A descriptive study on Applications of Blockchain in Industries

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ABSTRACT

This article offers a comprehensive study of the literature on blockchainbased applications in several industries. The purpose of this study is to examine the current state of blockchain technology and its applications while highlighting how some aspects of this disruptive technology can completely alter current business practices, literature and media have widely covered the potential of blockchain. One trend that has emerged recently is using blockchain as the foundation for internet security and immutability at the company level. Industry 4.0 and the Industrial Internet of Things are two examples of emerging application fields (IIoT). Therefore, we thoroughly examine current blockchain applications in Industry 4.0 and IIoT scenarios in this study. We specifically discuss the most recent research trends in each of the relevant industrial sectors, as well as successful commercial blockchain deployments in these areas. We also talk about the difficulties that each sector will face when implementing blockchain. We hope that our research opens new doors.

INTRODUCTION

With its distinctive combination of properties, including as decentralization, immutability, and transparency, the blockchain technology (BT) provides enormous potential to support a variety of industries (Casino et al., 2018). We anticipate that this technology will have positive applications in academia and science. In this essay, we wish to demonstrate why the BT is particularly suited to open science. The news about the emergence of cryptocurrencies has so far attracted the most interest to the technology (Morini, 2016; Notheisen et al., 2017; Carson et al., 2018; Volpicelli, 2018). Examples of cryptocurrencies with outstanding market capitalizations include Bitcoin, Litecoin, Dash, and Monero1. According to a study by Schutte et al. (2018) from the German Fraunhofer Institute for Scientific and Technical Trend Analysis (INT), BT is now most frequently employed in financial applications.

The exchange of value units without the use of intermediaries is the typical use case for BT in that sector (Nakamoto, 2008; Ben-Sasson et al., 2014). The cryptocurrencies and other applications that, for instance, allow people to promote and sell their digital assets like art or sensor data on a marketplace or allow landowners to transfer their property without a notary are examples of this (Kombe et al., 2017). The significance of Blockchain is demonstrated by the present and rising number of cryptocurrencies, which exceeds 1900. (CoinMarketCap, 2017). Due to the diversity of bitcoin applications, such a growth rate may eventually result in interoperability issues (Tschorsch and Scheuermann, 2016, Haferkorn and Quintana Diaz, 2015). Additionally, the environment is quickly changing as blockchain technology is applied to areas other than cryptocurrencies, with Smart Contracts (SCs) playing a crucial role. We can translate contractual provisions into embeddable code using SCs, which Szabo defined in 1994 as "a computerized transaction protocol that performs the conditions of a contract" (Szabo, 1994).

Blockchain can be defined as a decentralized, distributed directory driving smart contracts and providing the opportunity to traceability aid, record management, automation for the supply chain, payment applications

and other business transactions. Blockchain offers an immutable record that is duplicated in almost real-time between a network of business partners. The procedure uses data that would have previously been kept in the business' Enterprise Resource Planning. It now makes it accessible through a distributed network of records held by many businesses. Several benefits of blockchain enable organizations to better understand their customers, particularly on the demand side.

OBJECTIVE

❖ To provide a transparent, replicable, and scientific examination of blockchain-based applications

❖ To identify the industries using blockchain based applications.

❖ To understand the main purpose of usage of blockchain among the industries.

❖ To find out how industries are implementing blockchain in their environment

LITERATURE REVIEW

Application of Blockchain Technology in Environmental Health Meiwen Guo, Zhenheng Huang (2 July 2022): Research has recently focused on blockchain technology and its applications. Its three main technologies distributed ledger, smart contract, and consensus mechanism offer features that increase trust for a variety of applications, including tamperproof records, complete traceability, and data decentralisation. The application of blockchain technology to environmental health is examined in this article. Between 2014 and 2021, it examines metrics including the quantity of publications published, author collaboration networks, research institution networks, and keyword co-occurrence. It explains and examines the history and significance of these indicators. In-depth research on blockchain has been done by several academics in a variety of fields. However, there aren't many cross-disciplinary research on environmental health or the widespread use of technology. In order to lay a theoretical framework for the use and sustainability of blockchain technology in this field, the current study examines the development of research on the application of blockchain technology in environmental health, as well as prospective development patterns and research trends. The number of papers published, author collaboration networks, research institution networks, keyword co-occurrence, co-citation analysis, keyword clustering, keyword burst, time zone, and the distribution of countries and regions were some of the nine factors used to analyze the literature. There were descriptions of the traits the data expressed. In this study, the characteristics of collaborations, the effects of the contributions, and other aspects of cross-over literature studies were explored. The current study also suggested that in order to minimize constraints brought on by a shortage of disciplines, it should be encouraged when studying the application of blockchain technology across many fields.

