

UNLOCKING THE POTENTIAL OF BLOCKCHAIN AND IOT: A COMPREHENSIVE ANALYSIS OF THEIR SIGNIFICANCE AND APPLICATIONS IN DIVERSE INDUSTRIES

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Abstract

The integration of Blockchain and the Internet of Things (IoT) is one of the most exciting and promising technological advancements of the 21st century. This research paper presents a comprehensive analysis of the potential of these two technologies and their significance in diverse industries. The paper covers a thorough literature review of the latest research, exploring the most promising use cases and discussing the benefits, limitations, and challenges of adopting Blockchain and IoT. The analysis covers various industries, including healthcare, agriculture, finance, logistics, and energy. Through this study, we aim to provide insights into the potential of these technologies and inspire further research and innovation in unlocking their full potential.

Keywords: blockchain, Internet of Things (IoT), technology, applications, industries, comprehensive analysis, potential, security, transparency, efficiency, supply chain, healthcare, education, hospitality, agriculture.

I. INTRODUCTION

As per Technological growth there are various sectors are used the new enhanced technologies to make system easy, efficient and secured. The Blockchain and Internet both these technologies combined with any application to be convert this application in smart and validate.

A. Blockchain

A Blockchain is “an open, distributed / decentralized ledger that can record transactions between two parties efficiently and in a verifiable and permanent way”.

It is seen as different types of currency was used in various countries such as Rupee, Dollar, Euro, JPY, GBP, Pound etc. Currently it seen that countries moving towards digitized money system with third party such as Gpay, Googlepay, PatTM, Phonepay etc. The Blockchain is cryptocurrency used as digital payment mode without third party interface and secured system.

A Blockchain is a list of records which is known as Blocks which is interconnected with each other using chain. These Block is contains Data, Hash key and Hash key of previous Block. When one person transfer information to other person, it is stored in the data which is stored inside a block with secured hash key. Blockchain require Proof of Work concept when it is need to add new one.

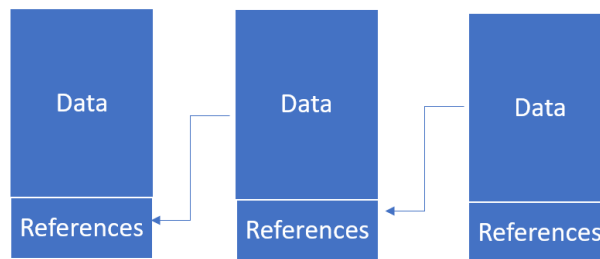


Fig. 1 – Interconnecting Blocks in Blockchain

The blockchain database is a distributed database type with peer-to-peer network facility which is not centralized. So this technology is very time-reducing, decentralized, network-structured, secured, integrated, and without using a third party.

Blockchain is a system of recording information in a way that makes it difficult or impossible to change, hack, or cheat the system. *Blockchain* is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network.

B. Internet of Things - IOT

“Sensors and actuators embedded in a system with physical objects are through networks facility, which connects the Internet”.

In other words, the IOT is a togetherness of “Any work place by Any one in Any Time with the Any service mode with Any Network facility done by Any object.”

IOT or Internet of Things is a connection of virtual things through the internet network, for communication with each other between devices as M2M (Machine to Machine) and M2P (Machine to People). Automation and Control of IOT objects are connected through the internet as well as a wireless environment. The devices can do automatic work and control in the workings without any human interaction, leading to faster and timely output. The IOT devices have the feature of capturing data by using sensors connected to devices, so it is very useful to capture accurate information and data.

The internet contracted the world by giving effective communication among gadgets situated at remote terminals. Along these lines, trade of valuable data over the globe (with the assistance of human intercession) was made conceivable. Inquires about needing to dispense with human intercession or downplay it, bringing forth an inventive idea of associating each and every gadget independent of size. This denoted the start of the cutting-edge innovation, the “internet of things (IOT)”. What’s more, Cisco considered this the “Internet of Everything (IOE)”.

