ISSN:2731-538X | E-ISSN:2731-5398
Vol. 18 No. 01 (2024)

EXPLORING THE FEASIBILITY OF BLOCKCHAIN ADOPTION ACROSS INDUSTRIES: A SYSTEMATIC REVIEW

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Abstract:
Blockchain technology has rapidly gained prominence as a groundbreaking innovation with the potential to transform numerous industries. Originally devised as the foundational technology for cryptocurrencies, blockchain's decentralized, transparent, and immutable characteristics offer far-reaching applications beyond digital currencies. This systematic review aims to explore the feasibility of blockchain adoption across various industries by synthesizing existing literature, case studies, and empirical research.
The review encompasses a broad spectrum of sectors, including finance, supply chain management, healthcare, real estate, energy, and government, each presenting distinct opportunities and challenges for blockchain integration. Through a methodical examination of scholarly articles and practical implementations, this review identifies key factors influencing the successful adoption of blockchain technology, such as technological infrastructure, regulatory environment, industry-specific requirements, and organizational readiness.
Our findings reveal that while blockchain holds significant promise for enhancing operational efficiency, security, and transparency, its adoption is contingent upon overcoming specific barriers, including scalability issues, interoperability challenges, and the need for standardized protocols. Moreover, the review highlights successful case studies and best practices that provide valuable insights into effective blockchain implementation strategies.
This paper concludes by summarizing the critical insights gained from the analysis, discussing the implications for industry stakeholders, and suggesting directions for future research. By offering a comprehensive evaluation of the feasibility of blockchain adoption across industries, this review contributes to the understanding of how blockchain technology can be leveraged to drive innovation and improve industry practices.
Keywords: Blockchain Adoption, Blockchain feasibility, Blockchain Industry Use cases, Blockchain research, Blockchain Finance, Blockchain Supply Chain, Blockchain healthcare

Introduction:

In the past decade, blockchain technology has emerged as a transformative force with the potential to revolutionize various sectors of the economy. Originally conceptualized as the underlying technology for cryptocurrencies like Bitcoin, blockchain has evolved far beyond its initial applications. Its decentralized, immutable, and transparent nature offers unprecedented opportunities for innovation and disruption across diverse industries.
The adoption of blockchain technology, however, is not a one-size-fits-all solution. It requires a nuanced understanding of its feasibility within different industrial contexts. While blockchain holds immense promise, its implementation poses challenges and considerations unique to each sector. Understanding these complexities is essential for organizations seeking to leverage

ISSN:2731-538X | E-ISSN:2731-5398
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blockchain effectively to enhance efficiency, security, and transparency in their operations.
This systematic review aims to comprehensively analyze the feasibility of blockchain adoption across industries. By synthesizing existing literature, case studies, and empirical evidence, we seek to provide insights into the opportunities, challenges, and best practices associated with integrating blockchain technology into various sectors. Through a rigorous examination of real-world implementations and theoretical frameworks, this review aims to inform decision-makers, researchers, and practitioners about the current state and future prospects of blockchain adoption.

Scope of the Review:

This review will encompass a wide range of industries, including but not limited to finance, supply chain management, healthcare, and transportation. Each industry presents unique use cases and challenges for blockchain adoption, necessitating a comprehensive analysis to evaluate feasibility accurately.

Methodology:

A systematic approach will be employed to identify, select, and analyze relevant literature and case studies. Database searches, including but not limited to PubMed, IEEE Xplore, Google Scholar, and Scopus, will be conducted using predefined search terms related to blockchain adoption and specific industry domains. Articles will be screened based on predefined inclusion and exclusion criteria to ensure relevance and rigor in the review process. Data extraction and synthesis will be performed to identify key themes, trends, and insights across industries. Afte the review, some representative will be looked in depth with key representative articles reviewed. With this approach the authors look to find and separate strong feasibility studies and find common adoption characteristics across domain.

Organization of the Paper:

This paper will be organized into several sections, including a literature review providing background on blockchain technology and its potential applications, a methodology section outlining the systematic review process, findings from the analysis of literature and case studies across industries, discussion of key themes and implications, and concluding remarks summarizing the insights gained and highlighting avenues for future research.

Overview of current research

Blockchain Feasibility Assessment Frameworks

Several studies have proposed frameworks for assessing the feasibility of blockchain adoption in organizations. A comprehensive, generic, and quantitative blockchain assessment approach was developed to assess technical suitability, economic feasibility, high-level design, adoption approach, and business value potential of blockchain solutions. This framework aids decision-making in the initial stages of blockchain exploration. The TOE framework with technological, organizational, human and security factors was used to explore critical factors affecting blockchain adoption

Security and technology were identified as the top two major factors influencing blockchain

ISSN:2731-538X | E-ISSN:2731-5398
Vol. 18 No. 01 (2024)

adoption decisions in the banking sector. A proposed model integrates blockchain into banking processes to simplify operations and reduce participants. The practical aspects of this solution could be tested empirically.

Industry-Specific Blockchain Adoption Studies

Researchers have also examined blockchain adoption feasibility in specific industries:

In the banking sector, studies have focused on technical aspects like scalability, security and privacy

.Frameworks have been proposed for how banks can start-up and accelerate blockchain innovations

.Blockchain's potential to improve supply chain agility, adaptability and alignment was examined . A decision aid was applied to assess the comparative feasibility of blockchain in industries like logistics, health, energy, finance, automotive, pharmaceutical and agriculture. Logistics, finance and health were found to be the most feasible industries.

