Identify the Key Success Factors and Enabling Strategies for Successful Blockchain Implementation in Supply Chain

Saranya Muthuraj
MBA-MS Student
Amrita School of Business
Amrita Vishwa Vidyapeetham University
Bengaluru, India
saranyamuthuraj1695@gmail.com

Dr. Shekar Babu PhD
Professor & Founding Head
Amrita Vishwa Vidyapeetham University
Bengaluru, India
sb@amrita.edu

Shijith Kumar PM
Assistant Professor
SolBridge International School of Business,
Woosong University
Daejeon, South Korea
Shijith.pm@solbridge.ac.kr

Abstract

Blockchain is one of the emerging trends that could transform Supply Chains making it robust and secure. Effective management of Supply Chains is crucial in industries such as finance, healthcare, food, and logistics not just at a time of pandemic but also for routine operations. Supply chain processes are potential sources of competitive advantage for firms in a highly competitive market. Blockchain in Supply chains will be a disruptive innovation that could significantly transform Supply Chains. Implementing blockchain could reduce costs, reduce administrative and logistical errors, speed up the processes and make the entire supply chain very dynamic and streamlined to all stakeholders. This paper aims to understand how various firms from different industries have effectively implemented blockchain technologies in their supply chain processes to improve transparency, integrity, and accessibility. Information asymmetry is quite common in supply chains and is a serious issue in current times especially during an ongoing pandemic. Blockchain could also aid in minimizing information asymmetry at different stages of the supply chain. This paper using a case study approach aims to highlight how different industries strategically use blockchain to their competitive advantage.

Keywords

Blockchain, Supply Chain, Strategic benefits, Information Asymmetry and Transparency.

1. Introduction

Blockchain was developed by Satoshi Nakamoto (pseudonym) to enable Bitcoin transactions. It collectively maintained a reliable database through decentralization and trust. Blockchain did not use any data managers, or a central institution thereby being decentralized and making data immutable. It eliminates the need to rely on third-party vendors to verify and handle data. The underlying technology was Cryptography and a mathematically distributed algorithm. Blockchain is a secure, encrypted, peer-to-peer database architecture that uses blocks to maintain a comprehensive list of records which thereby expands by connecting individual blocks through interconnected chains that connects the blocks and expands further. It serves as the open public transaction and distribution ledger.

Blockchain is an open distributed ledger records transaction between two entities in an efficient, certifiable, and permanent way. It paved the viable way for digital trust challenge because of its transparency, decentralization, time-stamped and perpetual.

A Supply chain is a network that an organization has amongst its suppliers, distributors, and customers for the distribution of a particular product or service. Supply chain is integral in industries to deliver the desired value to the consumers of the organization. Global networks are inherently designed to take advantage of resource availability, customer proximity and aspects such as cost, demographics, and socio-cultural aspects. In order to lower the barrier and promote free markets globally, countries are encouraged to upscale their abilities in narrow areas to create a highly reliable and inter-related system. The current period following the COVID-19 pandemic has put the global supply chain under pressure due to the existing turbulent geopolitical situation, shipping issues, good availability, and surge in demand. The risk of supply chain disruption is clearly high and reflected globally. The pandemic also offers an opportunity to reset the supply chain and make it more customer-centric and digitally enabled. This reset will pave way for Blockchain, as it is mentioned as one of the emerging upcoming trends. A lot of companies have already adopted this technology to strengthen their supply chain. The technology of blockchain should be adopted by supply chain managers for their operations since it virtually makes all transactions more “traceable and efficient” (Aste et al. 2017). In addition, the cohesive working amongst the supply chain members drastically increases, thereby reflecting on cost reduction and agility in the supply chain. Blockchain enhances customers’ trust allowing them to view the complete journey of goods across the supply chain. In this regard, traceability mechanisms of blockchain assist the prevention of fraud and counterfeit products across the supply chains.