Few years ago, all patterns of work depend on manual working strategies, but the early days’ human being is used to remote working patterns using technology. So that the IOT technology made up for interacting devices like computers, laptops, smart phones with IOT devices with the help of internet connection for managing and controlling all functionality remotely. There are many several advantages of IOT devices as it is beneficial to interact with M2M. The IOT technology saves a lot of working time so that it increases efficiency of work. It also helps to reduce manual working phenomenon so it minimizes effort of work. IOT is one of the technologies which work on automating daily life tasks by device monitoring. It affects the quality of life style.

II. APPLICATIONS OF BLOCKCHAIN AND IOT TECHNOLOGY IN VARIOUS SECTORS – LITERATURE REVIEWS

1) Use Of Blockchain And IOT Technologies In Fintech

Blockchain can be used for secure and transparent financial transactions, reducing fraud, and streamlining processes. The Key feature of IOT in Supply chains have been getting more brilliant for certain years as of now. Answers for following products while they are out and about, or getting providers to trade stock data have been available for a considerable length of time. So while it is flawlessly rational that the theme will get another push with the Internet of Things, it appears that so far its prevalence stays constrained.

- This literature review article discusses the challenges and opportunities of integrating blockchain and IoT technologies in the insurance industry. The authors discuss how these technologies can improve fraud detection, risk management, and customer experience in the insurance industry. They also highlight the challenges of integrating these technologies, including interoperability, security, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for the insurance industry, but also requires careful consideration of the challenges [1].
- This literature review article provides an overview of the applications, challenges, and opportunities of blockchain and IoT technologies. The author discusses the potential for these technologies to transform various industries, including FinTech. The article provides an overview of the key characteristics of blockchain and IoT, and discusses the challenges of integrating these technologies, including scalability, interoperability, and regulatory compliance. The author concludes that the integration of blockchain and IoT can provide significant benefits, but requires careful consideration of the challenges [2].
- This empirical study examines the use of blockchain and IoT in supply chain management. The authors focus on the benefits and challenges of integrating these technologies in supply chain management. They discuss how blockchain and IoT can improve supply chain transparency, reduce costs, and enhance customer experience. The authors also identify the challenges of integrating these technologies, including security, privacy, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for supply chain management, but also requires careful consideration of the challenges [3].
- This systematic literature review provides an overview of the integration of blockchain and IoT technologies in various industries, including FinTech. The authors identify several use cases for blockchain and IoT in FinTech, such as asset management, payments, and identity management. They also highlight the challenges of integrating these technologies, including security, privacy, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for FinTech, but also requires careful consideration of the challenges [4].
- This literature review article discusses the potential for IoT and blockchain technologies to transform the financial services industry. The author discusses several use cases for these technologies, such as asset management, payments, and identity management. The article also provides an overview of the key characteristics of blockchain and IoT, and discusses the challenges of integrating these technologies, including regulatory compliance and interoperability. The author concludes that the integration of blockchain and IoT can provide significant benefits for the financial services industry, but also requires careful consideration of the challenges [5].

2) Use and Literature Review of Blockchain and IOT technologies in Government sector

Blockchain can be used for secure and transparent voting, identity verification, and reducing corruption. IOT is used as in Smart City is an urban city that is the foundation of lands, rails, aircrafts terminals, water control, street lights in roads. The smart city includes Smart Apartments, Smart Traffic Control, Smart Environment and Pollution Control, Smart Power Grids, Smart Health Care, Smart Transportations, Smart Highway Systems, Weather System, the system of Logistic, Water Purification and Distributions, Smart Banking, Smart Education System, Smart Tube Railway Ticketing System, Smart Plate form Ticketing System, Smart manufacturing and Industries etc all these models works with IOT technology.