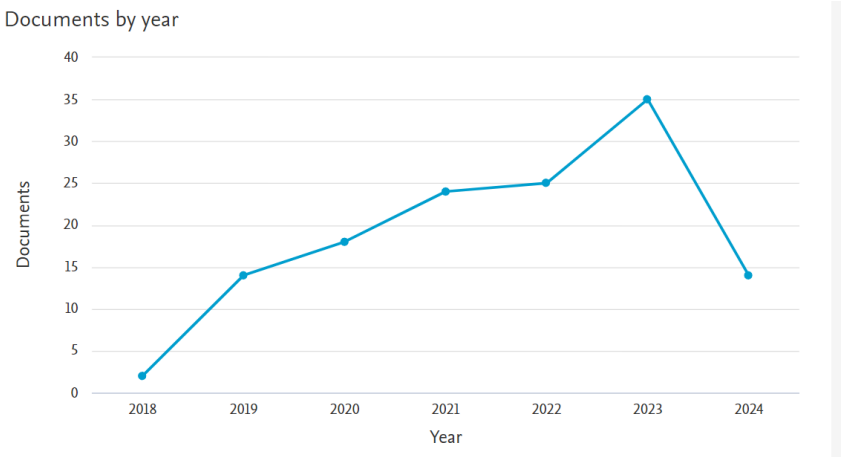
Big data analytics using blockchain is developing and needs more research to study the probability and feasibility of adoption in marketing

A total of 132 papers were reviewed, the statistics of the reviewed paper were :

The search parameters in SCOPUS were (Blockchain, Feasibility and Adoption)

Year ↓	Documents ↑
2024	14
2023	35
2022	25
2021	24
2020	18
2019	14
2018	2

The papers are rising consistently as more industries look for benefits of blockchain and explore its feasibility.



The downward trend is in 2024, but this covers just one third of the year, so a reasonable number for the entire year should be around 40.

ISSN:2731-538X | E-ISSN:2731-5398
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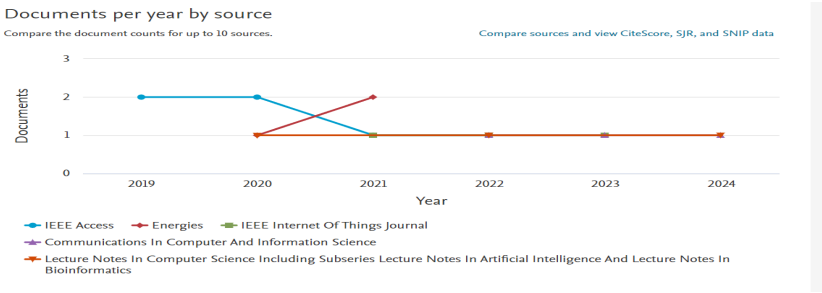
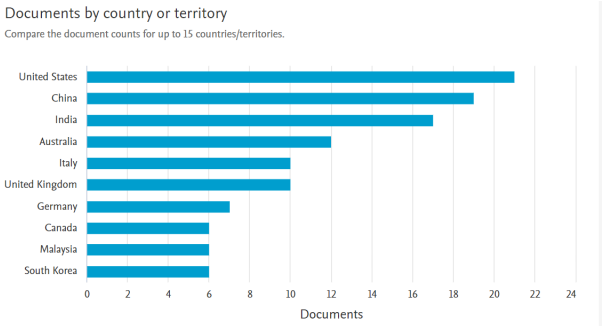
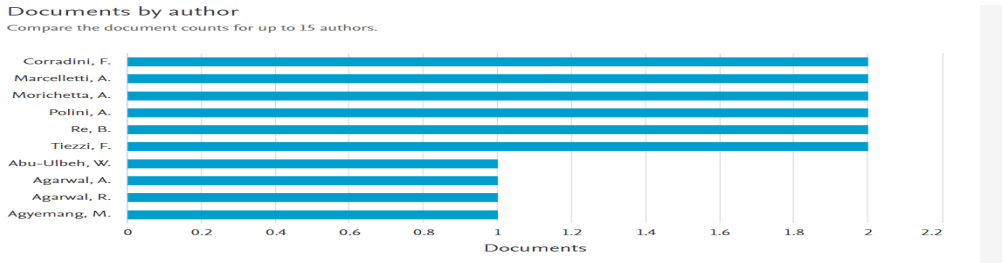


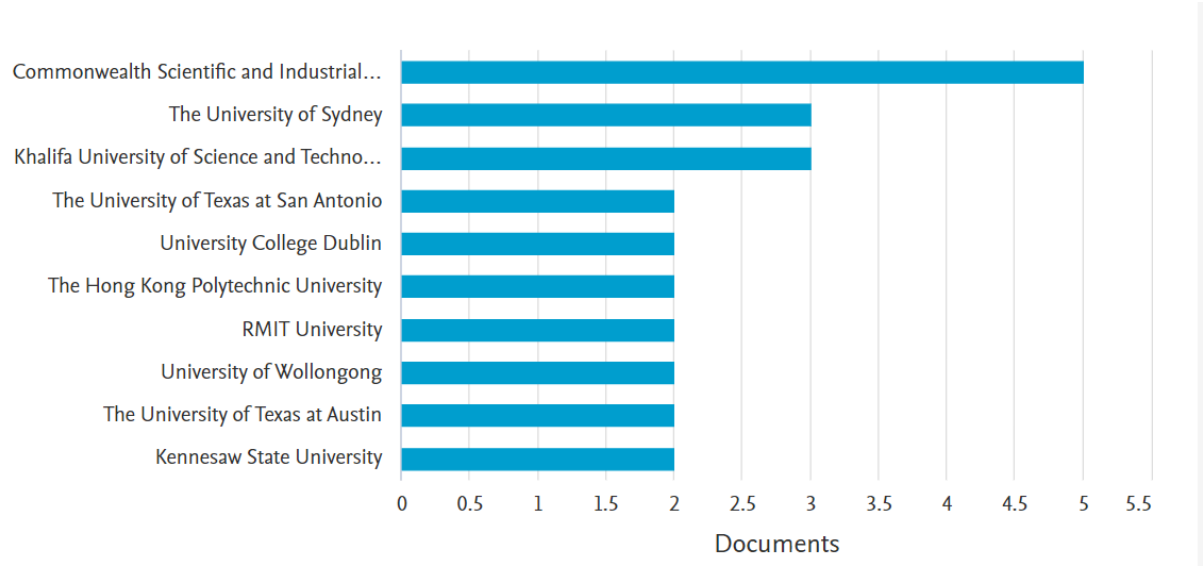
As is to expected IEEE and Computer Science journals have most of the published articles.



United States, China and India lead the research in the area of blockchain.



Even though this shows a population of 132 articles. The author output low, but that is because this particular research is domain specific and author expertise by its very requirement would be both in domain and blockchain.



