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CONSIDERATIONS ON THE ROLE AND IMPACT OF ARTIFICIAL INTELLIGENCE AND BLOCKCHAIN TECHNOLOGY IN ACHIEVING COMPETITIVE ADVANTAGE AND FINANCIAL PERFORMANCE OF COMPANIES

Irina HANGANU
Stefan cel Mare University of Suceava, Romania
imhanganu2022@gmail.com
Marian SOCOLIUC
Stefan cel Mare University of Suceava, Romania
marian.socoliuc@usm.ro
Mihaela Ionela SOCOLIUC
Stefan cel Mare University of Suceava, Romania
mihaela.socoliuc@usm.ro

Abstract
Purpose - The rapid development of the information and communication technology (IT&C) sector as well as online commerce have provided companies with new horizons and new prospects for growth. Alongside these, the implementation of artificial intelligence (AI) and blockchain technology (BCT) in recent years represent important opportunities for companies, both in terms of costs, conquering new markets, gaining superior competitive advantages and implicitly increasing financial performance. In this context, business organizations have had to adapt to market changes and consumer behavior. As a result, the aim of our study is to identify the role and impact of the implementation and use of these technologies in the business environment from the perspective of gaining competitive advantage and superior financial performance. Design / Methodology / Approach - The study is based on the six steps outlined in the scientific literature review procedure presented by Kitchenham (2004). Findings - The study initially focused on a definition of AI and BCT, followed by an analysis of the impact and role of their implementation in the areas considered to be most compatible. The study also revealed the advantages and disadvantages of implementing AI and BCT technologies. The study also revealed that the business environment is intensely concerned with identifying competitive advantages leading to superior performance. Practical implications - The study may be useful for managers and entrepreneurs who are concerned about implementing emerging technologies in their businesses. Social implications of this study - The implementation of emerging technologies not only presents the risks inherent in new technologies for employees, but also entails high costs for organizations. Originality/Value - The study provides a number of arguments regarding the role and impact of artificial intelligence and blockchain technology in achieving competitive advantage and financial performance of companies.

Keywords: *artificial intelligence; blockchain technology; financial performance; competitive advantage*

JEL Classification: M41

I. INTRODUCTION

The unprecedented evolution of artificial intelligence and emerging technologies offers new development prospects to companies that implement them in their activities, conscious of creating a competitive advantage and increasing the added value of their business.

Thus, Artificial Intelligence and Blockchain Technology (BCT) are currently the subject of wide-ranging debates, both at the level of international regulatory bodies with attributions in the field, at the level of national states, business organizations, as well as in the literature.

The holistic approach to performance by the entity, towards cost optimization, increased security, safety and traceability of online transactions and payments, has also implied a holistic approach to artificial intelligence and Blockchain Technology integration. products, respectively.

The aim of the paper is to identify the role and impact of the implementation and utilization of these technologies in the business environment from the perspective of achieving competitive advantage and superior financial performance (FP).

Thus, the paper aims to identify the current status and development prospects of the impact of these technologies on financial performance and competitive advantage, to identify the areas that are best suited to their use, the advantages but also the risks and barriers inevitably associated with these technologies. In this sense, associated with the research aim, we also set the following objectives:

O1- to provide a comprehensive definition of the concepts of AI and BCT;

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O2 - to identify the areas or sectors of activity that can increase their added value by using these technologies;

O3 - to present the advantages and disadvantages of implementing AI and BCT in business.

Structurally, the paper addresses in the next section a review of the literature on the topic analyzed, followed by the presentation of the research methodology, the results and related discussions obtained from the qualitative research conducted, followed by the section dedicated to the final conclusions.

II. LITERATURE REVIEW

Following a review of the literature with this focus, we find that the official use of the term Artificial Intelligence (AI) was first made in 1956, the year that marks the creation of a group of specialists who joined forces to build a machine that simulates human intelligence.

