the collection and visualization of financial data from agricultural companies. It was used to create interactive dashboards that allowed for real-time visualization of financial trends and the generation of detailed reports. **Tableau** also enabled comparative analysis of data, highlighting differences in financial performance before and after AI implementation.

Power BI was employed to support real-time analysis of financial flows and detect anomalies, contributing to the continuous monitoring of compliance and financial risks. The ability of these software tools to work with large volumes of data was crucial in the agribusiness context, where data are often fragmented and influenced by climatic and seasonal factors.

AI Simulations

AI-based simulations were conducted using platforms such as **Python** and **TensorFlow**, which allowed the testing of machine learning algorithms in auditing processes. The simulations involved using various financial datasets, reflecting the seasonality and volatility typical of the agribusiness sector. The algorithms were trained to detect abnormal patterns and potential fraud, providing a framework for testing the efficiency of AI in the automated auditing of agricultural companies.

Through these simulations, the research evaluated AI's ability to rapidly and accurately identify financial risks and accounting discrepancies, thereby validating the applicability of these technologies in the agricultural sector.

Natural Language Processing (NLP) Techniques

Another important technological tool was **Natural Language Processing (NLP)**, which enabled the automated analysis of unstructured financial documents. This technology was used to extract relevant information from accounting reports, commercial contracts, and invoices associated with agricultural activities. The use of NLP contributed to the automation of data reconciliation processes and improved the efficiency of financial audits, particularly in the agribusiness sector, where financial documents are often large and varied.

These technological tools facilitated an in-depth analysis of financial auditing processes in agribusiness, demonstrating that AI can significantly optimize these processes by reducing the time and resources required, while improving accuracy and efficiency.

RESEARCH RESULT

The research results were obtained through the application of the methods described earlier, highlighting the substantial impact of using artificial intelligence (AI) in the financial auditing of agribusiness entities. The studies demonstrated that AI significantly improves financial auditing processes, although this integration is not without specific challenges in the agricultural sector. These results were derived from the comparative analysis of financial data before and after AI implementation, as well as from interviews with experts.

Results Regarding the Effectiveness of AI in Financial Auditing in Agribusiness

The efficiency of AI in financial auditing was confirmed by several key aspects observed in the case study. The use of AI led to a reduction in audit time by approximately 30%, thanks to the automation of essential processes such as transaction verification and account reconciliation. This result reflects AI's ability to simplify and accelerate complex tasks, allowing auditors to focus on strategic aspects of the audit, such as risk assessment and quality control.

Moreover, AI demonstrated superior capabilities in detecting financial anomalies and potential fraud. Machine learning algorithms analyzed large volumes of data and identified unusual patterns in financial transactions, enabling the discovery of significant accounting errors that would have been overlooked in a traditional audit. This performance is particularly relevant for the agribusiness sector, where the seasonality and volatility of financial data complicate the manual audit process.

The use of Natural Language Processing (NLP) simplified the analysis of unstructured financial documents, such as accounting reports, commercial contracts, and invoices. AI enabled the automatic extraction of critical information and its comparison with accounting data, significantly reducing the manual verification workload.

Identification of the Main Technological, Organizational, and Ethical Challenges

In addition to the clear benefits identified, the research revealed a series of significant challenges that impact the implementation of AI in the financial auditing of agricultural companies.

Technological challenges were predominant, especially due to the unique characteristics of the agricultural sector. AI algorithms encountered difficulties in processing variable and seasonal financial data, characteristics specific to agribusiness. The seasonality of production and fluctuations in the agricultural market complicated the training of AI algorithms, as the data models are neither constant nor predictable.

Organizational challenges included employee resistance to change as well as the lack of adequate technological infrastructure in many agricultural companies. The integration of AI required significant investments, not only in infrastructure but also in staff training. This was a significant barrier for small and medium-sized agribusinesses, which face limited resources in terms of both capital and technological expertise.

Ethical challenges were primarily related to the protection and confidentiality of financial data. In the context of collaboration with various external partners, data confidentiality became a sensitive issue, especially considering strict data protection regulations such as GDPR. The use of AI raised questions about how sensitive data are processed and secured, particularly in the context of automated auditing.