- This systematic review article provides an overview of the use of blockchain and IoT technologies in government. The authors identify several use cases for these technologies, such as supply chain management, identity management, and voting systems. They also discuss the challenges of integrating these technologies, including interoperability, privacy, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for government, but also requires careful consideration of the challenges [6].
- This literature review article discusses the current status and future prospects of using blockchain and IoT technologies in the public sector. The authors identify several use cases for these technologies, such as digital identity management, smart cities, and public health. They also discuss the challenges of integrating these technologies, including security, privacy, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for the public sector, but also requires careful consideration of the challenges [7].
- This literature review article discusses the challenges and opportunities of integrating blockchain and IoT technologies in government services. The authors identify several use cases for these technologies, such as supply chain management, identity management, and smart cities. They also discuss the challenges of integrating these technologies, including interoperability, security, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for government services, but also requires careful consideration of the challenges [8].
- This systematic review article provides an overview of the integration of blockchain and IoT technologies in e-government. The authors identify several use cases for these technologies, such as identity management, voting systems, and public health. They also discuss the challenges of integrating these technologies, including security, privacy, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for e-government, but also requires careful consideration of the challenges [9].
- This comprehensive literature review article provides an overview of the use of blockchain and IoT technologies in government. The authors identify several use cases for these technologies, such as supply chain management, digital identity, and smart cities. They also discuss the challenges of integrating these technologies, including interoperability, security, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for government, but also requires careful consideration of the challenges [10].
- As per paper IOT is used in data exchange describes in current utilities of IOT are widespread in multiple sectors of buildings as like smart lighting, smart parking, smart security system, smart charging station, smart Kiosk etc. paper discussed stages of architecture design contains sensors, internet gateway, edge IT, the data center and cloud and types of architecture design is application, network, Perception, business, transporting, & processing layers. In Cloud- and Fog-Based architectures have certain layers as security, storage, preprocessing & monitoring layers. IOT systems have social architectures based on socialization of human beings.

Paper represents the benefits of smart buildings and the need for energy Efficiency in Smart buildings with IOT Systems for this required energy Modeling feature. Paper discussed Open Challenges and Futures, Lack of Interoperability for Currently Used Protocols of Conserved Energy [11].

3) Use of Blockchain and IOT technologies in the energy sector

Blockchain can be used for managing and tracking energy distribution, promoting renewable energy, and reducing waste. And in IOT Smart Energy consumption Management. The Smart Environment monitoring system includes different sensors and data storage capacity. It maintains the energy of overall. The interconnectivity environment sensors with different objects through the internet which are able to detect change in the environment variables in the surrounding of city. The smart energy system maintains the surroundings of the environment