Electricity powered by blockchain. Tama roth, Manuel utz (2022) Effective blockchain applications can be found in many different industries, proving that blockchain technology is no longer just a fad. However, very few blockchain-based energy system projects in Europe have been a success. We examined recent blockchain energy literature, examined industry reports, and spoke with professionals who have implemented blockchain initiatives in Europe's energy systems to determine the causes of this delayed development. Eight typical use cases, their anticipated advantages, and the difficulties they encountered are revealed by our investigation. We discover that theanticipated advantages are sometimes little more than vague hopes, greatly overshadowed by organizational, technological, and legal difficulties. For use cases involving peer-to-peer trading and microgrids, the issues found are considerable and many. Few projects have thus yet offered solid proof of lucrative use, indicating that there is still a difficult path ahead. Furthermore, it appears that many use cases need more than just blockchain technology to be successful. Particularly, privacy and scalability demand frequently necessitate solutions in which blockchains only serve as a minor component. This understanding could be crucial for blockchain technology's implementation in energy systemsin the future, both in Europe and elsewhere.

A systematic blockchain-based applications: Fran Casino, Thomas K. Dasaklis (March 2019): The purpose of this study is to examine the current state of blockchain technology and its applications while highlighting how some aspects of this disruptive technology can completely alter current business practices.

In order to achieve this, the theoretical foundations of numerous research papers published in prestigious scientific journals over the past ten years, as well as a number of reports from grey literature, are included in this review. This helps to streamline our analysis and fully capture the constantly expanding blockchain domain. This article presents thorough classification of blockchain-enabled applications across diverse sectors like supply chain, business, healthcare, IoT, privacy, and data management and we establish key themes, trends, and emerging areas for research based on a structured, systematic review and thematic content analysis of the discovered literature. It also explains the shortcomings identified in the relevant studies, specifically the limitations of the blockchain technology and how these limitations spread throughout other fields and industries. On the basis of these findings, they suggest a number of research gaps and potential future exploratory avenues that are expected to be highly beneficial to both academics and practitioners. Blockchain technology develops, additional companies and domains beyond those we surveyed are anticipated to adopt its applications. Blockchains are not a panacea or a replacement for databases, despite what many people try to claim. Traditional databases should be used in many situations instead. Moreover, each application domain's most essential personal traits have been recognized. This makes it easier to select the ideal blockchain and the associated processes to mold the blockchain to the precise requirements of the application.

Blockchain Applications for Industry 4.0 and Industrial IoT: Tejasvi Alladi, Vinay Chamola (2019)
Blockchain's potential has received a lot of attention in literature and the media, particularly in the banking and payment sectors. At the company level, one relatively new trend is the use of blockchain as the foundation for immutability and internet security. Industrial Internet of Things and Industry 4.0 are examples of emerging application domains. As a result, this thoroughly examine current blockchain applications in Industry 4.0 contexts in this article. Specifically outline the latest research developments in each of the important industrial sectors, along with examples of blockchain technology being successfully applied in business. This article also talk about the difficulties that each sector will face when implementing blockchain. This also cover more recent application areas and ongoing problems with Industry 4.0's use of blockchain technology.

Blockchain Applications in Smart Grid–Review and Frameworks Ahmed S. Musleh (2016) Modern power systems must contend with several issues, including the rising demand for electrical energy, the massive expansion of distributed renewable energy sources, the adoption of a large number of Internet of Things (IoT) devices, the emergence of cyber-physical security threats, and the primary objective of maintaining the system's stability and reliability. Finding cutting-edge technology and sustainable solutions to ensure the safe and dependable operation of the power system is under great strain because of these problems. Due to its singularity and decentralized nature, the blockchain is one of the more recent technologies that has drawn significant interest in a variety of applications, including smart grid. With the emergence of cryptocurrencies like Bitcoin and Ether in recent years, this technology has gained momentum. The use of blockchain in smart grids may provide numerous creative and cost effective solutions to some of the problems that both the present and the future of smart grids will face. It is demonstrated how the blockchain can 13 be used as the smart grid's cyber-physical layer. This paper reviews various prospects, advantages, approaches, and technical challenges of utilizing blockchain technology in the smart grid and presents frameworks for key blockchain-based smart grid application.

Blockchain technology framework: Current and future perspectives for the tourism industry Waleed Rashideh (October 2020) Blockchain technology on the tourism sector is its capacity to raise the level of disintermediation. By shifting power from suppliers to consumers, the emergence of online travel firms has altered the market structure of the tourist industry. This study employs a qualitative approach and a semi-structured interview to learn how domain experts envision the role of intermediaries in the future should the tourism sector adopt blockchain technology. The goal is to create a blockchain-based framework for the industry. The findings demonstrate that, when considering blockchain's impact on businesses, this technology is thought to be suitable for removing intermediaries from the supply chain of the tourism industry as well as for prohibiting the entry of new intermediaries, which will eliminate intermediaries from the tourism market.

