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Integration of Blockchain and AI: Exploring Application in the Digital Business

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Artificial intelligence (AI) and blockchain are two disruptive technologies that have emerged from the Fourth Industrial Revolution (IR4.0) and have brought about significant transformations in the industry. The convergence of artificial intelligence (AI) with blockchain technology presents significant opportunities for the development of novel business models facilitated by digitalization. The current body of research pertaining to the integration of artificial intelligence (AI) with blockchain technology is available, although there is a lack of comprehensive understanding of the practicality and effectiveness of this integration within the business context. In order to bridge this existing knowledge gap, the primary objective of this research endeavor is to comprehensively analyze and delineate the various applications and advantages of integrated artificial intelligence (AI) and blockchain platforms within diverse sectors of the business industry.

Keywords: Artificial intelligence; blockchain; IoT; business innovation; integration.

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1. INTRODUCTION

According to Weill and Woerner [1], in order for traditional businesses to remain competitive in the age of the digital economy, they must fully digitalize their company activities. In this regard, the adoption of advanced systems and applications such as the Internet of Things (IoT), Blockchain Technology (BCT), Cloud Computing, Data Analytics, and Artificial Intelligence (AI), in conjunction with the development and maturity of relevant digital skills and capabilities, are fundamental for the digital transformation of businesses [2]. Each digital application stands on its own, bringing with it a unique set of technical merits and a distinct set of effects upon the data and information it handles. Within the realm of data analysis, artificial intelligence (AI) is defined as "a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" [3]. According to Research And Markets [4] , the value of the artificial intelligence (AI) market in the food and beverages industry is projected to reach US$29.94 billion by the year 2026, representing a CAGR of 45.8% [5]. According to Kamble et al.'s 2019 research [6], BCT is a distributed ledger that can enable secure data sharing in the hardware industry. This results in improved visibility and transparency in supply chains.

1.1 Artificial Intelligence

Artificial intelligence refers to the emulation of human cognitive processes through the utilization of technology, predominantly computer systems. AI has various specific applications, such as expert systems, natural language processing, speech recognition, and machine vision [7,8]. With the rapid advancement of artificial intelligence (AI), manufacturers have been actively striving to showcase the integration of AI in their goods and services. Frequently, the term "AI" is utilized to denote a certain constituent of the technological framework, namely machine learning [9]. The utilization of artificial intelligence necessitates a fundamental infrastructure comprising of dedicated hardware and software components to facilitate the development and implementation of machine learning algorithms.

There is no singular programming language that can be considered synonymous with artificial intelligence (AI). However, some programming languages, including Python, R, Java, C++, and Julia, possess capabilities that are highly favored by developers working in the field of AI [10-12].

AI systems typically operate by consuming substantial quantities of annotated training data, scrutinizing the data to identify correlations and patterns, then leveraging these patterns to generate predictions concerning forthcoming conditions [13,14]. By utilizing a dataset of text samples, a chatbot can acquire the ability to generate realistic conversations with individuals. Similarly, an image recognition tool can develop the capacity to recognize and provide descriptions of items within photos through the examination of a vast number of examples. Emerging generative artificial intelligence (AI) methodologies exhibit notable advancements in the production of authentic textual content, visual representations, musical compositions, and several other forms of media [15-18].

1.2 Difference Between AI, Machine and Deep Learning

The terms AI, machine learning, and deep learning are frequently seen in the realm of enterprise IT and are occasionally employed interchangeably, particularly in the marketing materials of various organizations. However, it is important to note that there exist discernible differences [19,20]. The term "Artificial Intelligence" (AI), which was introduced in the 1950s, pertains to the emulation of human intelligence through the utilization of machines. The scope of capabilities encompassed by this field is subject to constant evolution due to the emergence of novel technologies. The technologies encompassed within the field of artificial intelligence (AI) include machine learning and deep learning [21,22]. The utilization of machine learning facilitates the enhancement of software programs' predictive capabilities, without the need for explicit programming. Machine learning algorithms leverage previous data as input in order to make predictions about fresh output values [23,24]. The effectiveness of this approach significantly increased with the emergence of extensive datasets for training purposes. Deep learning, a subfield within the broader domain of machine learning, is founded upon our comprehension of the structural organization of the human brain. The utilization of artificial neural networks inside deep learning serves as the foundational framework for current advancements in the field of artificial intelligence, encompassing notable applications like as autonomous vehicles and ChatGPT [25-27].