ISSN:2731-538X | E-ISSN:2731-5398
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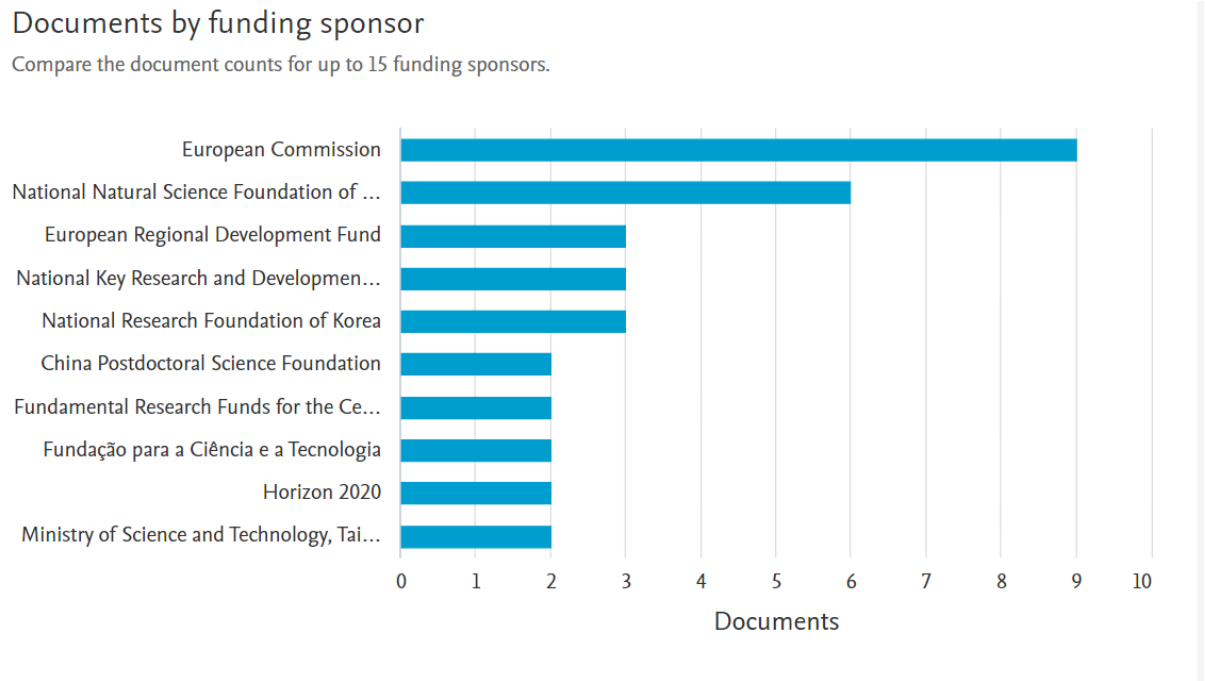
The University Output shows quite a few universities out of Australia, so though Australia is in fourth place in a country wise ranking, its Universities are clearly the most active. Correspondingly no Universities from India or China are there.



Here, China's emphasis of funding research in blockchain is clearly shown. European funding agencies also show a strong presence in this graph.

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Adoption and Feasibility study by Industry

<u>Blockchain adoption and feasibility in the transportation sector</u>

There are some very substantial developments in the Vehicles arena.

Blockchain technology is playing a crucial role in the advancement of Electric Vehicles (EVs) and connected vehicles, offering various benefits and applications in this sector. Here are some key points based on the provided sources:

- **EV Charging Network**: Blockchain facilitates the creation of a larger and more efficient EV charging network by enabling peer-to-peer (P2P) EV charging platforms. This allows individuals to share their chargers with others, turning idle chargers into a source of income. Users can locate available chargers, set rates, and make secure digital transactions facilitated by blockchain technology1.

- **Data Accuracy and Insights**: The automotive industry has been leveraging blockchain for data accuracy, essential for maximizing vehicle resale value, verifying spare parts' authenticity, optimizing insurance operations, and ensuring compliance with regulations. Blockchain data insights are crucial for enhancing various aspects of the EV ecosystem, including insurance claim management and compliance monitoring.

ISSN:2731-538X | E-ISSN:2731-5398
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- **Energy Trading and Grid Interaction**: Blockchain-enabled energy trading systems are actively being explored for EVs, allowing vehicle-to-vehicle energy trading and efficient power management in smart grid platforms. This technology enhances the interaction between EVs and the grid, making EV chargers grid interactive and integrating EVs into a better-connected, distributed energy network.
- **Connected Mobility and Smart Contracts**: Blockchain technology enhances connected mobility by enabling secure two-way communication between vehicles and supporting facilities. It facilitates peer-to-peer transactions with a high level of security, simplifies aspects like car insurance payments, repairs, and tolls through smart contracts, and ensures secure verification of passengers and vehicles, enhancing overall safety and user experience in autonomous and networked vehicles.
- **Future Prospects**: The future of the automotive industry, particularly in the realm of EVs and connected vehicles, is intertwined with blockchain technology. As carmakers invest in blockchain solutions, the technology is expected to revolutionize data management, security, and transactions in the mobility sector. Blockchain's transparent and tamper-proof nature is set to bring significant changes to how data is handled in the vehicles of the future, offering enhanced security, efficiency, and reliability.

Review of representative articles

In the case of a crowdsourcing intiative for UAVs, a novel supply chain management framework on a consortium blockchain with last-mile delivery through crowdsourced vehicles and UAVs. The blockchain-based framework aims to provide last-mile delivery for time-critical tasks in a transparent and cost-efficient manner. A blockchain-hosted Gale-Shapley Matching mechanism was designed for allocating delivery tasks to UAVs and vehicles that will perform them timely and cost-efficiently. The allocation mechanism was incorporated in the proposed management framework consisting of smart contracts that autonomously respond to members' interactions. In addition, the framework stores the supply chain process data transparently and immutably. The performed experiments explore the feasibility of the proposed solution showing the increase in task allocation percentage (at least 6%) and reward (at least 50%) while reducing the delivery time (at least 23%) compared to the considered benchmarks (Kadadha, 2024). The increasing popularity of electric vehicles (EVs) has brought about the demand for high-quality charging services. Existing studies focus on overcoming the driving range limitation by introducing planned detours to charging stations, but served EV users still have to endure the time-consuming charging process. In another usecase the aim was to explore a novel personalized charging system to ease user impatience with charging duration. The personalized charging approach underlines individual preferences for charging station amenities and recommends charging stations offering preferable activities for EV users. In the proposed model, the preferences for charging station amenities can be inferred based on historical activity data using the tensor decomposition technique. With the obtained individual preference, the charging strategy design problem is formulated as a mixed-integer linear programming (MILP) model. Numerical experiments are conducted to demonstrate the benefits of the proposed personalized charging approach. This