- This literature review examines the use of blockchain and IoT in the energy sector. The authors begin by discussing the challenges faced by the sector, such as inefficiencies, high costs, and carbon emissions. They then explain how blockchain and IoT can be used to address these challenges, by enabling decentralized, secure, and transparent energy transactions, as well as real-time monitoring and control of energy systems. The paper provides an overview of the different applications of blockchain and IoT in the energy sector, including smart grid, energy trading, and renewable energy. The authors also discuss the challenges and limitations of these technologies, such as scalability, interoperability, and regulatory issues. Finally, they conclude by identifying future research directions in this area, such as developing new consensus algorithms, integrating artificial intelligence, and exploring the social and environmental impacts of these technologies [12].
- This systematic literature review examines the applications of blockchain and IoT in the energy sector. The authors begin by providing an overview of the energy sector, its challenges, and the potential benefits of blockchain and IoT. They then present a detailed analysis of the existing literature on the use of these technologies in the energy sector, focusing on the areas of smart grid, energy trading, and renewable energy. The paper identifies several benefits of using blockchain and IoT in the energy sector, such as increased efficiency, transparency, and security. However, the authors also highlight the challenges and limitations of these technologies, such as interoperability, standardization, and regulatory issues. The paper concludes by proposing future research directions, such as developing new business models, exploring the social and environmental impacts of these technologies, and integrating them with other emerging technologies [13].
- This literature review examines the emerging trends and challenges in the use of blockchain and IoT in the energy sector. The authors begin by explaining the benefits of these technologies, such as enhanced energy efficiency, reduced costs, and increased renewable energy integration. They then analyze the current state-of-the-art in the use of blockchain and IoT in the energy sector, focusing on areas such as smart grid, energy trading, and energy storage. The paper also identifies the challenges and limitations of these technologies, such as data privacy, security, and interoperability. The authors conclude by proposing future research directions, such as developing new consensus algorithms, improving data interoperability, and addressing regulatory and policy issues [14].
- This literature review provides an overview of the applications of blockchain and IoT in the energy sector. The authors begin by explaining the benefits of these technologies, such as decentralized and transparent energy transactions, improved energy management, and reduced carbon emissions. They then analyze the different applications of blockchain and IoT in the energy sector, such as smart grid, energy trading, and renewable energy. The paper also identifies the challenges and limitations of these technologies, such as scalability, interoperability, and regulatory issues. The authors conclude by proposing future research directions, such as exploring the potential of these technologies for promoting energy access and energy justice [15].
- This paper reviews recent advances in the use of blockchain and IoT for smart energy management, including applications such as energy forecasting, demand response, and grid management. The authors discuss the benefits and challenges of these technologies in the context of smart energy management and highlight the need for further research in areas such as data privacy, interoperability, and standardization. They also discuss the potential future directions of research in this area, such as the integration of artificial intelligence and machine learning into blockchain and IoT-based energy systems [16].

4) Use of Blockchain and IOT technologies in the Manufacturing sector

Blockchain can be used for tracking the supply chain, preventing fraud, and ensuring quality control. In IOT the thought behind utilizing IOT apparatuses in the assembling business is to connect sensors to their gadgets and gather information from clients. This information can be utilized to manage clients for prescient upkeep of the benefits.

The business cannot just break down how their items are being utilized however they additionally decide the utilization designs. Assembling businesses are embracing IOT instruments to build their proficiency which encourages them in their everyday activities and encourages them to upgrade their creation quality and offers very good quality security too.

- This comprehensive survey article provides an overview of the use of blockchain and IoT technologies in manufacturing. The authors identify several use cases for these technologies, such as supply chain management, asset tracking, and quality control. They also discuss the challenges of integrating these technologies, including security, privacy, and scalability. The authors conclude that the integration of blockchain and IoT can provide significant benefits for manufacturing, but also requires careful consideration of the challenges [17].
- This comprehensive review article discusses the integration of blockchain and IoT technologies in the manufacturing industry. The authors identify several use cases for these technologies, such as inventory management, logistics, and product tracking. They also discuss the challenges of integrating these technologies, including interoperability, security, and scalability. The authors conclude that the integration of blockchain and IoT can provide significant benefits for manufacturing, but also requires careful consideration of the challenges [18].
- This systematic literature review article provides an overview of the use of blockchain and IoT technologies in manufacturing. The authors identify several use cases for these technologies, such as product traceability, quality control, and supply chain management. They also discuss the challenges of integrating these technologies, including security, privacy, and scalability. The authors conclude that the integration of blockchain and IoT can provide significant benefits for manufacturing, but also requires careful consideration of the challenges [19].
- This literature review article discusses the challenges and opportunities of integrating blockchain and IoT technologies in manufacturing. The authors identify several use cases for these technologies, such as predictive maintenance, asset tracking, and supply chain management. They also discuss the challenges of integrating these technologies, including security, privacy, and scalability. The authors conclude that the integration of blockchain and IoT can provide significant benefits for manufacturing, but also requires careful consideration of the challenges [20].
- This literature review article provides an analysis of use cases and applications for blockchain and IoT technologies in manufacturing and supply chain management. The authors identify several use cases for these technologies, such as product traceability, quality control, and logistics. They also discuss the challenges of integrating these technologies, including interoperability, security, and scalability. The authors conclude that the integration of blockchain and IoT can provide significant benefits for manufacturing and supply chain management, but also requires careful consideration of the challenges [21].