Blockchain and supply chain management integration Maciel M, Renato Telles, Silvia H.Bonilla (12 February 2019) This study identifies, organizes, and analyses the literature on blockchains in the context of supply chain management (SCM) (blockchain-SCM integration), and it provides a research agenda for the future. This study intends to shed light on the primary present blockchain applications in SCM, the primary

disruptions and issues caused by the use of blockchains in SCM, and the potential applications of blockchains in SCM in the future.

Blockchain Application Technology in Sustainable Energy Systems Jiani Wu (2018) The integration of sustainable energies has made the Energy Internet a major topic. However, as a result, there are many sustainable energy players and forms, the system is exceedingly complicated, and certain important problems, such the control and administration of distributed sustainable energy forms, are challenging to resolve. A consensus process, peer-to-peer transmission, distributed data storage, encryption methods, and smart contracts are all components of blockchain technology, on the other hand. Many of the issues preventing the growth of the Energy Internet can be resolved by applying the technical advantages of the blockchain to it. Reviewing the evolution of both blockchain technology and the Energy Internet is the goal of this essay, which will also offer some references for potential blockchain uses in the Energy Internet.

Blockchain for AI Khaled Salah (2020). Recently, blockchain and artificial intelligence (AI) have emerged as two of the most popular and disruptive technologies. Blockchain technology has the capacity to automate bitcoin payments and to give users decentralized, trusted access to a shared ledger of data, transactions, and records. Blockchain has the capacity to regulate Indepth research on blockchain applications for AI is presented in this article. They examine the research, tabulate, and provide an overview of the newest blockchain platforms, apps, and protocols that are targeted exclusively towards the AI space. Identify and talk about the open research problems that using blockchaintechnology for AI.

Blockchain for healthcare: Vision and future opportunities Ahmed Farouk (March 2020) A crucial component of industrial healthcare is now medical data. With the expansion of medical data comes the requirement for secure processing of that data. The industrial healthcare sector will be significantly impacted by the adoption of blockchain and the Internet of Things due to the industry's architecture consisting of connected devices and software applications that communicate with other IT systems (IoT). These technologies will enhance information security, transparency, regulatory regulation, and processing efficiency while also opening up new commercial prospects. While exchanging electronic health records might help with diagnosis accuracy, it is crucial to protect privacy and security. Sensitive medical data is exchanged in the IoT device network; patient monitoring must be completely protected from privacy threats and attacks. By utilizing blockchain technology in the healthcare sector, information security management might be improved. Healthcare data could be evaluated and shared while still maintaining its confidentiality and privacy.

Blockchain in power systems: Maria Lusia Di Silvestre (March 2020) The blockchain is now synonymous with technical innovation, having been named one of Gartner's top 10 strategy technologies for 2018. It is also being used by more and more industries. The initial excitement for this technology is moving past the zenith of unrealistic expectations, though, and toward more reliable uses in financial transactions, cryptocurrencies, and digital commodity exchanges. In essence, misplaced attempts, excessive blockchain usage, and the decline in the price of Bitcoin have been the key causes of this decline in expectations. However, it appears that the potential of blockchain technology in the field of electricity systems is relatively untapped. In addition, the connection to the physical asset makes the blockchain application more complicated, but also more dependable and linked to quantifiable advantages.

Blockchain technology in the energy sectors Merlinda Andoni (February 2019) Blockchains, also known as distributed ledgers, are a new technology that has attracted a lot of attention from the academic world, national governments, financial organizations, and energy supply companies. Blockchains are seen as having the potential to deliver important advantages and innovation by many sources from these backgrounds. Blockchains, especially when integrated with smart contracts, promise transparent, unchangeable, and secure platforms that can enable innovative business solutions. This paper offers a thorough understanding of the underlying concepts, including system architectures and distributed consensus methods, that underlie blockchain technology. Next, we concentrate on blockchain applications for the energy sector and present the current state of the art by carefully examining the literature and real-world commercial applications

APPLICATION OF BLOCH CHAIN IN DIFFERENT

INDUSTRIES HEALTHCARE

The healthcare sector stands to benefit greatly from the implementation of blockchain technology, with potentially far-reaching implications for both patient data storage and the secure transmission of medical records. The use of a distributed ledger system improves security by enabling patient data to be encrypted and stored across multiple computers, while decentralization allows users multiple points of entry securely, ensuring information is available wherever it's needed. By decentralizing data in this way, providers can cut out the middleman when exchanging patient information and dramatically reduce processing and administrative costs associated with current systems. In addition, blockchain provides an efficient way for patients to control access rights to their own health records as well as possibly facilitate insurance fraud prevention through enforced compliance with regulations. If embraced fully, integrated blockchain technologies may revolutionize healthcare services around the world