ISSN:2731-538X | E-ISSN:2731-5398
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further led to emerging blockchain technology to enable reliable and transparent charging services. An implemented proof-of-concept prototype validates that the proposed system model is technically feasible and affordable (Li, 2024)Smart Vehicle connectivity is a crucial communication environment that needs cyber security attention. Robust connectivity and deterring remote cyberattacks are essential for vehicles connected through smart features. It also means that various security and privacy risks, such as location tracking and remote carjacking, can affect automated vehicles. This study focuses on cybersecurity and discusses the possibility of introducing blockchain technology to the automobile sector. The conceptual model comprised of Task-Technology fit and Fit viability models to comprehend better the to validate the conceptual model, structural equation modelling technique was applied. The findings showed, that task and technology characteristics contributed to task-technology fit. IT infrastructure and IT skills, and organization capabilities contributed to technology viability. It was thought-provoking to note economic feasibility did not contribute to technology viability. From blockchain security adoption and usage perspective, task-technology fit was significant, while technology viability was insignificant. The study has important theoretical and managerial implications for the automotive industry. The automotive industry has to focus on the fitment and viability of blockchain-based cybersecurity for interconnected smart vehicles. Smart and connected vehicles, in particular, are predicted to drastically lower the number of accidents, congestion, city parking spots, and transportation expenses. (Patil, 2024)

Blockchain in Healthcare Sector

Blockchain technology is revolutionizing the healthcare sector by providing enhanced security, transparency, and efficiency in various aspects of healthcare operations. Here are some key points based on the provided sources:

Data Security and Integrity:

Blockchain ensures secure and transparent record-keeping, making it an invaluable tool for protecting sensitive healthcare data. It acts as a decentralized ledger where each block of data relies on the previous one, ensuring data permanence and protection against unauthorized access or tampering

Electronic Health Records (EHR):

Blockchain facilitates the secure management of electronic health records, enabling immediate, secure, and accurate communication with insurance companies and supply chains. It streamlines transactions between healthcare stakeholders, authenticates identities, logs contract details, and tracks payments for goods and services, reducing bureaucratic delays and inaccuracies

Smart Contracts:

Blockchain technology enables the use of smart contracts in healthcare, going beyond traditional supply chain management to automate business processes. Shared smart contracts between manufacturers, distributors, and healthcare organizations on a blockchain ledger can significantly reduce payment disputes and enhance the management of medical insurance contracts for patients IoT Security for Remote Monitoring: Blockchain enhances security for Internet of Things (IoT) technologies used in remote patient monitoring by limiting unauthorized data access and ensuring secure communication between devices. This technology safeguards against disruptive attacks

ISSN:2731-538X | E-ISSN:2731-5398
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and provides reliable access to IoT technologies for proactive and preventative care
.
Interoperability and Data Sharing: Blockchain offers significant opportunities to improve health information exchange (HIE), protect data, support interoperability, manage genomics data, and track disease outbreaks. It enables the transition from institution-driven interoperability to patient-centered, allowing patients to control access rules for their medical data
.
Challenges and Future Prospects: While blockchain presents numerous opportunities for healthcare, challenges such as implementation issues, technological barriers, and regulatory questions need to be addressed. Despite these challenges, blockchain technology is expected to continue transforming the healthcare sector by enhancing data security, interoperability, and efficiency in the management of healthcare records and transactions

Review of representative articles

The *adoption* of cloud-based electronic health record (EHR) systems and *blockchain* technology in healthcare is gaining attention for enhancing data security and interoperability. One research focused on designing and implementing a *blockchain*-based cloud EHR system. It explored selecting suitable *blockchain* technology, cloud infrastructure, and data management methods to ensure patient data confidentiality, integrity, and availability. The architecture and components of the system, including the *blockchain* network, cloud storage layer, and user interface, were thoroughly discussed. A pilot study evaluated the system's *feasibility* and performance, showcasing improved data protection, sharing, and management compared to traditional EHR systems. The potential benefits, drawbacks, and barriers to *adoption* of a *blockchain*-based cloud EHR system were examined. This research provided valuable insights and recommendations for healthcare institutions (Samala, 2024)considering the implementation of such systems, addressing the challenges, and offering guidance for successful *adoption*. Electronic health record (EHR) management systems require the adoption of effective technologies when health information is being exchanged. Current management approaches often face risks that may expose medical record storage solutions to common security attack vectors. However, healthcare-oriented blockchain solutions can provide a decentralized, anonymous and secure EHR handling approach. One research presented PREHEALTH, a privacy-preserving EHR management solution that uses distributed ledger technology and an Identity Mixer (Idemix). That paper described a proof-of-concept implementation that uses the Hyperledger Fabric's permissioned blockchain framework. The proposed solution is able to store patient records effectively whilst providing anonymity and unlinkability. Experimental performance evaluation results demonstrate the scheme's efficiency and feasibility for real-world scale deployment. (Stamatellis, 2020)

The digitization of health records has massively increased Health Information Exchange (HIE) activities among different practitioners, but it has lagged behind Electronic Health/Medical Records (EHRs/EMRs) *adoption* for numerous reasons, including confidentiality, interoperability, integrity, and privacy-related concerns. In this paper, we present a Blockchainas-a-Service based solution for HIE (BaaS-HIE). In particular, our design work involves the use of a private *Blockchain* and smart contracts as access control manager to medical records. In order

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to maintain high level of performance for applications, thus that such applications could be economically viable, all of the health data are encrypted and stored into a decentralised InterPlanetary File System (IPFS) and the hash of the assets URI is stored in *blockchain*. Our experimental results demonstrate the *feasibility* of the proposed approach in offering a decentralized and fine-grained accessibility mechanism for the patient and the doctor in a given healthcare system. (Buzachis, 2019)

Supply Chain Management

Blockchain technology is being increasingly adopted in supply chain management to improve transparency, traceability, and efficiency. Here are some key ways blockchain is being used:

Enhancing Traceability

Blockchain provides a secure, tamper-evident digital ledger that records transactions across many computers in a network. This allows all parties to track goods as they move through the supply chain, from raw materials to the final product. This traceability is valuable for meeting consumer demands for sourcing information and preventing issues like counterfeiting.