5) Use of Blockchain and IOT technologies in the Healthcare sector

Blockchain can be used for secure and transparent patient data management, reducing medical errors, and streamlining insurance claims. In IOT the Clinical businesses should be further developed and thus they are as of now utilizing IOT based devices. With the assistance of IOT devices, the specialists can screen the patient remotely and give sedates based on the following data. For example, there is a patient at home, he is in consistent life backing and all his medical problems are as a rule totally recorded in a cloud framework.

In a crisis circumstance, specialists could be set up for the activity as they as of now have a total record. Likewise, the emergency clinic can dispatch the rescue vehicle to the patient's area. Specialists don't require investing a lot of energy to comprehend ailment of the patient since they are now mindful of the necessary activities which can spare a great deal of time and endeavors.

- This systematic literature review article provides an overview of the use of blockchain and IoT technologies in healthcare. The authors identify several use cases for these technologies, such as

patient data management, clinical trials, and drug supply chain management. They also discuss the challenges of integrating these technologies, including security, privacy, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for healthcare, but also requires careful consideration of the challenges [22].

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- This systematic literature review article provides an overview of the use of blockchain and IoT technologies in healthcare. The authors identify several use cases for these technologies, such as medical records management, clinical trials, and drug supply chain management. They also discuss the challenges of integrating these technologies, including security, privacy, and regulatory compliance. The authors conclude that the integration of blockchain and IoT can provide significant benefits for healthcare, but also requires careful consideration of the challenges [26].

6) Use of Blockchain and IOT technologies in the Education sector

Blockchain can be used for secure and transparent academic record-keeping, verifying credentials, and reducing fraud. The use of IOT in Education become the Smart education means a smart campus, in smart classrooms uses fully smart objects of IOT in the classroom. The main feature of IOT applications are digital learning. The smart classroom of IOT uses smart objects having examined the need of Internet of things in part of education grounds Campus the opposite advancements are going hit advertise very soon, has likewise been portray as a pertinent case of use of the IOT worldview to keen urban areas and how new advances and IOT applications can be upgrade education.

IOT Smart Campus with effective E-Learning of multiple smart things containing the different components like LAB Room, share notes, Augmented (AR) enabled smart classroom, featured classroom, 3D virtual objects for capture virtual inputs, Smart display board, Intelligent IOT objects, IOT Robotics etc. These instructive types of applications can be considered as distinct advantages as they give countless instructive games. These games give various highlights that offer fascinating prospects with regards to educating and learning facility.

- This paper discusses the potential of blockchain technology in creating a lifelong learning passport for students, which will help them keep track of their educational achievements and share them with potential employers. The paper also highlights the benefits of blockchain technology in ensuring data security, privacy, and authenticity in the educational sector [27].
- This paper provides an overview of blockchain technology and its potential applications in the education sector. It discusses how blockchain can be used to secure educational data, create digital credentials, and facilitate micropayments for educational services. The paper also examines the

potential impact of blockchain on the education sector, such as reducing administrative costs, improving student outcomes, and increasing access to education [28].

- This paper explores the potential of the Internet of Things (IoT) in improving the quality of education. It discusses how IoT can be used to create personalized learning environments, facilitate real-time feedback, and enhance student engagement. The paper also examines the potential challenges of implementing IoT in education, such as data privacy and security concerns [29].

- This paper examines the feasibility and sustainability of using blockchain technology for academic credentialing. It discusses the potential benefits of using blockchain in academic credentialing, such as reducing fraud, improving data accuracy, and increasing efficiency. The paper also examines the challenges of implementing blockchain-based academic credentialing, such as ensuring interoperability and addressing legal and regulatory issues [30].