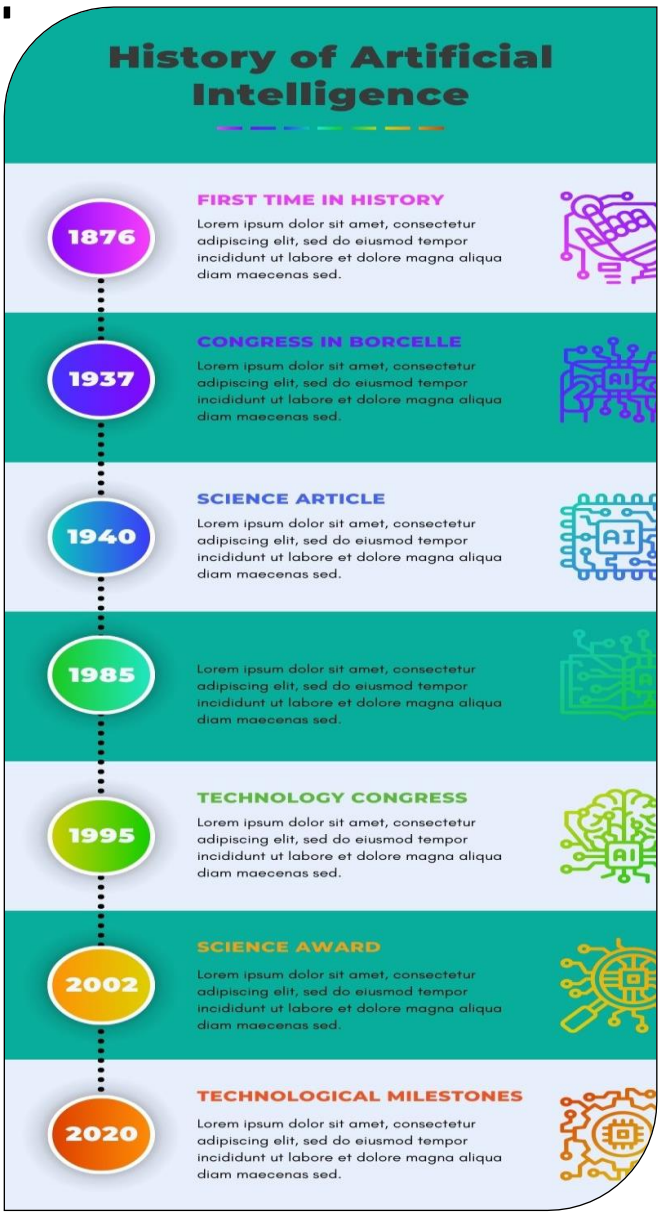

Fig. 1. History of AI

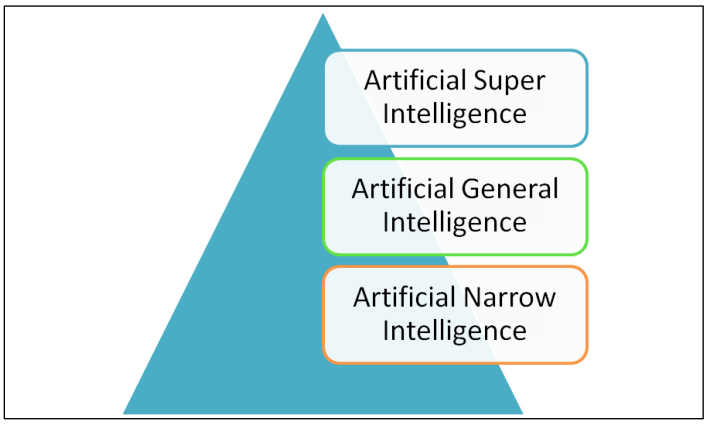

Fig. 2. Few types of AI

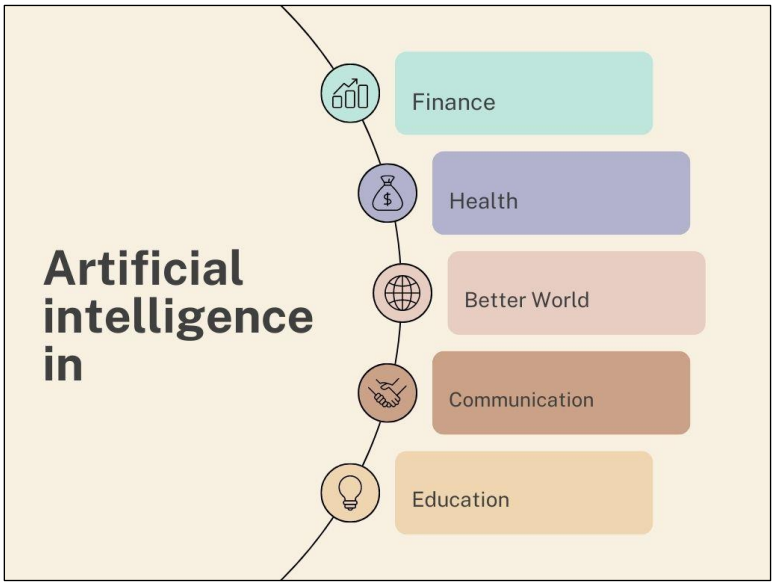

Fig. 3. AI in different sectors

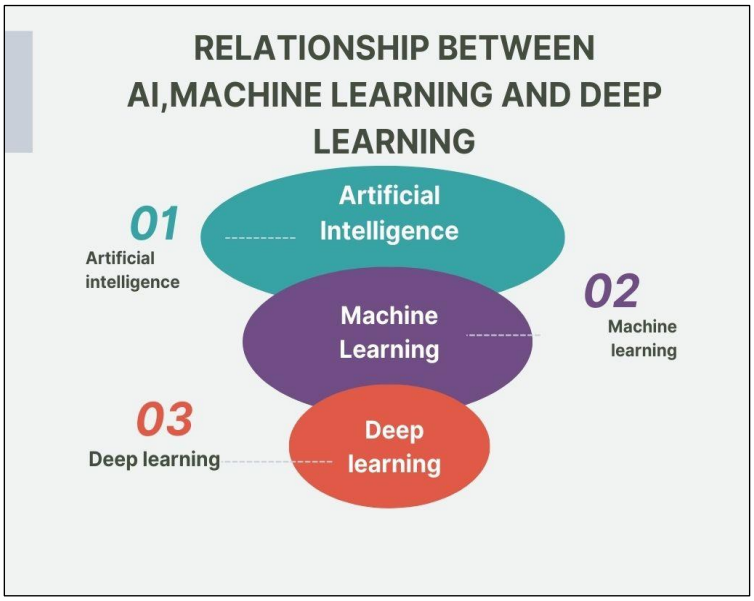

Fig. 4. Relationship Between AI, ML and DL

1.3 AI As Business Innovation Driver

Artificial Intelligence (AI) is a technology that has the potential to bring about significant changes and disruptions in several industries. It empowers enterprises to drive innovation and undertake transformative initiatives in their business operations[28]. The primary objective of business processes is to effectively transform inputs into outputs of significant value. It is anticipated that the integration of new technology would bring about substantial changes and enhancements to these processes [29]. Artificial intelligence (AI) is not exempt from this phenomenon, as it has the potential to facilitate the reconfiguration of business processes with the aim of fundamentally transforming the execution of existing activities [30]. According to Wamba-Taguimdje et al. (2020) [30], AI serves as a catalyst for the re-engineering and redesign of the current organizational structure.

The utilization of human resources is impacted, hence enabling the implementation of alterations in business procedures and the organizational framework. According to Makarius et al. [31], the integration of artificial intelligence (AI) introduces a novel array of competencies and capacities that facilitate collaboration between managers, employees, and AI systems. Consequently, there may be a necessity to restructure existing employment, while simultaneously witnessing the emergence of novel career opportunities. The utilization of artificial intelligence enables firms to redistribute resources, potentially leading to a restructuring of the organizational chart in the future [32]. In essence, the impact of artificial intelligence on business operations can manifest in either a direct or indirect manner.