Increasing Transparency

By capturing key data points like certifications and claims on the blockchain, companies can provide open access to verified, real-time information. This builds trust with consumers and regulators by proving compliance with standards. Blockchain also streamlines workflows and provides auditors greater visibility across the complex network of suppliers, manufacturers, distributors and retailers.

Enabling Efficiency

Blockchain eliminates the need for intermediaries and reduces administrative costs. Smart contracts can automatically execute transactions when predefined conditions are met, speeding up processes. Integrating blockchain with IoT sensors allows real-time tracking and monitoring of shipments. Overall, blockchain enables faster, more cost-efficient delivery of products.

Improving Coordination

The shared, decentralized nature of blockchain fosters better collaboration among supply chain partners. By ensuring data integrity and providing a single source of truth, it helps offset the detrimental effects of information opacity and lack of trust between parties. This enhanced coordination leads to reduced risks and delays.

The impact of *blockchain* technology (BCT) implementation on the accuracy, reliability, visibility, incorruptibility, and timeliness of supply-chain processes and transactions, makes it attractive to improve the robustness, transparency, accountability and decision-making in risk management. Therefore, the emerging BCT can present an invaluable opportunity for the organisations in need of preparing for and responding to uncertain and complex instances. The *adoption* of BCT in the operations and supply chain management (OSCM) literature remains scarcely investigated, especially in the context of managing risks in emergency situations such as crises, disasters, and pandemics, which are characterised by volatility, uncertainty, complexity and ambiguity (VUCA) in the business environment. This article will contribute to the OSCM literature by developing a conceptual model that will examine the causal relationships between VUCA business environment, constructs derived from technology acceptance model (TAM),

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resilience and behavioural intention of the operations managers to adopt BCT for risk management (Chowdhury, 2023)

The recent era of inter- and intra-organisational are facing the challenges of lack of integrated SC transparency and traceability (ISCTAT) concerns in global COVID-19 pandemic situations. The readiness of inter-organisational keen to gain the strategic competitive advantages through transparency and traceability aspects encompasses in inter- and intra-organisational sustainability. Sustainable technology footprint enablers (STFEs) selection is based on transparency aspects needs in inter- and intra-organisational *adoption* decisions. Sustainable SCM are governed through upstream integration of supplier's visibility and traceability by STF-enablers adaptations as well as downstream integration to decouple the techno-*feasibility* quality responsiveness for efficient consumer response (ECR). The framework of STF-enabler's selection decisions has based on integration SC transparency and traceability responsiveness in inter- and intra-organisational sustainability by fuzzy-ISM approach. Fuzzy MICMAC analysis helps to evaluate the autonomous, linkages, independent and dependent enabler's relationship with sustainable technology-*feasibility* driven in inter- and intra-organisational relationship with ISCTAT. The objectives are subjected to identify the STF-enablers and transparency aspects into inter- and intra-organisational from ISCTATA. The architecture design of structure matrix of STFEs in inter- and intra-organisational transparency aspects in sustainable SCM. It explores the relationship among the driving and dependence power in STF-enablers potential inter- and intra-organisational from ISCTAT (Kumar, 2023)

Blockchain has the characteristic of being tamper-proof, which can make product information transparent and ensure data authenticity. The *adoption* of *blockchain* can improve consumer trust and expand the market. However, *blockchain adoption* will lead to fairness concern. We consider a supply chain comprising a manufacturer and a retailer responsible for introducing and publicising *blockchain*, respectively. To study the impacts of implementing and promoting *blockchain* on secondary supply chain decision-making and coordination under retailer's fairness concern, we construct one centralised and two decentralised decision-making supply chain models where the retailer may have fairness concern. After solving and analysing the optimal decision-making of the three models, we design a two-part tariff contract to ensure that the supply chain is stable and coordinated. Our major findings are as follows: (1) *Blockchain*-based consumers' perception of authenticity and preference for the retailer's publicity is conducive to *blockchain adoption*. As consumers' trust in products using *blockchain* increases, the manufacturer will increase the *blockchain* level, the retailer will actively promote *blockchain*, product pricing will increase, and supply chain system profit will increase. (2) The retailer's excessive focus on fair profit distribution can lead to systemic damage, decrease the *blockchain* level and retailer publicity, and hinder the use and publicity of *blockchain*. As the manufacturer becomes less cost-sensitive to *blockchain*, the retailer's concern for fairness hurts its own profit. (3) The sales price under centralized decision-making and decentralized decision-making is related to the marginal cost of *blockchain*. A high marginal cost of *blockchain* is the main factor hindering the popularization of *blockchain*. (4) The two-part tariff contract can achieve Pareto optimization where the retailer is concerned about fairness in profit distribution. In coordination under this contract, the manufacturer's wholesale price is consistent with its own

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cost. The fixed technology fee can re-distribute the supply chain's profit. The more significant the effect of *blockchain* on improving consumers' product trust is, the higher is the technology fee that the manufacturer charges the retailer. *Blockchain* will increase the fixed fee charged by the manufacturer and raise its voice in coordination; however, fairness concern may reduce the *feasibility* of the coordination mechanism. In coordination under the two-part tariff contract, the manufacturer's *blockchain* level has the most significant growth, and the retailer's publicity effort and system profit also increase significantly, and the product has a more price advantage (Yuyan, 2023)

Blockchain in Banking and Finance Sector

Blockchain technology is transforming the banking and finance industry in several key ways:Cost Reduction: Blockchain can eliminate inefficiencies and reduce the reliance on intermediaries, delivering significant cost savings for banks. A 2017 report by Accenture found that big investment banks could save $10 billion by utilizing blockchain to improve processes like clearing and settlement. Robust Security: Blockchain's decentralized nature and cryptographic protection can bolster bank security. It enables robust know-your-customer (KYC) solutions and eliminates single points of failure, reducing the risk of data breaches. Instant Payments and Money Transfers: Blockchain protocols allow banks to connect directly to each other for cross-border payments, removing the need for intermediaries like SWIFT. This can significantly speed up and reduce the costs of international money transfers. Audit Trail and Transparency: The immutable record-keeping of blockchain creates an audit trail that helps eliminate financial fraud and data redundancies. All network participants have access to the shared, transparent ledger. Overall, blockchain is enabling banks to modernize outdated systems, improve efficiency, enhance security, and provide better services to customers. As the technology matures, its adoption in the banking and finance sector is expected to grow rapidly in the coming years.