- This paper provides a systematic review of the literature on the use of blockchain and smart contracts in the education sector. It examines the potential applications of blockchain and smart contracts in various aspects of education, such as credentialing, assessment, and student records. The paper also identifies the challenges and limitations of implementing blockchain and smart contracts in education, such as the need for standardization and interoperability [31].

- Objective of the paper is to develop smart campus using IOT, cloud computing and virtual technology. Smart campuses have digital campuses having communication of multiple objects together by network. In the paper discussed as the smart campus is made up of an energy efficient and heat controlling system.

It is developed for digital institutes. The internet of things promotes existing facilities. The virtualization of the Data Centre used for the data collection process [32].

- IOT is connection with each other by multiple smart things through the network of Internet connection. Smart college can be one of the emerging concepts in IOT in the current situation.

So the developed system Smart Campus, needs to be Secure Campus. Internet of Things (IOT) system, supported to educational sectors which most effectively impacted educational environments.

The paper described the different systems like smart library systems enabled with sensors. Smart attendance with face recognition system, smart administration system makes easy process of administration plans, smart monitoring system for real time decisions, smart tracking system used for trace to students and smart security system to protect from unauthorized users [33].

- As this paper described outcomes using IOT in subject notes sharing technique which is enhanced in the online class rooms for students. Study of IOT with E-Learning Importance traditional classrooms replaced by smart classrooms using IOT devices by using data sharing technique.

Learning of the IOT with Electronic Learning value traditional class rooms are replaced by the intelligent class rooms using IOT technology based devices by using the data sharing technique.

The IOT uses smart devices and linked with various networks. In paper discussed as the essentialness of this technology for new trades of institutes or colleges to make digitized campus & how new technologies and IOT applications can be enhanced for online learning techniques for enhance or improve educational quality [34].

- As per paper author says as, The IOT is a technology which controls over all object through network integration. The paper proposed a model for making efficient decisions based on IOT Clouds consider a business architecture designed on IOT. In this paper discussed on feature of IOT in education. In paper the author implies the IOT and bigdata is very relevant with each other as like father and mother respectively.

IOT useful in administrative part of collaboration of information. It is linked with different objects with each other for smoothly working in the education field. The categorization of IOT in education is techniques, Business & Society. This paper explained different challenges or problem are faced in implementing IOT in education [35].

7) Use of Blockchain and IOT technologies in the Hospitality sector

Blockchain can be used for secure and transparent booking and payment systems, reducing fraud, and streamlining processes. The use of IOT in the lodgings and hotels to improve voyaging experience of clients with IOT cordiality industry is likewise enhancing IOT encounters to make their administrations increasingly agreeable for visitors. In lodgings, face recognition id is given to the clients with the goal that inn staff can perceive the client before their appearance. Soon of IOT, there are chances that inns may get outfitted their rooms with sensors and feeling acknowledgment cameras to catch feelings of supporters for example on the off chance that the client is eager, it can suggest for suppers. On the off chance that the visitor is feeling cool, the room will get hotter on personalization.

The Smart Alert system is a modern security system implemented in institutes for security purposes. It is based on IOT devices interconnected with security devices. The Alert system is less expensive and helpful in emergency situations. There is a use of Radio frequency (RF) detects signals and transmit information, it generates an alert system. The alert system of security remote monitoring system used for alert on unconvinced situations