The first versions of AI were the ELIZA machine, which was able to simulate a conversation with a human, and the General Problem Solver, which offered automatic solutions to various problems. The development of these technologies was stagnant due to lack of financial resources, until 2015 when AlphaGo achieved an impressive victory in the game of Go using Deep Learning, which was the cornerstone for algorithms used in image recognition, which today are used by social networks and speech recognition algorithms used for devices and cars (Haenlein and Kaplan, 2019).

Author Bharadiya (2023) identifies as important components of AI, Data Warehousing, Data Mining and Decision Support Systems, which help to build flexible strategies and goals through complex data and information processing. The author also reveals the importance of education and ethics in this field, so that users can understand the implications of using AI but also its evolution.

The evolution of these technologies, has led large companies ,in recent times, to integrate blockchain technology along with AI, in their work, with the aim of performing complex analytics using large volumes of data (Big Data) and to do so while maintaining data security. In this last aspect, Socoliuc (2023) considers that artificial intelligence will have a major impact on business, in the sense of replacing traditional business models with business models based on research-development-innovation-digitization (RDID).

Kumar et al. (2024), in a study conducted on the collected data of 407 SMEs in India, showed that the adoption of blockchain technology was conditioned by exacerbated competition and market dynamics as well as top management support. Also, the authors showed that there is a significant association between blockchain adoption and firm performance and on the other hand, significant cost and complexity of implementation and maintenance associated with implementation are the main barriers in blockchain technology adoption.

Authors Wang et al. (2024a) demonstrate that blockchain technology is associated with lower financial risk for companies through optimized receivables management, improved financial solvency and hence increased performance. Autore et al. (2024), demonstrate that blockchain adoption can contribute in a direct way to increased earnings.

From the same point of view, Wang et al. (2024b), believe that BCT contributes to the revolution of industry 4.0, in which the symbiosis between digital and physical technologies is realized, i.e. the leap to industry 5.0 is ensured, and even though it also brings with it multiple challenges, it can contribute to a transparent, accountable and sustainable business future, information technologies also influence the development of digital data flows and lead to the transition to a digital economy (Cojocaru et al., 2023).

Bibliometric research by Stafie et al. (2021) reveals that emerging technologies will considerably contribute to business automation and digitization and accounting will have to adapt to these new realities.

Considering the above, we support the idea that emerging technologies open up new opportunities for development and contribute to increasing efficiency and reducing operational costs, developing new business models, but they also bring with them multiple challenges, including high initial costs, regulatory gaps, and the need to train human resources equipped with advanced digital skills.

III. RESEARCH METHODOLOGY

As a fundamental research, the present study is based on the six steps presented in the scientific literature review procedure presented by Kitchenham (2004). A schematic representation of the methodology can be seen below.

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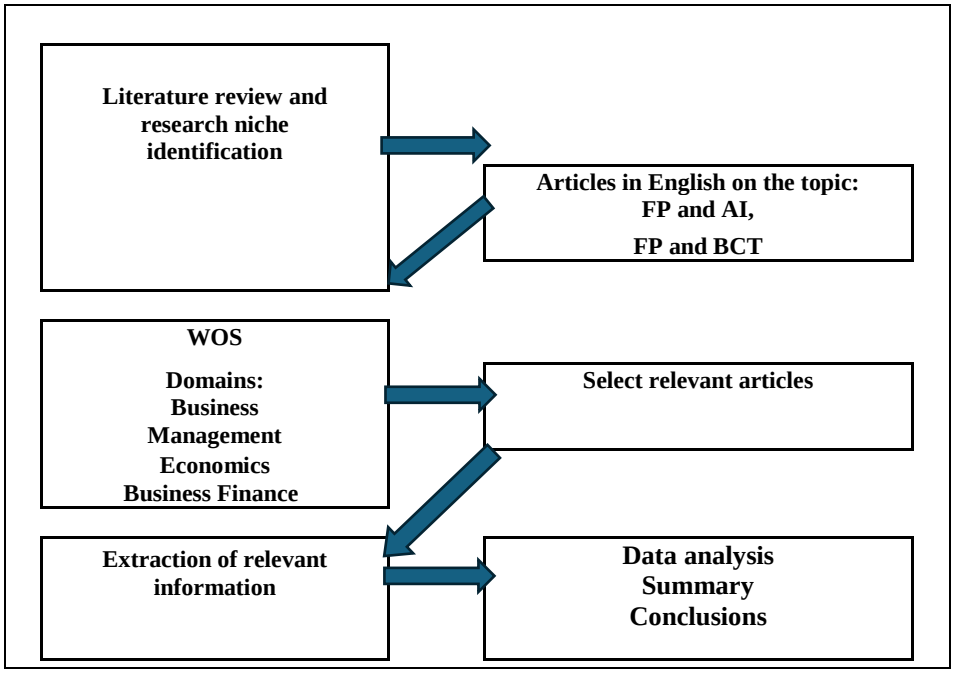