Review of representative articles

The purpose of this research paper is to analyze the *feasibility* of *adoption* of *blockchain* technology as a viable, transparent, and traceable solution for storing data and transactions in firms belonging to the banking and financial sector of India. This study examines the role of four key variables, namely technical knowledge, availability of resources, collaborations among firms, and usability; for successful *adoption* of the technology in financial functions. This research is based on the analysis of data acquired from these factors which influence the *feasibility* of *blockchain* technology as per the in-depth study of 30 firms belonging to the banking and financial sector of India. This study investigates the current penetration of technical knowledge, research, and development of use cases with available resources, preparedness level of firms for collaborations, and the challenges faced in the usability of implementing *blockchain* technology for financial applications (Agarwal, 2021)

Blockchain technology can have ramifications across the investment banking ecosystem due to their cryptographic distributed ledger. The aim of this chapter is to evaluate the adaptation *feasibility* and predict its performance for a regulatory framework when *Blockchain* technology is applied by investment banks (R., 2020)

Distributed Ledger Technology (DLT), a type of *blockchain*, refers to a decentralized peer-to-

ISSN:2731-538X | E-ISSN:2731-5398
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peer network-based transaction ledgers for greater transparency without arbitrating and monitoring central authority. DLT can transform financial markets and payments industries through technology innovation and digital transformation of extant governance structures and processes for transferring digital assets, including bitcoin, in real-time to enable faster efficient payments, clearing, and settlement. While the IS *adoption*/investment research studied different types of enterprise information systems from the status quo bias theory perspectives, it has not studied DLT investment decisions in government. This research draws on the status quo bias theory to investigate DLT investment decisions to explore the *feasibility* of DLT in central banking. We found evidence of different types of status quo bias in affecting two of the most influential central banks' DLT investment decision-making. We explicate their decision characteristics that may explain the observed different types of status quo bias. (Chatfield, 2019)

Energy Trading:

Cost Reduction

Blockchain can eliminate the need for intermediaries like brokers, exchanges and clearing houses in energy trading. This significantly reduces costs for traders. Using blockchain, traders can send orders anonymously to a decentralized order book accessible by other traders.4

Transparency and Traceability

Blockchain provides an immutable record of all energy trades, enabling complete transparency and traceability. Trade contracts for all counterparties can be placed into a blockchain and made accessible to all involved parties. This gives consumers flexibility and transparency in energy trading.3

Peer-to-Peer Energy Trading

Blockchain enables peer-to-peer (P2P) energy trading, allowing individuals to directly buy and sell excess renewable energy with their peers. This eliminates control from central authorities and benefits consumers by reducing energy costs. Companies like Power Ledger are using blockchain to facilitate P2P energy trading in communities.

Smart Contracts

Blockchain smart contracts can automatically execute the terms of energy trade contracts, providing confidence in the accuracy of metering and billing. Bots integrated with energy trading and risk management (ETRM) systems can track the location and condition of energy commodities in real-time and dictate settlement terms.

Renewable Energy Integration

Blockchain is enabling better integration of renewable energy sources like wind and solar into the grid. It provides a way to track the origin of energy and ensure the transparency of renewable energy certificates (RECs). This incentivizes the use of renewable energy. Overall, blockchain is creating a more efficient, transparent and decentralized energy trading ecosystem. As the technology matures, its adoption in the energy sector is expected to grow rapidly in the coming years.

Review of representative articles

The widespread *adoption* of distributed energy resources (DERs) and the progress made in internet of things (IoT) and cloud computing technologies have enabled and facilitated the

ISSN:2731-538X | E-ISSN:2731-5398
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development of various smart grid applications and services. This study aims to develop and implement a peer-to-peer (P2P) energy trading platform that allows local energy trading between consumers and prosumers within a microgrid which combines IoT and *blockchain* technologies. The proposed platform comprises an IoT-cloud home energy management system (HEMS) responsible for gathering and storing energy consumption data and incorporates a *blockchain* framework that ensures secure and transparent energy trading. The proposed IoT–*blockchain* architecture utilizes a Chainlink oracle network and a private Ethereum *blockchain*. Through the use of smart contracts, consumers and prosumers can participate in an open auction to trade energy, while the settlement process involves acquiring external energy data from an API through the oracle network. The performance of the platform is evaluated through a testbed scenario using real-world energy data from a real house in Valparaiso, Chile, while storing those measurements in AWS cloud, validating the *feasibility* of the proposed architecture in enabling local energy trading. This work contributes to the development of energy management systems by providing a real-world implementation of an IoT–*blockchain* architecture for local energy trading. The integration of these technologies will allow for a more efficient and secure energy trading system that can benefit prosumers, consumers, and utilities. (Condon, 2023)

Compared to other applications of distributed ledger technologies, for example, in decentralized finance, non-fungible tokens, and logistics, *Blockchain* applications in the energy industry have not found widespread dissemination and fell short of market expectations during the *Blockchain* hype in the late 2010s. In semi-structured qualitative interviews with leading providers in the energy industry, conducted from 2019 to 2021, hurdles in energy applications are compared with a control group of additional interviews with representatives of companies operating in IT and FinTech. The analysis uses a framework covering technical *feasibility*, desirability, and economic viability, as well as the role of regulatory frameworks. The interviews reveal that the first *Blockchain* applications suffered from a combination of technological constraints and inter-platform competition. Due to the permissionless configuration of the early energy Blockchains, they were slow in terms of transaction speed compared to existing platforms and prices per transaction were high, in addition to high degrees of complexity related to requirements from both critical-infrastructure systems and financial market regulation. The analysis further points to the slow *adoption* of *Blockchain* applications in the energy sector being related to business models rather focusing on products and platforms as well as on transactional rather than procedural use cases, with a high degree of standardization of the offering and low levels of inclusiveness concerning processes. The move from transaction platforms to innovation platforms and the emergence of *Blockchain* as a service provider—plus technical advances with regards to high-frequency transactions combined with the increasing importance of use cases, such as proof of origin for fuels or e-charging—may induce a shift from pilot applications to commercialization within the larger innovation ecosystem. While the involvement of *Blockchain* solutions in energy markets increases with pilot projects and with this, the acceptance of players and stakeholders in the energy ecosystem, a big hurdle for innovation remains the regulation of energy markets to allow for peer-to-peer trading, a usage-driven distribution of network costs, and bottom-up pricing markets (Burger, 2022)