Health records

Electronic medical records are the backbone of every modern healthcare system, but your medical records grow longer and become more complex with each visit to doctor. Since each hospital and doctor's office has a unique system for classifying them. But this is not always easy for healthcare sector obtain them. Already there are some companies out there, like Patientory, Medical chain that mainly focus to solve this problem. The goal is to give patients authority over their entire medical history and to provide a one-stop access to it for patients and physicians as well. Blockchain would not only simplify and make access more efficient, but inherently bring data security to the field as well

INSURANCE SECTOR

Insurance sector plays an main role in every human life. Blockchain technology has the potential to improve the workforce and claims processing in the insurance industry, whether it be for health insurance or other risky insurance. How would Block-chain application help the insurance sector? Implementing blockchain in the insurance sector can advance the growth curve to the next generation.

Digital Documentation - Blockchain insurance platforms can digital records instead of using paper copies, which can save a ton of paper. Records can be digitalized to prevent damage from disasters and data loss.

Automated claim approvals - Processing large claims during disasters are a major problem for the insurance industry. In these situations, a blockchain-based insurance platform with community governance can process claims quickly.

Schedule Payments - Using smart contract procedures, insurance premiums, claim approvals, and other industry payment processes can be scheduled. Because the blockchain insurance channel permits p2p transactions, the procedure would go quickly

BANKING

Blockchain technology, a groundbreaking innovation in the banking and financial services industry, has the potential to revolutionize the way transactions are processed and verified. By utilizing a distributed, cryptographically secure ledger system, blockchain provides unparalleled security and transparency of financial activities, reducing overall risk while simultaneously increasing efficiency and accuracy. Furthermore, banks using blockchain can create digital tokens or coins to increase customer loyalty while also providing a competitive edge by establishing trust with customers.

Payment Transfer - Cryptocurrencies like Ether and Bitcoin are created on open blockchains that anybody may use to send and receive money instantly and without paying any transaction fees. The payment transfer through blockchain in banking and finance is also quicker and less expensive because there is no need to authenticate the transaction because the payment occurs on a decentralized network.

Settlement and Clearance system - A typical bank transfer can take up to three days to complete. Not only are the customers affected, but the banks also have logistical challenges. Today, a straightforward bank transfer

can skip a convoluted series of middlemen from the bank to the custodial service and directly go to the intended recipient. This is where blockchain technology in banking comes into play.

EDUCATION SECTOR

The use of blockchain technology in the education sector is quickly becoming an attractive solution for its many advantages. By recording student transcripts, grades, academic progress, awards, other qualifications, and certifications on a distributed ledger that is immutable and secure, educational institutions can streamline their processes while offering students greater transparency when it comes to the accuracy of their academic records. Moreover, by using smart contracts and digital tokens to manage tuition fees and international payments between universities efficiently, universities can reduce costs associated with thirdparty financial intermediaries. Furthermore, the ability to store credentials on a secure ledger also ensures that those credentials are more difficult to counterfeit or manipulate due to the added security provided by blockchain technology.

Record Keeping - The administrative division of institutions can maintain student records without needless problems thanks to blockchain technology. There is no requirement for intermediaries to check the academic records, degrees, certificates, etc. because all credentials and credentials are maintained on a distributed ledger.

Courses and Certificate - One of the most frequently sought student records in the K–12 system and in higher education is certification of course content. When deciding whether a pupil should advance academically, this information is essential. Because they list students' grades across a range of topics, transcripts can act as a mark of achievement. To maintain correctness, records in the traditional educational system must be manually stamped and signed several times. Blockchain applications, however, do away with the necessity for such labor- and time-intensive operations. With only a few clicks, one may quickly and easily receive comprehensive, verifiable record of successfully completed courses and academic achievements on a blockchain.

CONCLUSION

The blockchain technology is revolutionary. It'll change how particular information is stored and how deals for goods and services are made, making life easier and safer. Every sale is recorded permanently and immutably thanks to blockchain technology. It's insolvable to commit fraud, hack, steal data, or lose information using this unbreakable digital record. Every assiduity in the world will be impacted by technology, including finance, education, insurance, healthcare, and others. Blockchain technology offers functional, nonsupervisory, increased visibility, and traceability verification edge. This technology also functions as a strong database that may be coupled with big data with ease. Blockchain technology can reduce costs and boost the competitiveness of multitudinous services.

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