1.4 Blockchain Technology

Blockchain is a cryptographic and decentralized system for recording and storing information, which is designed to provide a high level of security and immutability, hence minimizing the risk of unauthorized modifications, breaches, or tampering. A blockchain refers to a decentralized ledger system that replicates and disseminates transactions throughout a network of computers engaged in the blockchain [33-35]. Blockchain technology is a decentralized system that securely keeps transactional data, referred to as blocks, among many interconnected databases, commonly referred to as the "chain." These databases are distributed throughout a network of peer-to-peer nodes. Commonly, this form of storage is known as a "digital ledger [36,37]." Each transaction recorded in the ledger is duly authorized through the utilization of the owner's digital signature. This digital signature serves the purpose of verifying the authenticity of the transaction and ensuring its protection against any unauthorized alterations. Therefore, the data stored in the digital ledger is characterized by a high level of security [38,39].

In more accessible terms, the digital ledger might be likened to a shared Google spreadsheet that is distributed across multiple computers inside a network. This ledger is utilized to hold transactional records that correspond to real-world purchases. One intriguing aspect is that the data is accessible to everybody, yet remains impervious to tampering [40-43].

1.5 Blockchain and Business

Blockchain technology is playing a significant role in the global corporate landscape, facilitating transformative changes across various industries. The establishment of a higher level of trust fosters enhanced efficiency through the elimination of redundant tasks [44]. The implementation of blockchain technology is significantly transforming various sectors such as the supply chain, food distribution, financial services, government operations, retail industry, and other domains [45,46].