Microgrids with renewable distributed generation units are a promising solution for reducing

ISSN:2731-538X | E-ISSN:2731-5398
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investment cost and greenhouse gas emissions in the face of rapidly rising energy demand and recent organizational concerns regarding social and environmental issues. However, microgrids closely located to demand areas cannot easily balance power supply and demand owing to the intermittency of renewable energy generation and the barriers to connecting with the main electricity grid. To overcome this problem, this study addresses a sustainable microgrid design problem, where *blockchain* technology is used for peer-to-peer energy trading in the microgrid. The *adoption* of the *blockchain* technology in peer-to-peer energy trading ensures the security and sustainability for participants in the microgrid. It enables the participants to take control of the energy system without the need for a central regulatory authority. The problem entails decisions regarding not only the power flow among entities in the grid and the number, location, and capacity of renewable distributed generation units but also the price mechanism for peer-to-peer trading. A sustainable network microgrid is modeled by considering economic and environmental objectives with social constraints related to maximizing demand satisfaction of consumers. A fuzzy multi-objective programming model is proposed to tackle the variability in the capacity of renewable distributed generation units and demand load. The proposed model is solved by a genetic algorithm. Numerical experiments are conducted to evaluate the *feasibility* of the proposed model in decision-making regarding microgrid design, the impact of peer-to-peer trading on the total profit of the microgrid, and the applicability of the developed solution approach (Thanh, 2021)

Conclusion:

As blockchain continues to garner attention as a disruptive technology, understanding its feasibility across industries is paramount. This systematic review seeks to contribute to the growing body of knowledge on blockchain adoption by offering a comprehensive analysis of its opportunities and challenges within diverse industrial contexts. By synthesizing existing research and empirical evidence, this review aims to inform strategic decision-making and spur further research and innovation in the field of blockchain technology. Several common themes emerge from the blockchain adoption and feasibility studies across supply chain, transportation, healthcare, banking/finance, and energy trading domains:

Cost Reduction

Blockchain can significantly reduce costs in various industries by eliminating intermediaries and inefficiencies. In banking and finance, it can save billions by improving processes like clearing and settlement. In energy trading, it removes the need for brokers, exchanges and clearing houses. Blockchain enables peer-to-peer energy trading, reducing costs for consumers.

Transparency and Traceability

The immutable record-keeping of blockchain provides transparency and traceability in supply chains, healthcare, and energy trading. It creates an audit trail that helps eliminate fraud and data redundancies. In energy trading, blockchain enables tracking the origin of energy and transparency of renewable energy certificates.

Improved Efficiency and Scalability

Blockchain can improve efficiency and scalability in various sectors. In supply chain operations, it enables real-time tracking of goods, reducing errors and delays. In healthcare, it can streamline

ISSN:2731-538X | E-ISSN:2731-5398
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processes and improve data management. Blockchain allows banks to directly connect for faster cross-border payments.

Challenges in Adoption

Despite the benefits, there are significant challenges in adopting blockchain across industries. These include technological immaturity, lack of standards, high costs, regulatory uncertainty, and resistance to change. Operational challenges like poor infrastructure, scalability, and integration with legacy systems also hinder adoption.

Potential for Disruption

Blockchain has the potential to disrupt and transform various industries. In banking and finance, it can modernize outdated systems. In energy, it enables new models like peer-to-peer trading. Blockchain is still in early stages, but its adoption is expected to grow rapidly as the technology matures and the challenges are addressed

References

Agarwal, A., 2021. Feasibility of Adoption of Blockchain Technology in Banking and Financial Sector of India. *Advances in Intelligent Systems and Computing.*

Burger, C., 2022. Blockchain Platforms in Energy Markets—A Critical Assessment. *Journal of Risk and Financial Management,* 15(11).

Buzachis, A., 2019. On the Design of a Blockchain-as-a-Service-Based Health Information Exchange (BaaS-HIE) System for Patient Monitoring. *Proceedings - IEEE Symposium on Computers and Communications.*

Chatfield, A. T., 2019. Blockchain investment decision making in central banks: A status quo bias theory perspective. *25th Americas Conference on Information Systems, AMCIS 2019.*

Chowdhury, S., 2023. Blockchain technology adoption for managing risks in operations and supply chain management: evidence from the UK. *Annals of Operations Research,* 327(1), pp. 539-574.

Condon, F., 2023. EnergyAuction: IoT-Blockchain Architecture for Local Peer-to-Peer Energy Trading in a Microgrid. *Sustainability,* 15(17).

Kadadha, M., 2024. Crowdsourced vehicles and UAVs for last-mile delivery application using blockchain-hosted matching mechanism. *Vehicular Communications,* 47(June).

Kumar, 2023. Developing a framework of sustainable technology footprint enablers in inter- and intra-organisational integrated supply chain transparency and traceability: using fuzzy ISM approach. *International Journal of Business Performance and Supply Chain Modelling,* 14(4).

Li, X., 2024. A blockchain-enabled personalized charging system for electric vehicles. *Transportation Research Part C: Emerging Technologies.*

Patil, K. P., 2024. Blockchain based security for connected smart vehicles - A study through the theoretical lens of fit-viability model. *AIP Conference Proceedings.*

ISSN:2731-538X | E-ISSN:2731-5398
Vol. 18 No. 01 (2024)

R., V., 2020. Blockchain Technology: A Paradigm Shift in Investment Banking. *Cryptocurrencies and blockchain technology.*

Samala, A. D., 2024. Transforming Healthcare Data Management: A Blockchain-Based Cloud EHR System for Enhanced Security and Interoperability. *International journal of online and biomedical engineering,* Volume 20, pp. 46-60.

Stamatellis, C., 2020. A privacy-preserving healthcare framework using hyperledger fabric. *Sensors (Switzerland),* Volume 20, pp. 1-14.

Thanh, V.-V., 2021. Toward sustainable microgrids with blockchain technology-based peer-to-peer energy trading mechanism: A fuzzy meta-heuristic approach. *Renewable and Sustainable Energy Reviews,* Volume 136.