Figure 1. Research methodology
Source: Adapted from the research strategy developed by Kitchenham (2004)

Thus, in the following we will briefly review the steps included in this research and which are graphically presented in the research methodology in Figure 1.

1. Thus, the initial stage aims to identify the research niche to be addressed by appealing to the relevant specialized literature in the field. In this regard, the purpose of the research was established, which derives from identifying the impact and role of AI and BCT implementation on financial performance at the company level, complemented by the perspective of obtaining competitive advantage.

2. The second stage of the research was based on establishing the criteria for including and excluding articles. Articles in English were selected, using relevant keywords and Boolean operators, which were used to narrow the search results.

3. The third stage involved identifying relevant articles. The most relevant articles were selected from the Web of Science (WoS) platform, considered the platform with the most valuable research articles. We achieved this by selecting only articles from the fields of Business, Management, Economics and Business Finance.

4. In the next stage, we analyzed the quality of the selected articles and considered only those compatible with our objectives.

5. From the articles considered compatible with the research purpose, the relevant information for the present study was extracted. Thus, only articles were selected that present the evolution of emerging technologies and their impact on businesses and that focused on tracking and identifying the advantages, risks and barriers they can bring to companies.

6. The last stage was dedicated to an analysis of the extracted data, synthesizing the most relevant for achieving the objectives and formulating conclusions.

IV. RESEARCH RESULTS

As mentioned above, in this section we will present, in a summarized manner, the most relevant results of the research carried out, directly related to achieving the research aims and objectives presented in the introductory section. Thus, we will focus our attention, first of all, on the issues deriving from the conceptual clarification of the term's artificial intelligence and blockchain technology, on the identification of the business domains in which the emerging technologies can compete in creating added value, as well as on the identification of the advantages and disadvantages of the implementation of AI and BCT by business organizations.

1. Defining and clarifying the concepts of artificial intelligence and blockchain technology

From the qualitative research of the literature focused on the impact of IA and BCT on business, we noticed that the two items, although commonly used, leave room for interpretation both conceptually and in terms of their definition, which led us to set as the first objective of the research, the conceptual clarification of the terms IA and BCT.

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Thus, after reviewing the specialized literature, we noticed that for the concepts of IA and BCT there are several definitions. For these reasons, in the table below, we have centralized those we considered the most relevant.

Table 1. Most used definitions in the literature for AI and BCT

Technology	Definitions	Authors
AI	is the ability of a system to correctly interpret external data sets, learn from them and use them to accomplish specific tasks and objectives	Haenlein and Kaplan (2019)
	is a computer-based system, which can be called intelligence and which is used to analyze data	Shahid and Li (2019)
	is a machine created by humans based on their intelligence	Jumani et al. (2021)
BCT	is based on registries that use operation chaining, which facilitates autonomous sharing of common resources	Osakwe et al. (2023)
	is a data warehouse that is distributed and maintained by different actors and operators in a decentralized network	Min (2019)
	is a technology based on blocks of data that are identified through mining operations by computers globally and stored through encryption operations in a decentralized registry	Pundir and Jagannath (2019)
	it uses multiple transactions on a large scale, facilitates the conclusion of contracts between individuals and legal entities on a global scale, and allows data to be stored as encrypted codes	Arabioun and Moghaddasi (2024)

Source: Authors' processing based on the analysis of specialized literature

Thus, from the definitions presented in table no. 1, we deduce that AI offers considerable advantages related especially to the approach of strategies based on the analysis of large volumes of data in a short time, and BCT optimizes operations that represent successions in a chain of operators, offers the possibility of structuring them in a more efficient way and allows transparency and traceability of actions.