The aim of this research study is to understand how blockchain is leveraged across industries, especially in industries where transactions in supply chain contribute to their overall competitive advantage. The key success factors that the supply chain provides to different industries can be understood and identified, servicing as a motivation for other industries to utilize this platform. Existing literature emphasizes the necessity for social network analysis to facilitate the understanding of the correlation of key success factors (KSF) and derive the market enabling strategies in a streamlined manner. Developing relationships in a network that operates within the same industry also enhances profitability. Therefore, blockchain is a promising trend to be used in a permissioned manner to share necessary information across groups and elevate their coordination, for example, with respect to key suppliers. Another integral development that is currently being understood is the amalgamation of demand with supply chain functions and modifying operations such as production or service levels, marketing strategies and customer retention. Understanding the supply chain throughout will also throw light on the evaluation of risk and uncertainty, particularly in global supply networks (Sydow and Frenkel 2013). In health care, coordinating all of the care processes can be achieved using blockchain, preventing leak of patient data, enhancing secure experiences, trust and accessibility (Sampson et al. 2015)

However, implementation of Blockchain in the supply chain will involve several challenges in an organization and risks involved. Various regulatory guidelines are to be followed and significant budget allocation will also be required. This paper will furthermore study the winning strategies that have directly translated into a competitive advantage, corresponding to the industries and will make it easier to identify the success factors and strategies as a whole in the end.

1.1 Objectives

The research objectives include:

- 1.1.1 Perform case analysis of different industries and their supply chain
- 1.1.2 See how blockchain is leveraged across these industries
- 1.1.3 Understand the enabling strategies of this implementation in various industries

2. Literature Review

Recent studies are scrutinizing the critical impact of blockchain in supply chains because, “elements such as cost, quality, risk reduction, flexibility, and improved transparency” (Kshetri 2018). Along with minimising issues such as product traceability problems (Biswas et al. 2017) and anti-counterfeits (Toyoda et al. 2017). Most organizations clearly want to take the advantages that are brought in by blockchain through its process of enhancing the operations and making the supply chain very safe, secure, transparent reliable, agile, and efficient (Kshetri 2018). It also improves trust and dependability across the supply chain network and increases cooperation amongst the stakeholders of the businesses. The significant distinctive of blockchain is the “security” (Aste et al. 2017). It also has the prospective to promote a reengineering of all the relationships in the supply chain. The upcoming trends are also seeing combinations

of blockchain with cutting edge technologies such as "Internet of Things (IoT)" as per (Banerjee et al. 2018), "cyber-physical systema (CPS)" as per (Yin et al. 2017) and "big data analytics (BDA)" as per (Li et al. 2018). Relevant data to validate these concepts are on the rise and researchers have been trying to understand the performance of professionals in the blockchain embracing process and related facilitating conditions (Queiroz and Wamba 2019). This paper aims to understand these leveraging factors and identify the key strategies and areas blockchain has been used successfully to capture the market and contribute to the competitive advantage of companies.

2.1 Blockchain to enhance supplier integrity

Some studies have been performed on various industries to test out blockchain and this resulted in increasing the integrity quotient of their business. Need for robust and transparent supply chain because of increasing consumer awareness of a product, fair trade, blood diamonds, increasing competitors and asymmetrical information (Parker 2016). The issues in supply chain can be overcome by blockchain, because of its ability to track down each step of the supply chain from sourcing materials to end consumer with all associated transactions, provides symmetrical information and creates permanent and public records, thereby creating accountability. All of this will help in understanding the demand from supplier and consumer sides. Companies that can adapt blockchain and incorporate it into their business strategies are high-end luxury companies to reduce counterfeits and improve customer loyalty, fair trade organizations that use sustainable sourcing and ethical sourcing and multinationals that do cross-border transactions. Blockchain can be used as a competitive advantage in the areas of brand equity, brand value, customer perception and targeted marketing strategies. Some challenges may include cost, scale, information safety and regulatory restrictions (Parker 2016).

2.2 Blockchain in Pharmaceutical Industry supply chain

One of the leading industries scaling up using blockchain in the healthcare industry. Problems in the medical supply chain have been persistent over the years. Recent times of the pandemic fueled the troubles by giving fraudulent respirators, unknown sources for N95 masks and other PPEs. Blockchain can make the process cheaper, easier, faster, and authentic as companies can co-exist in a shared and permanent ledger without giving up control of their data. MediLedger network is a consortium with many leading pharma members. It provides product verification and only distributes authentic drugs, the serial numbers are tracked down and the manufacturers can be contacted in less than a second using barcode scanners, where the traditional process takes up to 48 hours (McCauley 2020). MediLedger is also working further on developing this to increase visibility in their real-time drug delivery amongst wholesalers, retailers and consumers from manufacturers and distributors. The Drug Supply Chain Security Act 2013 gave a deadline till 2023 to achieve "track and trace" in all its transactions supporting and demanding the need for a more secure supply chain. With enhanced granular visibility, anti-tampering security, stakeholders can better narrow down on clogs in the supply chain, they can also locate and remove expired products as a faster pace. Damaged, fraudulent products can be prevented from entering the system. Checking where supplies are on the low and efficiently redistributing inventory to where it is most needed during crises like the pandemic (McCauley 2020). Blockchain has not only automated the process of supply chain but incorporated smart procurement contracts as well during the time of COVID in the healthcare system (Omar et al. 2021). This was done to avoid poor procurement, ordering, forecasting, and distribution practices for group purchasing organizations (Omar et al. 2021).