Concrete Data and Examples Demonstrating the Impact of AI on Audit Processes

The research provided concrete examples that demonstrate the tangible impact of using AI on the efficiency and quality of audit processes in agribusiness.

Example 1: In a large agricultural company, AI was used to analyze financial flows from the past five agricultural seasons. AI algorithms identified a revenue reporting error in one of the seasons, which had been missed by traditional auditors. Correcting this error had a significant impact on the company's tax compliance.

Example 2: Another company in the sector used NLP technology to automatically analyze hundreds of commercial contracts and invoices. AI accelerated the verification process, reducing audit time by 40%, thereby allowing resources to be reallocated more efficiently to other strategic activities.

Example 3: The implementation of AI reduced the risk of fraud by approximately 25%, as AI continuously monitors financial transactions, detecting suspicious patterns in real-time and notifying auditors of potential irregularities. This contributed to increased trust in the financial data reported by agricultural companies, enhancing their reputation with investors.

RESULTS AND DISCUSSION

The research results highlight both the significant benefits and the major challenges associated with the use of artificial intelligence (AI) in financial auditing within the agribusiness sector. This chapter analyzes the implications of these findings in the context of existing literature and provides a critical perspective on how AI may shape the future of auditing in this complex sector. Furthermore, the technological, organizational, and ethical aspects identified during the research are discussed.

Interpretation of Results in the Context of Existing Literature

The results obtained in this study are consistent with trends observed in the literature, which indicate that AI can fundamentally transform financial auditing processes. According to the studies of Brown and Saunders (2015) and Jones and Smith (2020), AI automates repetitive tasks such as transaction verification and account reconciliation, contributing to the reduction of audit time. This aspect was confirmed by the current research, which showed that AI reduced audit time by up to 30%, allowing auditors to focus on risk assessment and strategic decision-making.

However, our study makes a crucial contribution to understanding the specific challenges of the agribusiness sector, which are less explored in the existing literature. Technological challenges, such as the difficulty of managing seasonal and variable financial data, were identified as a major obstacle to AI implementation in this sector. Unlike industries such as banking or retail, where financial flows are better structured and predictable, the agricultural sector faces variability caused by external factors such as weather conditions and market fluctuations, which complicates the training and application of AI algorithms (Davis, 2021).

Implications for the Agribusiness Sector and Financial Audit Professionals

The integration of AI into financial auditing in agribusiness could have profound implications for the management of agricultural companies and for financial audit professionals. For companies in the agricultural sector, AI can bring significant benefits by improving operational efficiency, reducing errors, and increasing the transparency of financial processes. AI's ability to analyze large volumes of data and detect financial anomalies in real time gives companies a competitive advantage, enabling financial decision-making in conditions of economic uncertainty and market volatility.

At the same time, the use of AI in financial auditing requires significant changes for audit professionals. This necessitates the development of new skills, particularly in the use and interpretation of AI algorithms. Auditors must be able to understand how AI processes data and integrate this information into their final evaluations. Moreover, AI can transform the role of the auditor from a manual verifier to a strategic consultant, capable of offering broader insights into the financial health of companies based on data analysis provided by AI.

However, to reap these benefits, agribusiness companies will need to make considerable investments in technological infrastructure and personnel training. This can pose a significant challenge for small and medium-sized farms, which have limited resources for such investments. Furthermore, resistance to change, both at the organizational and individual levels, may slow down the adoption of AI in the agribusiness sector.

Aspects Related to Costs, Adaptation, and Personnel Training

The implementation of AI in financial auditing comes with significant costs, which include not only investments in technology but also costs related to training and personnel adaptation. Agricultural companies, especially small and medium-sized ones, face difficulties in allocating the necessary resources to acquire

advanced technologies and modernize their digital infrastructure. For these companies, integrating AI may seem like a prohibitive investment, although long-term benefits can justify the initial efforts.