Thus, regarding AI, Bharadyia et al. (2023) consider that the implementation of AI technologies contributed to minimizing costs regarding repetitive or redundant processes, high resource consumption and which were prone to frequent human errors, with beneficial effects in terms of efficiency and productivity of work at the company level. Regarding BCT, the authors Arabioun and Moghaddasi (2024) reveal positive implications of its use from the perspective of reducing financial resources allocated to audit activities, contributing to the optimization of supply chains, allowing economic transactions to be carried out safely and reducing risks generated by human errors. From the above it follows that the use of these technologies has beneficial effects on companies and is particularly related to the streamlining of activities, cost optimization, higher turnover, adaptability to market conditions, quantifiable benefits and increased financial performance and business resilience, even in adverse conditions.

2. Identification of areas of activity that can increase their added value by using these technologies

This subsection is dedicated, in accordance with the second objective of the research, to the identification, by means of an analysis of the specialized literature, of the areas in which these technologies can bring added value.

Table 2. Identification of the area's most compatible with the adoption of AI

A Identifying areas/sectors of activity compatible with AI	Author
Labor market – for recruitment operations and assessment of human resource skills	Tambe et al. (2019), Huang et al. (2019)
Marketing – Automatic identification of prices, website content, customer relationship management; Identification of consumption trends and identification of consumer behavior, sales forecast	Kumar et al. (2019), Overgoor et al. (2019)
Business – cost optimization, rationalization of resource consumption, substantiation of investment decisions, tool used in the decision-making process	Bharadyia et al. (2023), Shrestha et al. (2019), Metcalf et al. (2019), Brock and Von Wangenheim (2019)
Social – development of educational programs adapted to the needs of the labor market	Bharadyia et al. (2023)
Government – development of public policies to regulate ethical and responsible use	Bharadyia et al. (2023)
Health – diagnosis, treatment and monitoring of patient health	Tama et al. (2017), Ali et al. (2023)

Source: Authors' processing based on the analysis of specialized literature

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From the information presented in the table, it emerged that AI impacts different areas, such as those related to the labor market, marketing, the medical system, public policies, but last but not least, it can be used in business, with benefits related to obtaining competitive advantage, reducing costs, rational use of resources and easy and documented substantiation of investment decisions.

In the same way, we also proceeded to a qualitative analysis of the areas in which BCT can find its utility, information that we have summarized in table 3.

Table 3. Areas most compatible with BCT implementation

Identifying areas/sectors of activity compatible with BCT	**Author**
Pharmaceutical and medical industry - protocols and procedures for approvals and authorizations	Vadgama and Tasca (2021), Tama et al. (2017)
Finance and banking - implementation of virtual currencies and financial services	Hughes et al. (2019), Tama et al. (2017)
Online commerce - facilitating electronic payments	Hughes et al. (2019)
Agriculture - Food traceability and food safety.	Marin (2021)
Supply chain - monitoring products between supply chain operators	Laroiya et al. (2020), Marin (2021)
Voting-based electoral process - avoiding fraud	Laroiya et al. (2020)

Source: Authors' processing based on the analysis of specialized literature

As a conclusion, following the analysis of the specialized literature, we can state that BCT technology has also experienced a development in tandem with the needs of society.

Thus, if initially BCT was considered a support service for cryptocurrencies, in recent years, BCT has experienced an expansion in other sectors of activity, thus demonstrating its versatility, in the pharmaceutical field, financial services, online commerce, agriculture, supply chain development and not least in the electoral process.