Yuyan, W., 2023. Supply chain modelling considering blockchain improvement and publicity with fairness concern. *Journal of Intelligent Manufacturing.*

Ahmad, S., Mehfuz, S., Mebarek-Oudina, F., & Beg, J. (2022). RSM analysis based cloud access security broker: a systematic literature review. Cluster Computing, 25(5), 3733-3763.
Ahmad, S., Shakeel, I., Mehfuz, S., & Ahmad, J. (2023). Deep learning models for cloud, edge, fog, and IoT computing paradigms: Survey, recent advances, and future directions. Computer Science Review, 49, 100568.
Ahmad, S., Mehfuz, S., & Beg, J. (2021). Enhancing security of cloud platform with cloud access security broker. In Information and Communication Technology for Competitive Strategies (ICTCS 2020) Intelligent Strategies for ICT (pp. 325-335). Springer Singapore.
Urooj, S., Lata, S., Ahmad, S., Mehfuz, S., & Kalathil, S. (2023). Cryptographic data security for reliable wireless sensor network. Alexandria Engineering Journal, 72, 37-50.
Ahmad, S., Mehfuz, S., & Beg, J. (2022). Assessment on potential security threats and introducing novel data security model in cloud environment. Materials Today: Proceedings, 62, 4909-4915.
Okafor, C. E., Iweriolor, S., Ani, O. I., Ahmad, S., Mehfuz, S., Ekwueme, G. O., ... & Chikelu, O. P. (2023). Advances in machine learning-aided design of reinforced polymer composite and hybrid material systems. Hybrid Advances, 2, 100026.
Ahmad, S., & Mehfuz, S. (2024). Efficient time-oriented latency-based secure data encryption for cloud storage. Cyber Security and Applications, 2, 100027.
Ahmad, S., Mehfuz, S., & Beg, J. (2023). Hybrid cryptographic approach to enhance the mode of key management system in cloud environment. The Journal of Supercomputing, 79(7), 7377-7413.
Ahmad, S., Mehfuz, S., & Beg, J. (2022). Cloud security framework and key management services collectively for implementing DLP and IRM. Materials Today: Proceedings, 62, 4828-4836.
Ahmad, S., Mehfuz, S., & Beg, J. (2020, December). Securely work from home with CASB policies under COVID-19 pandemic: a short review. In 2020 9th International conference system modeling and advancement in research trends (SMART) (pp. 109-114). IEEE.
Tătăranu, E., Diaconescu, S., Ivănescu, C. G., Sârbu, I., & Stamatin, M. (2016). Clinical,

ISSN:2731-538X | E-ISSN:2731-5398
Vol. 18 No. 01 (2024)

immunological and pathological profile of infants suffering from cow's milk protein allergy. Romanian journal of morphology and embryology = Revue roumaine de morphologie et embryologie, 57(3), 1031–1035.

Ciongradi, C. I., Sârbu, I., Iliescu Halițchi, C. O., Benchia, D., & Sârbu, K. (2021). Fertility of Cryptorchid Testis-An Unsolved Mistery. Genes, 12(12), 1894. https://doi.org/10.3390/genes12121894

Ciongradi, C. I., Filip, F., Sârbu, I., Iliescu Halițchi, C. O., Munteanu, V., & Candussi, I. L. (2022). The Impact of Water and Other Fluids on Pediatric Nephrolithiasis. Nutrients, 14(19), 4161. https://doi.org/10.3390/nu14194161

Ciongradi, C. I., Benchia, D., Stupu, C. A., Iliescu Halițchi, C. O., & Sârbu, I. (2022). Quality of Life in Pediatric Patients with Continent Urinary Diversion-A Single Center Experience. International journal of environmental research and public health, 19(15), 9628. https://doi.org/10.3390/ijerph19159628

Popa, Ș., Apostol, D., Bîcă, O., Benchia, D., Sârbu, I., & Ciongradi, C. I. (2021). Prenatally Diagnosed Infantile Myofibroma of Sartorius Muscle-A Differential for Soft Tissue Masses in Early Infancy. Diagnostics (Basel, Switzerland), 11(12), 2389. https://doi.org/10.3390/diagnostics11122389

Mohammed, A. H. (2021). Fish Schooling And Sorensen Trust Based Wireless Sensor Network Optimization. International Journal, 9, 6.

Mohammed, A. H. DDoS Malicious Node Detection by Jaccard and Page Rank Algorithm in Cloud Environment.

Mohammed, A. H. (2021). Invasive Weed Optimization Based Ransom-Ware Detection in Cloud Environment.

Purohit, S. (2023). California Geographical Society, 96162, California, United States. Journal of Environmental Science and Public Health, 7, 176-184.

Purohit, S. Role of Industrialization and Urbanization in Regional Sustainable Development–Reflections from Tier-II Cities in India.

Purohit, M. S. (2012). Resource management in the desert ecosystem of Nagaur district_ An ecological study of land _agriculture_ water and human resources (Doctoral dissertation, Maharaja Ganga Singh University).

Faisal, L., Rama, V. S. B., Roy, S., & Nath, S. (2022). Modelling of Electric Vehicle Using Modified SEPIC Converter Configuration to Enhance DC–DC Converter Performance Using MATLAB. In Smart Energy and Advancement in Power Technologies: Select Proceedings of ICSEAPT 2021, Volume 2 (pp. 643-653). Singapore: Springer Nature Singapore.

Faisal, L., Rama, V. S. B., Yang, J. M., Wajid, A., & Ghorui, S. K. (2022, May). Performance and Simulation Analysis of IPMSyncRM (Internal Permanent Magnet Synchronous Reluctance Motor) for Advanced Electric Vehicle Design. In 2022 3rd International Conference for Emerging Technology (INCET) (pp. 1-6). IEEE.

Faisal, L., Rama, V. S. B., Yang, J. M., Wajid, A., & Ghorui, S. K. (2022, May). Performance and Simulation Analysis of IPMSyncRM (Internal Permanent Magnet Synchronous Reluctance Motor) for Advanced Electric Vehicle Design. In 2022 3rd International Conference for

ISSN:2731-538X | E-ISSN:2731-5398
Vol. 18 No. 01 (2024)

Emerging Technology (INCET) (pp. 1-6). IEEE.
Mohd, R., & Faisal, L. (2022). Smart Agricultural Practices using Machine Learning techniques For Rainfall Prediction: A case Study of Valkenburg station, Netherlands. Mathematical Statistician and Engineering Applications, 71(4), 8451-8462.