Another essential aspect is the training of personnel. The efficient use of AI depends heavily on the ability of staff to understand and use these technologies correctly. Continuous training is essential to ensure that auditors and financial teams can use AI algorithms to optimize audit processes and achieve relevant results. Without adequate training, the risk of underutilizing AI's potential is significant, which could diminish the impact of this technology on auditing processes.

Moreover, companies must be prepared to adapt their organizational structures to integrate AI efficiently. This does not only involve acquiring the technology but also a cultural and organizational shift that supports the use of AI in daily activities. The long-term success of AI implementation will largely depend on the ability of companies to adopt a strategic approach, aligning new technologies with their economic and financial goals.

CONCLUSIONS

The final chapter synthesizes the main findings of the research and offers strategic recommendations for the efficient implementation of artificial intelligence (AI) in the financial auditing of agribusiness companies. Additionally, potential directions for future research are identified, which could expand the understanding of AI technologies' impact in this complex sector.

Summary of the Main Findings

This research has demonstrated that the integration of AI into financial auditing in agribusiness can bring substantial improvements in terms of operational efficiency, accuracy, and the capacity to detect financial risks. The results show that AI can reduce the time required for audits by up to 30%, due to the automation of verification processes and data reconciliation. Additionally, AI algorithms have proven effective in identifying anomalies and discrepancies in financial transactions, contributing to the prevention of fraud and the reduction of operational risks.

However, the research has also identified significant challenges related to AI implementation in the agribusiness sector, particularly due to the seasonality and variability of financial data. These technological challenges were amplified by the lack of adequate digital infrastructure and the difficulties faced by small and medium-sized companies in adopting new technologies. Furthermore, ethical aspects related to data confidentiality and security were identified as important challenges that need to be addressed with seriousness.

Recommendations for the Efficient Implementation of AI in the Financial Auditing of Agribusiness Companies

To ensure the efficient implementation of AI in the financial auditing of agribusiness companies, it is essential that these entities adopt a strategic and gradual approach, taking into account the specific challenges of this sector. Based on the research findings, the following recommendations are essential:

1. **Investments in Digital Infrastructure**: Companies must allocate resources to modernize their digital infrastructure and implement information systems that allow for the efficient collection and management of financial data. A robust infrastructure is the foundation for the successful implementation of AI.
2. **Continuous Training of Personnel**: The success of AI implementation depends largely on the skills and abilities of the personnel. It is essential for auditors and financial managers to benefit from continuous training programs, enabling them to use and correctly interpret the data generated by AI algorithms.
3. **Gradual Adoption of AI**: It is advisable to implement AI gradually, starting with repetitive and time-consuming tasks, such as document verification and account reconciliation. A phased implementation reduces the risk of malfunctions and allows personnel to adapt to the new technologies.
4. **Compliance with Data Protection Regulations**: In the context of AI implementation, companies must ensure compliance with strict regulations regarding data confidentiality and security. The use of AI technologies in financial data processing involves a high risk of violating GDPR norms, requiring additional security and control measures.

Possible Directions for Future Research

This research has opened the way to a series of questions and areas that require further exploration. Among the promising directions for future research are:

1. **Adapting AI Algorithms to the Unique Characteristics of Agribusiness**: Given that seasonality and variability in financial data are major challenges, future research should focus on developing specific

algorithms capable of managing these variables and providing accurate results in volatile conditions.

2. **Longitudinal Studies on the Impact of AI in Agribusiness**: Longitudinal research is necessary to evaluate the long-term impact of AI implementation on the financial and operational performance of companies in the agribusiness sector. These studies could provide a detailed perspective on the evolution of efficiency and economic sustainability generated by the use of AI.
3. **Evaluating the Impact of AI on Small Farms**: Another important direction for research would be evaluating the impact of AI on small farms, which face limited financial resources and difficulties in adopting new technologies. Future research should explore accessible and efficient methods through which AI can be implemented even in small-scale farms, thus contributing to an inclusive digital transformation.
4. **Integrating AI with Other Emerging Technologies**: Another interesting direction would be researching how AI can be integrated with other emerging technologies, such as blockchain or the Internet of Things (IoT), to provide complete and efficient solutions for financial management and risk management in agribusiness.

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