However, it should be noted that any innovative technology has its challenges when implemented and used. Therefore, the implementation of BCT presents both advantages and disadvantages, and it is up to companies to determine the opportunity to use BCT within the transactions they carry out.

3. Advantages and disadvantages of implementing AI and BCT in business

In accordance with the third objective of the research, the subsection is dedicated to identifying the advantages and disadvantages that derive from the implementation of emerging technologies at the level of business organizations.

Since the implementation of AI technologies generates costs, it was first used by large companies that identified the benefits of its use at the level of business development.

For these reasons, the authors Bharadyia et al. (2023) reveal that the benefits associated with the implementation of AI at the level of business organizations reside in improving the efficiency and productivity of work, increasing profitability, facilitating the substantiation and adoption of strategic decisions.

In this regard, in table no. 4, we have resorted to identifying the main advantages of its implementation within businesses, as they are mentioned in the specialized literature, considered by us relevant for this research topic.

Table 4. Advantages of implementing AI at the level of business organizations

Advantages associated with implementing AI at the level of business organizations	**Author**
Optimizing costs, making forecasts based on Big Data analysis	Kolbjørnsrud et al. (2016), Neiger (2019), Afiouni (2019)
Optimizing production processes and achieving operational efficiency	Bharadyia et al. (2023)
Identifying information security breaches and avoiding cyber attacks	Bharadyia et al. (2023), Bytniewski et al. (2020)
Assisting in customer management and identifying new buyer profiles, identifying new markets, optimizing the purchasing and sales strategy	Coombs et al. (2020), Haenlein and Kaplan (2019), Mitić (2019), Jumani et al. (2021)
Optimizing the supply chain	Bharadyia et al. (2023), Marin (2021)
Making forecasts in a turbulent business environment	Haenlein and Kaplan (2019)
Competitive advantage	Kaplan si Haenlein (2019), Lee et al. (2019)

Source: Authors' processing based on the analysis of specialized literature

From the analysis of what is mentioned in the table above, we can conclude and state that the implementation of AI by companies leads to important advantages, related in particular to the increase in the

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possibilities of processing large volumes of data (Big Data), the reduction of the possibilities of human error in the analysis and processing of data and the increase in the quality of managerial decisions made by the company, including through the quality of predictions and forecasts made with the help of AI.

One aspect that is worth pointing out is the fact that the implementation of AI also leads to high costs, which implies an analysis of the associated benefits and costs, especially for small companies. As a rule, they have much smaller financial resources compared to large companies, for which, in our opinion, the implementation of AI is easier, in terms of the associated costs.

Regarding BCT, although initially it was used exclusively in the field of cryptocurrencies, at the moment it can represent a catalyst for the development of an increasingly large number of industries, from banking systems to agriculture and health.

Among the innovative principles that BCT promises are: decentralization, transparency and collaboration, which in the opinion of the author Marin (2021), will allow the creation of a new governance model, compatible with current reality.

Following qualitative research of the specialized literature, we have summarized in the table below, the main advantages of BCT.

Table 5. Advantages of BCTSource: Authors' processing

Advantages of implementing BCT at the company level	Author
Leads to superior profitability, process efficiency and added value creation	Risius and Spohrer (2017)
Encryption operations allow restricted access to information as well as its rapid updating	Arabioun and Moghaddasi (2024)
Reduce audit costs, financial risks, and human errors	Rejeb et al. (2019)
Innovative financial data management	Arabioun and Moghaddasi (2024)
Optimization of supply chains	Marin (2021)
Facilitates the development of new business systems	Mendling et al. (2018)
Adaptabilitate şi descentralizare a informaţiilor, reduce costurile şi facilitează introducerea monedelor digitale	Arabioun and Moghaddasi (2024)

Source: Authors' processing based on the analysis of specialized literature

Synthesizing the advantages presented in the table above, we can conclude that BCT allows for fast transactions, minimizes the risks associated with transaction fraud and allows for increased efficiency and productivity.