2.3 Blockchain in Logistics platform supply chain

Platform-based business models are extensively using technology and innovation for better visible logistics data, the reason being immense pressure to reduce the operational cost of supply chain. Giants such as Maersk and IBM partnered to launch TradeLens (a blockchain-based platform) for global shipments involving multiple stakeholders. Event data and document information is available on blocks with automatic contract execution. Key success features include eliminating human errors, delays, and loss in the documentation (Choudary et al. 2019). TRIP in Singapore is another solution connecting distinct logistics stakeholders. Supply chain efficiency and be continuously optimized using APIs where two software can interact with each other. Alibaba's Cainiao, UPS's Ware2Go and project44 are some more examples of platforms that connect e-commerce companies to some logistics players thereby enhancing delivery and being able to provide last-mile deliveries (Choudary et al. 2019).

3. Methods

The method used is a qualitative study based on case studies for a comprehensive understanding of concepts and success factors (Danese et al. 2021). Empirical research on the use of blockchain in supply chains and how various industries are using it to their strategic advantage is still a topic to explore, and thus, qualitative studies based on case

studies were chosen as the model. While addressing the "how" questions and probing the current or contemporary events, a multiple-case study method works especially well (Yin 2017). Moreover, the purposefulness of this study is building on theory and research-based case studies that will facilitate a full understanding of the real-life complex phenomenon in its natural setting and in identifying critical factors (Yin 2017).

3.1 Case Selection

Cases selection was done based upon literal as well as theoretical replication (Yin 2017). We also intentionally searched for companies that would show some parallels and differences in a contrasting manner in terms of different industries and how they have adopted the blockchain mechanism. The purpose was to look at a spectrum of industries and their supply chains, we included companies that developed blockchain systems and companies that adopted systems developed by different technological firms using internet searches and pulling out various cases that contributed to secondary data collection.

3.2 Case Analysis

Each case study was thoroughly read to understand how the organization operated and if blockchain had contributed to major organizational growth (Danese et al. 2021). Detailed case analysis was written for each of the cases and then this was summarized with the help of various case questions and blockchain areas. Furthermore, from the case analysis, a summary of the most crucial point was documented. Then their advantages and constraints were documented, and this contributed to the key success factors (KSF) and challenges. The relevance of these key success factors on an industry level was understood by considering enabling strategies. The enabling strategies were what made the business a success.

4. Data Collection

The study involved reading various cases through industries and understanding their use of blockchain technology as a strategic fit, adding to their core values and competitive advantage.

Company	Industry	Key Success Factors (KSF)
TradeIX	**Finance supply chain**	General Workflow: Due to a high degree of complexity and low buffer stocks in healthcare, it is susceptible to constraints. Blockchain technology ensures data availability to different parties thereby increasing robustness.
		Safety: Writing contracts to always ensure compliance of stakeholders and defining a set of formulated rules using smart contracts.
		Visibility: Dedicated interface without infrastructural changes during movement of data, access is gained only for related data in the supply chain and there is no authority to manipulate data.
		The Marco-polo platform is based on permissioned blockchain (R3 corda) for supply chain.
		The platform enabled by blockchain of TradeIX provides the infrastructure that enabled secure and distributed storage of trade finance data, smart contracts, asset verification and many other features such as access controls and management of data.
Coda Coffee	**Food Supply chain**	The overall goal of the company was to provide the highest standards of verified social and environmental performance. There is also public transparency and legal accountability balancing profit and purpose.
		Using Blockchain and IoT are used to enable alignment with their organizational goal.