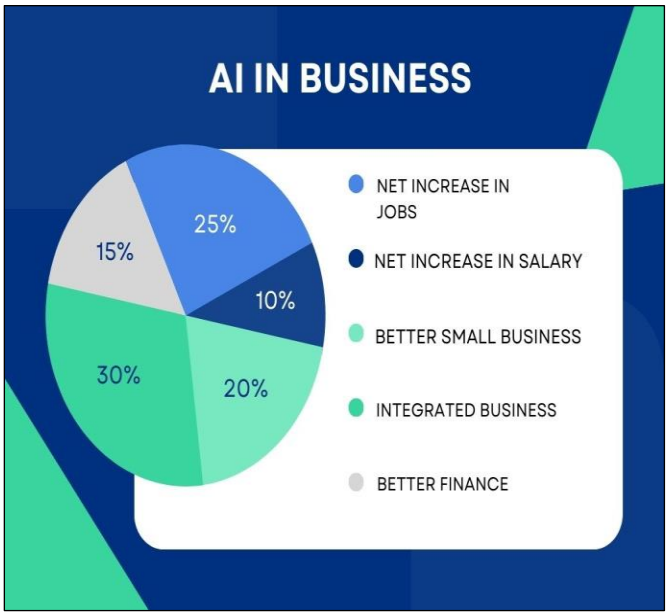

Fig. 5. Impact of AI in business

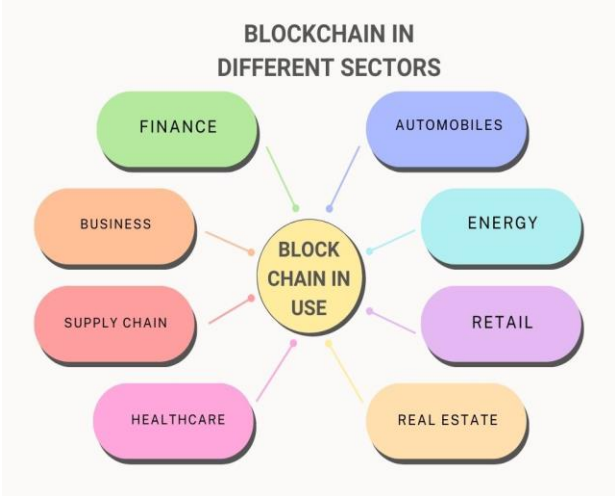

Fig. 6. Blockchain In Different Sectors

In recent years, the business sector has been consistently experiencing a continuous influx of new trends and advances. In the contemporary era of digitalization, enterprises are actively seeking novel technological advancements that are crucial for their continued existence [47]. The implementation of digital transformation in businesses enables them to make strategic decisions, optimize business processes, and adopt new business models through the utilization of disruptive technology available in the marketplace [48].

The blockchain technology is recognized as a pivotal driver of company transformation. The utilization of blockchain technology has experienced significant growth within the marketplace, particularly in the context of cryptocurrency or bitcoin. However, there is a prevalent sense of confusion among individuals regarding the associated terminology. There remains a prevalent perception among individuals that blockchain and bitcoin are synonymous, leading to the frequent interchangeability of both concepts [49,50].

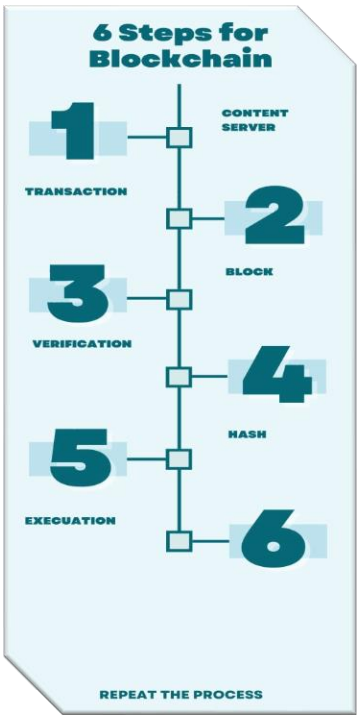

Fig. 7. Working Steps of blockchain

Fig. 8. Applications of blockchain in business

One consequence of this phenomenon is that individuals tend to associate the concept of blockchain for business primarily with the scope and implications of cryptocurrencies [51]. The utilization of blockchain technology in the business sector is predicated on the implementation of a distributed ledger system that operates within a permissioned framework, hence fostering enhanced trust and collaboration among trustworthy entities. The system operates on a peer-to-peer topology, which enhances the transparency, data robustness, and security of transactions, while simultaneously minimizing the supplementary expenses associated with conducting company activities [52]. Consequently, there is no justification for failing to capitalize on the substantial business prospects that this technology can present, solely due to one's lack of awareness or engagement. In this essay, we will explore the various ways in which blockchain technology might significantly impact corporate processes [53,54]. Blockchain technology offers numerous benefits to organizations and presents novel opportunities for reimagining established business models. It achieves this by cutting costs, minimizing the time required by intermediaries, and fostering a heightened level of trust within an ecosystem [55].

2. DIGITAL BUSINESS

The concept of digital business transformation can be seen as the process through which organizations leverage digital technologies to fundamentally alter their business models, operations, and strategies in order to adapt to the evolving digital landscape and capitalize on emerging [56,57].