- This literature review provides a systematic analysis of the existing research on the use of blockchain technology in the hospitality industry. The authors highlight the potential benefits and challenges of adopting blockchain in hospitality and identify potential research gaps that need to be addressed in future studies [36].
- This systematic review examines the current state of research on the use of blockchain technology in the hospitality industry. The authors identify the potential applications of blockchain in different areas of hospitality, such as hotel bookings, loyalty programs, and supply chain management. They also highlight the challenges that need to be addressed to implement blockchain in the hospitality industry [37].
- This literature review provides a systematic analysis of the use of blockchain technology in the hospitality and tourism industry. The authors examine the current state of research on blockchain in hospitality and identify potential research gaps that need to be addressed in future studies. They also highlight the benefits and challenges of adopting blockchain technology in hospitality and provide recommendations for future research [38].
- The authors provide an overview of the current applications of blockchain and IoT in the hospitality sector, including guest experience, operations management, and supply chain management. They discuss the benefits and challenges of these technologies, such as increased efficiency, security, and transparency, and identify potential future directions of research in this area, such as the integration of artificial intelligence and machine learning [39].
- The authors conduct a systematic literature review of the use of blockchain in the hospitality industry, analyzing its potential applications, benefits, and challenges. They identify several key benefits of blockchain in the hospitality industry, such as increased efficiency, transparency, and security, and highlight the challenges associated with its implementation, such as the need for regulatory frameworks and interoperability standards. They also discuss potential future directions of research in this area [40].
- The authors conduct a systematic review of the use of blockchain and IoT in the hospitality industry, examining its potential applications, benefits, and challenges. They identify several potential use cases, such as guest experience, operations management, and supply chain management, and discuss the benefits and challenges associated with their implementation. They also highlight the need for standards, interoperability, and regulatory frameworks to support the adoption of these technologies in the hospitality industry [41].
- The authors review recent advances in the use of blockchain and IoT in the hospitality industry, including applications such as guest experience, operations management, and supply chain management. They discuss the benefits and challenges of these technologies in the context of the hospitality industry and highlight the need for further research in areas such as data privacy, interoperability, and standardization. They also discuss potential future directions of research in this area [42].

- The authors provide an overview of the current applications of blockchain and IoT in the hospitality industry, focusing on their potential to enhance guest experience. They analyze the benefits and challenges of these technologies in the context of guest experience and identify potential future directions of research in this area, such as the integration of artificial intelligence and machine learning. They also highlight the need for standards, interoperability, and regulatory frameworks to support the adoption of these technologies in the hospitality industry [43].
- Paper provides IoT enabled Alert System for hotels only where they have proposed a system for which can alert the in situations of LPG leakage or smoke etc. this alert to the visitors through alarm, email, SMS, Message etc. this system to be help for attacks form terrorist and robbery. The Smart Alert system maintains emergency services of campus like fire, any unpredictable situations etc [44].
- The IOT based tracking system implemented using Android mobile for tracking and calling through system in emergency time. The paper describes the implemented IOT alert system by SMS, text messages in any unpredictable situations. The access for some situations are given to application for alert system [45].

8) Use of Blockchain and IOT technologies in the Agriculture sector

Blockchain can be used for tracking the supply chain, ensuring fair compensation for farmers, promoting sustainability, and reducing fraud. Blockchain technology can be used to record transactions, such as the purchase of fertilizers, seeds, and equipment, as well as the sale of produce to processors and retailers. The blockchain technology provides a trusted and decentralized ledger of these transactions, ensuring that the transactions are transparent and cannot be tampered with. Blockchain technology has the potential to revolutionize agriculture and its supply chain by increasing transparency, traceability, and efficiency.

IOT used in Smart Agriculturebased with IOT is an important application used for maintaining a smart building environment. The implementation of the Smart Garden system detects different parameters present in the soil. This system is designed to detect moisture, humidity, temperature and ultrasonic level of the soil. The automatic gardening systems used to monitor process of maintain land and watering system. The mobile application allows to the administrator by remotely monitor and control the Smart AgricultureSystem. The alerts system gives the notification by messages to the administrator to control the system. This method is cost effective and time saving.

- This literature review discusses how blockchain technology can be used to enhance supply chain management in agriculture. The authors discuss various use cases, including traceability of food products, supply chain financing, and smart contracts. They also highlight some challenges to implementing blockchain in agriculture, such as high transaction costs and lack of standardization [46].