		Leveraging machine vision as well as artificial intelligence (Ai) to determine quality of the coffee bean along with the accountability of the bean and knowledge of payment. The payment is made instantly favoring the farmers.
		Bext360 offers SaaS solution which provides horizontal permissions ensuring appropriate visibility and data entry across the supply chain. Providing complete transparency to the owner.
Walmart	**Meat processing supply chain**	Transparency
		Sell-by date
		Using supply chain to capture the origin of each meat piece and how long it was stored, along with its location.
IBM	**Automation Robotics, Cloud computing, Consulting, Blockchain, Computer hardware and software, Quantum computing, Artificial intelligence**	**TYS:** Trust your Supplier platform to reduce errors and fraud in the global supply chain.
		The success factors for IBM because of TYS were accelerated supplier onboarding, lower procurement operating costs, faster supplier assessments, streamlined insight sharing, lower compliance risk and accessing verified data.
		Rapid Supplier Connect: Built the strongest ecosystem of buyer-supplier-product-service.
		Provided critical supply chain visibility into availability, timing, capacities, and deliveries of PPE's during COVID.
		Offered at no cost during COVID, to hospitals in US and Canada, with over 200 suppliers and over 4000 from Worldwide Supply Chain Federation. Buyers were healthcare organizations and hospitals.
Jingdong (JD)	**E-Commerce and retail infrastructure provider**	Blockchain enabled E-invoice shows legal proof for tax payments for the seller and identifies the tax input by buyer.
		Need for blockchain to electricize the Value added tax (VAT) special invoice using JD Block-chain Open Platform based on e-procurement, for integrating finance, procurement, and re-imbursement.
		The features of their procurement supply chain included customization, strong security, high performance, and privacy protection, effective data governance, multi-chain coordination, cross-cloud networking, and low cost with ease of maintenance.
		Challenges: Any intentional or unintentional changes made in cross border trade are immutable
		Complex encryption keys are another advantage.
Chow Tai Fook (CTF)	**Diamond Jewelry Industry**	Challenges: Inconsistent information sharing across the entire network, multiple versions of the same document.
		Fraud, increase in quality of synthetic diamonds, blood diamonds
		Need for corporate image and social responsibility
		Three aspects – Distribution, Decentralized, Public ledger (Records all information: Time stamp, date, dollar amount) with encryption function (hashing)
		Leveraging blockchain to face declining sales trend

		Main business strategy – Innovation in its business model
		CTF uses blockchain to record diamond grading in its Block-chain ledger being immutable and traceable
		Ensures consumers are well protected without compromising data security and product authenticity
		Diamonds have a unique set of serial numbers using proprietary Nano inscription technology
		Blockchain assigns serial numbers and enters the number into ledgers for the customer to find if its blood or synthetic diamond and also records customer purchase data – generates customer level data with digital certifications
		Pricing for blockchain diamonds is same as non-blockchain diamonds with no additional charge
		Blockchain Connects: mining, sorting, exploration, cutting, polishing, jewelry manufacturing and retailing
		Each step being stored in the blocks
Good Shepherd Pharmacy	**Healthcare Industry**	A charity pharmacy in Tennessee where individuals can donate drugs that haven't expired. The owner Phil Baker also co-founded Remedi LLC and recruited a team to distribute these usable drugs efficiently and securely to the needy.
		Blockchain was fueled by regulatory developments such as DSCSA and HL7 FHIR. DSCSA enhanced package-level product tracing. HL7 FHIR- interoperability.
		In 2019 they agreed to a blockchain enable consortium for the redistribution process of the drugs, A local pilot analyzed the feasibility of this delivery verification process.
		Each block would be timestamped and there would be a cryptographic hash preceding it. A consensus mechanism validated transactions and it was also used to configure smart contracts.
		The use of permissioned blockchain, where there would be centralized administrators giving access to various players in the supply chain for the type of information exchange and modification that happens in the supply chain.
		Blockchain is considered an emerging technology in transportation and logistics and specifically in healthcare.
		In healthcare it is hoped to reduce medical waste, counterfeit drugs and recalls while helping companies comply with the standards and regulations.
		A block could be described as an event such as the Good Shepherd dispensing a unit of Gleevec capsules verified through barcode scanners, the block would contain all the information such as transaction date, time, drug name, price, quality, barcode, dispensing pharmacist, conditions of storage.