Digital business transformation (DBT) refers to the utilization of technology to significantly enhance the operational efficiency of organizations, as well as to redefine and reconstruct value propositions through the implementation of Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems. Additionally, DBT involves harnessing the potential of digital frontiers, such as smart devices, mobility, and analytics, to optimize intra-, extra-, and inter-business processes [58-60]. In a similar manner, the authors von Leipzig et al. [61] provided a definition of DBT that centers on the

transformation of business models, whereas Li [62] emphasized novel approaches to conducting business. Basole [63] and Singh and Hess [64] conducted investigations into the rising technology variables that are propelling the process of digital transformation. Sebastian and colleagues [65] have highlighted social, mobile, analytics, cloud, and Internet of things (SMACIT) as the primary driving forces behind the development of DBT. Nevertheless, the aforementioned research predominantly concentrated on the technological aspects, neglecting to establish a connection between those aspects and their impact on business value, firm performance, or strategic alignment [66,67]. In order to bridge this existing knowledge gap, Nadeem et al. [68] undertook a comprehensive analysis and discovered a strong correlation between digital transformation and digital business strategy. This connection is characterized by factors such as cross-functional integration and structural changes within organizations, as well as the development of talent and operational capabilities [69,70]. The primary focus of DBT is not limited to the integration of advanced technology, but also encompasses the formulation of a well-defined vision, the restructuring of the business model, the cultivation of adaptable capabilities, and the comprehension of consumer needs. The concept of digital transformation is examined by Kumar et al. [71], who emphasize the integration of digital thinking throughout all aspects of an organization's operations. Davenport and Spanyi [72] draw attention to the significance of customer-centric digital products and services in the context of digital transformation. Additionally, Verhoef et al. [73] contribute to the discourse by discussing the implementation of a novel digital business model aimed at generating enhanced value. In essence, the term "Digital Business Transformation" (DBT) refers to the process of reimagining a business model by leveraging digital technology in order to generate, convey, and provide value [74].

2.1 The Utilization of Blockchain Technology As a Catalyst for the Digitalization of Company Operations

Utilizing sophisticated cryptographic techniques, the blockchain functions as a decentralized database that is accessible to the public[75]. Bitcoin is widely regarded as one of the foremost implementations of blockchain technology, operating on a transparent and publicly accessible ledger [76]. This open-source platform facilitates code modification, enabling all parties to have visibility into the real processes taking place. In essence, the system can be classified as a genuine peer-to-peer (P2P) framework that operates without the need for intermediaries to verify or finalize transactions. According to Iansiti and Lakhan [77], the system has the capability to capture many forms of structured information, such as financial transactions, debt obligations, and the relationship between light sources and electricity sources. The inherent security features of blockchain technology render it very resistant to hacking attempts, thereby establishing it as a reliable platform. However, scholarly research, such as the study conducted by Orcutt in 2019, has highlighted several security vulnerabilities present in specific blockchain platforms [78].

The implementation of blockchain technology has the potential to effectively decrease expenses, such as the expenses associated with confirming transaction details, as well as

Fig. 9. Applications of AI in Digital Business Priority

eliminate the expenses incurred through middlemen [79]. A blockchain transaction operates by encapsulating a transaction into a block within the system, subsequently disseminating it to all participants within the network. Once the participants within the network grant their approval for the transaction, it is appended to the blockchain, thereby creating an immutable and easily verifiable account of the transaction, such as the transfer of funds between two entities [80-82].

The architectural framework of blockchain comprises a series of interconnected blocks arranged in a sequential manner. These blocks serve as repositories for storing transactions and information, similar to those found in a conventional public ledger. Blockchain is composed of decentralized ledger technology (DLT), which is upheld by peer-to-peer networks, hence avoiding control or ownership by any singular authority. According to Dunphy and Petitcolas [83], the digital identities remain under the user's control even in the event of access loss, as the system is designed to be tamper-resistant. In addition to the concept of decentralization, blockchain technology is acknowledged for its three distinct attributes: persistency, anonymity, and auditability. The concept of persistency on the blockchain refers to the ability to detect and prevent falsification. This is achieved by the process of verifying transactions, recording them in blocks, and distributing them over the whole network. Anonymity inside the blockchain ecosystem facilitates user privacy by enabling the generation of many addresses, hence mitigating the risk of revealing one's true identity. According to Zheng et al. [84], the presence of auditability in the blockchain technology enables users to effectively monitor and trace transactions by visiting various nodes within the distributed network. This feature contributes to enhancing the traceability and transparency of the data. In general, the functioning of blockchain technology is guided by five fundamental principles: the immutability of records, computational logic, transparency combined with pseudonymity, distributed database, and peer-to-peer networks [85,86].

3. THE CONVERGENCE OF BLOCKCHAIN AND ARTIFICIAL INTELLIGENCE

In the contemporary era of swiftly progressing technical advancements, two prominent and transformative phenomena have garnered significant attention: blockchain technology and artificial intelligence (AI). These transformative technologies provide significant potential, presenting novel opportunities for decentralization, enhanced knowledge, and the potential to disrupt established economic paradigms [87,88].