This review article provides an overview of the applications of blockchain technology in agriculture. The authors discuss various use cases, including supply chain management, crop insurance, and food safety. They also highlight the potential benefits of blockchain, such as increased transparency, improved trust, and reduced fraud.

- This literature review discusses the potential applications of blockchain technology in agriculture. The authors discuss various use cases, including traceability of food products, certification of organic products, and supply chain management. They also highlight some challenges to implementing blockchain in agriculture, such as the need for interoperability and the need for standardized data formats [47].

- This study examines the potential of blockchain technology to improve the traceability and transparency of the food supply chain in Thailand. The authors discuss the results of a pilot study, which involved the implementation of a blockchain-based system to track the supply chain of organic

rice. The study found that blockchain technology can improve traceability and transparency, reduce fraud, and increase consumer trust [48].

- This literature review provides an overview of the recent developments and future prospects of blockchain technology in agriculture. The authors discuss various use cases, including supply chain management, certification of organic products, and traceability of food products. They also highlight some challenges to implementing blockchain in agriculture, such as the need for interoperability and the need for standardized data formats [49].

CONCLUSION

The use of blockchain and IoT has significant implications for various sectors, each with their unique benefits and challenges. Here is a summary of the conclusions drawn from each sector:

Fintech: The use of blockchain and IoT in fintech has the potential to revolutionize the industry by improving security, transparency, and efficiency in transactions. Blockchain-based cryptocurrencies and smart contracts can simplify and automate complex financial processes, while IoT can provide real-time data for decision making. However, the lack of regulation and standardization in this emerging field remains a challenge.

Government: The use of blockchain and IoT in the government sector has shown potential in areas such as voting systems, identity management, and supply chain management. These technologies can enhance transparency, security, and efficiency in government processes. However, the adoption of these technologies may require significant investment and collaboration between government agencies and private sector stakeholders.

Energy: The energy sector can benefit from blockchain and IoT by enabling decentralized energy production and distribution, improving energy efficiency, and facilitating energy trading. Blockchain-based smart contracts can automate energy transactions and reduce the need for intermediaries. However, challenges such as regulatory barriers and data privacy concerns need to be addressed.

Manufacturing: Blockchain and IoT can enhance supply chain management in the manufacturing industry by providing real-time data, improving traceability, and reducing fraud. These technologies can also enable predictive maintenance and asset tracking, leading to cost savings and increased efficiency. However, the implementation of these technologies may require significant investment and collaboration between industry stakeholders.

Healthcare: The use of blockchain and IoT in healthcare can improve patient outcomes by providing secure and accessible electronic health records, facilitating clinical trials, and enabling secure sharing of medical data. These technologies can also enhance supply chain management in the healthcare industry. However, regulatory barriers, privacy concerns, and interoperability issues may hinder the adoption of these technologies.

Education: Blockchain and IoT can enhance the education sector by providing secure and accessible digital credentials, improving administrative processes, and enabling personalized learning experiences. These technologies can also facilitate the recognition of prior learning and increase the efficiency of academic institutions. However, challenges such as standardization, interoperability, and data privacy need to be addressed.

Hospitality: The use of blockchain and IoT in the hospitality industry can enhance guest experience by providing personalized services, improving supply chain management, and enhancing security. These technologies can also automate operations management and provide real-time data for decision making. However, the adoption of these technologies may require significant investment and collaboration between industry stakeholders.

Agriculture: The integration of blockchain and IoT in agriculture has the potential to improve transparency, traceability, and sustainability. However, adoption may require significant investment and collaboration between stakeholders, and data privacy concerns must be addressed. Continued research and investment can help maximize the potential benefits for farmers, consumers, and the environment.

In conclusion, the use of blockchain and IoT has the potential to revolutionize various sectors by improving transparency, security, and efficiency. However, the adoption of these technologies requires collaboration and investment from stakeholders, as well as addressing regulatory and privacy concerns. Future research can help address these challenges and explore the full potential of these technologies in various sectors.

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