Emerging technologies, in addition to their multiple advantages, also bring numerous disadvantages. In this regard, we have resorted to a summarized presentation of them in the following. Thus, in the table below we have centralized the main disadvantages, found in the specialized literature.

Table 6. Disadvantages associated with the implementation of AI at the business level

Disadvantages associated with AI implementation	Author
High implementation and maintenance costs	Bharadyia et al. (2023)
Data vulnerability	Jumani et al. (2021)
Possibility of data manipulation through statistical data	Jumani et al. (2021), Shahid and Li (2019)
Use of data belonging to customers	Jumani et al. (2021)
Existence of prejudices against the use of AI for ethical reasons	Soni (2020)
Need for specific skills and knowledge which leads to the consumption of financial resources	Bharadyia et al. (2023)

Source: Authors' processing based on the analysis of specialized literature

Analyzing the information presented in the table, a first aspect is the one that refers to the high costs of implementing and maintaining AI at the company level, which entitles us to state that the adoption of AI can only be done by large companies, which have significant financial resources.

Our analysis also revealed the existence of other disadvantages related to the vulnerability and insecurity of information, especially in the face of cyber-attacks, as well as the fact that the legislation affecting AI still presents regulatory gaps.

In the same way, we also proceeded to identify the disadvantages associated with BCT for companies, a synthesis of the main disadvantages of BCT, mentioned in the specialized literature, is presented in the table below.

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Table 7. Disadvantages of BCT

Disadvantages associated with BCT implementation by companies	**Author**
High implementation costs	Osakwe et al. (2023), Arabioun and Moghaddasi (2024)
Vulnerabilities generated by data insecurity	Osakwe et al. (2023)
Information security and the existence of hidden risks	Saberi et al. (2019), Arabioun and Moghaddasi (2024)
Lack of specific knowledge of human resources	Osakwe et al. (2023), Hsu (2022)
Existence of a dependency relationship with entities in the chain of collaborators	Osakwe et al. (2023)
The infrastructure used is provided by external collaborators	Osakwe et al. (2023)
Existence of hidden risks	Kemmoe et al. (2020)
Risks associated with the regulation of operations	Arabioun and Moghaddasi (2024)

Source: Authors' processing based on the analysis of specialized literature

From the analysis of the information presented in the table above, we identify that many of these disadvantages are common to those of AI, including: data vulnerability, high implementation costs, insufficient human resource knowledge and the existence of regulatory gaps. Summarizing, from the above, we note that the implementation of emerging technologies brings both advantages and disadvantages for business organizations, which denotes the importance of companies conducting a cost-benefit analysis, which reflects the opportunity or inopportunity of their implementation at the level of their organizations.

V. CONCLUSIONS

From In a business environment characterized by increased globalization and multifaceted crises, the implementation of emerging technologies in business organizations can represent an important opportunity to increase financial performance and achieve competitive advantage.

In this context, the advantages related to increased efficiency, the possibility of processing and analyzing large volumes of data and informing strategic decisions, are associated with significant disadvantages related in particular to high implementation and maintenance costs, data security, and the disadvantages associated with their regulatory gaps.

In the latter respect, we believe that the challenge of the future will be, in our view, to find ways of regulating these technologies so as to reduce or even eliminate the risks and vulnerabilities to which their users are exposed.

However, we believe that AI and BCT confer multiple benefits to business organizations, which will be reflected in increased financial performance, therefore monitoring activity and using key performance indicators to assess results can help inform decisions about the timing, risks and costs associated with implementing these technologies, as we are confident that the future of business will include AI and BCT.

We believe that our work can be useful to entity management, which can decide on the appropriateness of implementing emerging technologies by analyzing the advantages and disadvantages associated with each category, as well as to international and national regulators who can make public policy based on these findings.

This research has considered the impact of AI and BCT technologies mainly in the business environment, but can be extended to other domains. Furthermore, specific quantitative and qualitative studies can be carried out on specific business sectors to test and assess the impact of the implementation of disruptive technologies on the performance of individual companies or the performance of the whole business sector, which we propose as future research directions.

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