3.1 The Decentralized Model, As Well As AI

Both blockchain and AI are predicated on the concept of decentralized control. AI has the ability to change sectors by automating processes and eliminating the need for many employment, but blockchain technology has shown that it can remove intermediaries and create trustless systems. Blockchain technology has also proved its power to create trustless systems. The coming together of these two disciplines paves the way for new pathways of innovation and makes it possible for us to rethink the ways in which we engage with our governments, communities, and the wider globe [89].

3.2 The Strength of Proofs Based on Zero-Knowledge

Before we can truly appreciate the possibilities of ZKML, we need to have a solid foundational understanding of Zero-Knowledge Proofs (ZKPs). ZKPs are a type of cryptographic protocol that allow one party to demonstrate that they are in possession of specific information without disclosing the information that is being proven to be in their possession. Think of it as a place where you may demonstrate that you are familiar with the location of something without outright pointing him out [90,91].

3.3 Applications of ZKP in the Real World

ZKPs have an extremely wide range of potential uses. It is possible for them to assist smooth verification operations in the banking and insurance industries without exposing sensitive information. Even in the realms of education and professional training, ZKPs can guarantee the authenticity of credentials without putting individuals' private information at risk [92,93].

3.4 Embracing Privacy While Maintaining Collaboration Using ZKML

ZKML is an advancement in artificial intelligence that brings privacy and collaboration to a whole

new level. It is based on the ZKPs concept. ZKML is an extension of machine learning that allows collaborative training of AI models on pooled datasets without the need to share the actual data itself. This is made possible by merging Zero-Knowledge Proofs with machine learning. This innovative technique protects users' privacy while also developing collective intelligence and learning through collaboration [94,95].

4. INTEGRATION OF AI AND BLOCKCHAIN FOR BUSINESS INNOVATION

According to Morkunas, Paschen, and Boon [96], business innovation occurs whenever an organization introduces new processes, services, or products that result in beneficial changes to the business. Business innovation is the process by which a company introduces new products, services, or other components with the intention of stimulating positive change in their company. It is possible for it to incorporate working on already established procedures or practices, but it can also begin in the absence of any preparation. The term "artificial intelligence" (AI) refers to machines that can be trained to carry out tasks that have generally been perfected by people. A blockchain is a decentralized network of computers that collects and saves information to demonstrate a sequential set of events on a record system that is both simple and unchangeable. Blockchains are used in cryptocurrencies like bitcoin and ethereum.According to Hu et al. [97], innovation might entail either making improvements to existing procedures or processes or starting from scratch. According to Nguyen, Liu, Chu, and Weng [98], technologies such as Blockchain and artificial intelligence (AI) have the potential to change entire industries, as well as the procedures that are already in place, as well as to establish creative business models. For instance, Blockchain technology can enhance business units' levels of confidence, responsibility, protection, and privacy [99-101]. This is made possible by the technology's ability to provide a shared and decentralized distributed directory. According to Pham, Nguyen, Nguyen, Pham, and Nguyen [102], a blockchain is capable of holding a wide variety of attributes and is comparable to a register or a widely used distributed ledger. A data set is referred to be distributed ledger when it is openly exchanged and synchronized across several locations, institutions, or other topographies by a large number of distinct people. Blockchain, the technology that underpins bitcoin, uses basic appropriated records as its core component. Blockchain is also the technology that underpins basic appropriated records. Blockchain refers to a type of distributed ledger technology (DLT) in which transactions are recorded using a permanent cryptographic stamp called a hash. The transactions are then grouped together into blocks. In addition, each subsequent block includes a hash of the previous one, which ties the blocks together and is one of the reasons why transferred records are sometimes referred to as blockchains. According to Andoni et al. [103], the primary things that can be associated with these information are money and identities [104,105]. The Internet of Things is making strides in the German and European business sectors to optimize such sectors and make corporate operations easier. Last but not least, artificial intelligence improves operations by recognizing and optimizing the results of business processes [106,107]. According to Jan et al.'s research from 2020, the process of innovation is designed to make a profit for the company. According to Kumar et al.'s research from 2020, this benefit results from the creation of new sales opportunities, the drive of more income on existing platforms, the saving of time or resources, or improvements in efficiency or performance [108].

According to Arjun and Suprabha [109] and J. Gao, Wang, and Shen [110], blockchain innovation is a transformational innovation that destroys competence. This is due to the fact that the technical innovation will render the old one obsolete. According to Fu et al.'s [111] research, its market-wide application would reorganize company structures for every industry, making it a disruptively innovative architectural development [112,113]. Several aspects of artificial intelligence can be implemented with the assistance of blockchain technology, including decentralized markets and collaborative platforms, as well as data and algorithms pertaining to processing capacity. It has the potential to encourage the development of a larger variety of other technologies as well as the application of AI [114]. According to Khelifi et al.'s research [115], the term "artificial intelligence" refers to "machinery that has historically been designed to execute intellectual tasks."

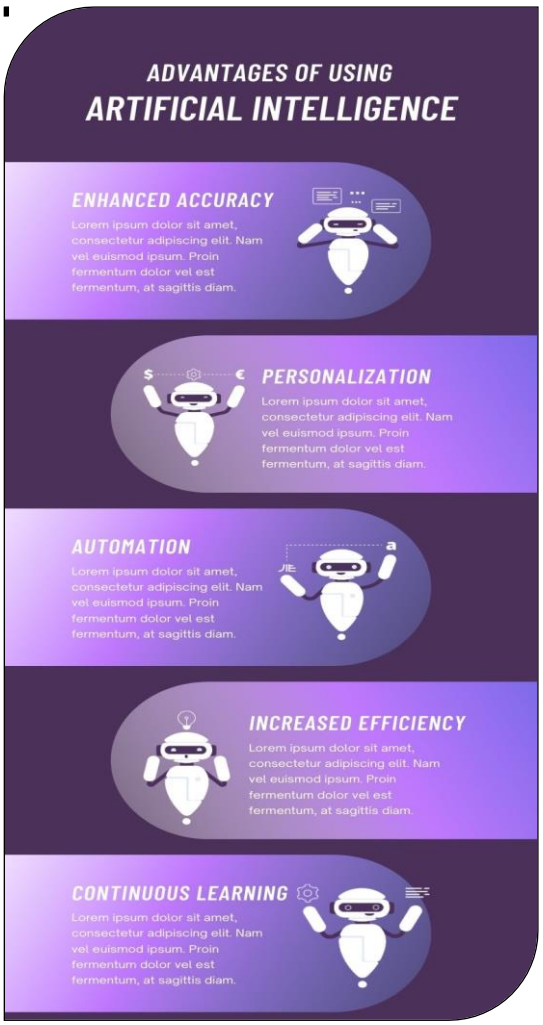

Fig. 10. Advantages of using AI

The challenge that has been taken on is to offer a high degree of promotion and marketing in the direction of branding in the context of the notion of digitalization leading up to artificial intelligence. Artificial intelligence is regularly utilized in marketing initiatives where speed is of the utmost importance. AI systems know how to better engage with customers based on information and client data, then deliver them personalised communications at the optimum timing without any need for advertising staff involvement, assuring maximum productivity. This can be done without the involvement of advertising employees. With the use of artificial intelligence, businesses are able to exert greater control over their internet brand and more safely maintain an existing presence online. This is achieved by empowering brand and service executives with the ability to conduct in-depth research and analysis on websites, social networking sites, and other platforms [116-119].

The technology known as blockchain has the potential to bring about major changes not only to the way businesses are operated but also to the social and economic institutions that serve as their foundation. It is going to be looked into how the block chain can be utilized to validate the qualities of a transaction in specific circumstances while keeping the cost to a minimum. A foolproof authentication system is now possible thanks to blockchain technology. Your customers and your employees all have electronic identification cards, which makes it easy to verify their identities. When this information is stored on a public blockchain, the chances of identity theft, financial fraud, theft, and other forms of cybercrime are significantly minimized. It has been suggested to boost business operations and provide a safe contact with various consumers by using an innovation in business that is based on both artificial

intelligence and the technology of Blockchain. This innovation is referred to as BI-AIBT. In the production of qualitative analytical evidence, there are a relatively small number of key respondents from two distinct business sectors. The company has evaluated BI-AIBT and has investigated the contrasts and similarities between the effects of digitalization on value generation, business proposition, and business capture. In addition, BT has the potential to improve the way in which organizational talents and skills interact with one another[120,121].

4.1 Potential of Integration of Blockchain and AI

The term "artificial intelligence" is commonly employed to refer to computer systems that are capable of doing tasks that typically require human intelligence. The feasibility of this achievement is facilitated by technological advancements such as artificial neural networks, machine learning, and deep learning [122]. The blockchain technology represents a novel approach to securely and decentralize the storage of digital data through encryption. This technology enables the establishment of a database with robust security measures, facilitating the structured storage of information that may afterwards be made accessible to the public [123,124].

The utilization of blockchain technology provides a more comprehensive understanding of the operations of artificial intelligence in comparison to human explanations. Artificial neural networks can be developed by humans, who can then employ machine-learning algorithms to enhance their capabilities through experiential learning. However, the ability to predict the actions and elucidate the reasoning of artificial intelligence remains elusive even to its own developers. The AI systems responsible for operating intricate decision trees can be perceived as opaque entities to human cognition. The comprehension of artificial intelligence's cognitive processes remains elusive to us [125-127].

This phenomenon can be attributed to the computer's capacity to analyze vast quantities of data that surpass our cognitive comprehension. The machine possesses a greater volume of knowledge in its memory compared to the cognitive capacity of the most intellectually gifted individuals. Consequently, it is tasked with the responsibility of discerning the relative significance of the many pieces of information it stores. It is feasible to devise an algorithm that can instruct the computer in performing this task; nevertheless, the trajectory of algorithmic development remains uncertain [128-130]. If the AI system's judgments are consistently documented on the blockchain, it would result in the creation of a comprehensive database. This would enable us to review the decisions made by the AI and provide explanations for their underlying logic. Furthermore, the utilization of blockchain technology will effectively safeguard the integrity of the data, as the information recorded within the blockchain is inherently resistant to tampering or falsification [131].

4.2 Artificial Intelligence has the Potential to Enhance the Operational Effectiveness of Blockchain Technology

The validation of blockchain transactions is conducted by miners who allocate their computational resources towards generating and testing various character combinations in an effort to successfully identify the correct one, thereby earning a reward. However, the monetary reward is exclusively bestowed upon the individual who successfully discovers the combination first, resulting in the expended efforts of the remaining miners being rendered futile. In forthcoming times, machine learning algorithms will enable AI systems to intelligently infer the code, so avoiding the inefficiencies associated with exhaustive trial-and-error approaches that consume substantial time and computational resources. This has the potential to enhance the efficiency and cost-effectiveness of the validation process [132,133].

One other obstacle in the integration of blockchain technology into our daily routines pertains to the magnitude of data involved. All data is safely stored within the blockchain and distributed across the network of computers. Over time, there is a progressive increase in the quantity of blocks, resulting in a corresponding increase in the overall weight of the chain. Machine-learning algorithms can also be utilized to optimize the data-storing methods of blockchain [134].

5. BENEFITS OF INTEGRATION

Decentralized artificial intelligence (AI) endeavors will rely on a parallel computing framework comprising a multitude of autonomous nodes distributed globally. The system's distributed nature enables the optimal utilization of its computational resources, facilitating

efficient analysis of large datasets in a timely manner. The dataset will be partitioned into smaller parts for analysis by individual nodes, and subsequently consolidated into a unified database. The global database will not be subject to the control of a single dominating entity, ensuring that all members of the network have access to the information contained within it. The utilization of this vast amount of data for training powerful AI algorithms will also be feasible [135-137]. Simultaneously, the decisions made by artificial intelligence would be recorded in the database, so enhancing their transparency and comprehensibility to human users [138,139].

6. CHALLENGES OF INTEGRATION

While there is a great deal of untapped potential at the junction of AI and blockchain technology, there are also a number of obstacles that need to be overcome before it can be successfully implemented.

Demanding Conditions For The Computation: The conventional artificial intelligence solution demands a significant amount of computer power, and when combined with the distributed ledger infrastructure, it can amplify the computational strain, which can rise to issues about scalability and efficiency. In order to conquer these obstacles, you will require creative solutions as well as a solid foundation [140].

Protecting One's Privacy And One's Data: However, this also means that once data is recorded on the blockchain, it becomes permanent and potentially available to all participants. This is despite the fact that blockchain technology guarantees immutability and transparency. This raises worries about the privacy of the data, particularly in sensitive areas such as the healthcare industry and the financial sector. It is essential to strike a healthy equilibrium between data privacy and openness in order to cultivate a culture of trust that will facilitate the widespread deployment of artificial intelligence and blockchain technologies [141,142].

Compatibility Between Systems: The quick pace of change in both of these disciplines has led to a lack of uniformity and standardization in terms of the frameworks and data formats that are used. As a result, the establishment of common standards and protocols is essential for facilitating the interoperability of blockchain and AI, which will provide faster synergy and scalability [143,144].

7. CONCLUSIONS

The progressive development of businesses and the advancements in Artificial Intelligence (AI) have resulted in the augmentation of various business procedures through the facilitation of novel forms of collaboration. The advancement of technology facilitates the provision of brand services and enables novel forms of business engagement with both customers and employees. The advent of AI digitization has prompted organizations to prioritize their present strategy while also actively and promptly pursuing new market opportunities. The field of business innovation is increasingly focused on digital technology research, with a particular emphasis on the potential of Blockchain technology to ensure data privacy. In the realm of innovations for businesses, digital technology analysis is becoming an increasingly interesting topic, and data protection can be maintained through the utilization of Blockchain technology. Therefore, utilizing technology such as blockchain and artificial intelligence, this study enhances market procedures and maintains secure contact between various clients. A small number of important respondents from two distinct market sectors are available for the purpose of gathering qualitative observational evidence. BI-AIBT places an emphasis on the use of social media to link companies and consumers, and it conducts both online and offline experiences with the goal of influencing customer behavior. The organization conducted an analysis of BI-AIBT and investigated the differences and similarities between the two in terms of value generation, business capture strategy, and influence of digitalization. In addition, BT has the potential to improve the connection between an organization's capacity and the talents of its people. The conclusions of the experiment indicate that digital transformation should be regarded significant and should increase initiatives for the innovation of businesses.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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