		If blockchain was incorporated into their supply chain, it would provide an irrefutable chain of custody. This would also be highly secure.
		This would also comply with the HIPPA privacy requirements.
		ScripRide was a mobile app developed for delivering and picking up these medications that would also be incorporated into the blockchain.
Ping An: Pioneering the New Model of "Technology-driven Finance"	**Fintech and healthtech conglomerate**	There are four ecosystems in Ping An, namely, financial services, healthcare, automobile services and real estate services.
		Internal developments in technology while most companies outsource.
		Built world's largest commercial blockchain platform connecting over 200 banks and 2,00,000 companies.
		Ping An developed scenarios first, built traffic, generated revenue and made profit. The new model offered free services before priced products using technology.
		Ping's OneConnect used AI and Blockchain and filed over 2200 patents.
		The smart ecosystem used blockchain to increase traceability, efficiency, and visibility in all their supply chains.
Chateu Lafite Rothschild	**Exquisite and expensive wine**	The significance of blockchain can be leveraged to increase traceability and prevent counterfeit wine from entering the supply chain.
		Emerging blockchain technology is beyond just technology to enable efficient supply chain but can be seen as an integral part of the firm in its IT strategies.
		Traceability has 4 dimensions, depth (economic and safety perspective), breadth (number of attributes to each traceable item), precision and access (speed of tracking).
		The typical challenges companies faced were limitations in terms of awareness (high investment), economic limitations, information, and lack of standardized info.
		Key success features were transaction transparency, confidence to trade, traceability. The use of type of blockchain was to be identified, public and private, the benefits of private blockchain include security, anonymity, consensus, ask and access data along the secure private blockchain, own terms for digital contracts in a specific market, knowledge of the technology.
		Five incentives for companies adopting upcoming technologies such as blockchain: opportunistic, evolutionary, Trojan horse solution (more power to the owner), avoiding fear of missing out and ability to transform current business model.
		Some limitations in the wine industry are from an economic perspective, where improving traceability is highly expensive, labor, thought and work can go into improving the quality of the wine in the meantime, lack of awareness in consumers about counterfeit wines is another.

		If Lafite should take up upcoming technologies such as blockchain technology, they should develop a stop core IT team or outsource to companies such as EY OPS (2017).
Beef Chain	**Dynamics of Traceability, Quality and Value capture in Beef Industry**	First Blockchain company to receive certification from USDA, PVP (Process Verified Program) certification.
		Provide significant economic benefit to ranchers.
		Beef Chain captured valuable data on cattle's health, provenance and incorporating feed plots, packers, retailers, exporters, and beef brands provided improved traceability for end consumers and generating stronger brand loyalty.
		Block Chain in food industry adds trust, transparency, and traceability. It reduces costs across logistics and financing.
		The best-known blockchain application in the food industry is the IBM Food Trust project.
		Firms can store and access data about harvests, processing, packaging, and shipping allowing trace-back in seconds.
		Tracing the cattle from birth to slaughter incorporating Rancher, sale barn, feed plot, processor and retailer on its custom block chain solution is the aim of Beef Chain.
		To prove the provenance of certified Wyoming beef from pasture to plate and allow ranchers to capture more value via higher margin raising and certification programs focusing on markets interested in untainted meat.
		Technologies used: RFID tags, Internet of Things (IOT), Smart devices, GPS, QR Codes to fuel its block-chain network.
		Lower audit times and costs, better tracking of the beef supply chain.
		RFID tags were used to record pertinent information such as parentage, geo-location, time stamp, vaccines, injuries, and treatments by manual upload or IOT devices and verified by Beef Chain members, then stored on the ledger which can't be manipulated.
Maersk: Betting on Blockchain Joint venture with IBM	**Container, shipping, and transport industry**	Companies in global logistics had minimal visibility into the status of goods as it moved through the supply chain prior.
		Communication which is complicated increases administrative costs between firms. Therefore, needs an integrative approach.
		IBM and Maersk together partnered on a new global trade digitization (GTD) platform using Blockchain.
		GTD aimed to reduce discrepancies in shipping and improve coordination and visibility, proven using pilot studies.
		This platform would be made available to every stakeholder, such as freight forwarders, ports, shippers, customs, rival shipping lanes and on with different value propositions for every player.
		GTD would serve as a single conduit of truth and also enhance trust between players as every change will also be visible and verifiable.

		Safe, secure, and seamless transfer of information that would be paperless, in the supply chain, amongst players that happens real time.
		One challenge would be other players using the information present on the chain to their own benefit, resulting in loss of competency, this can be overcome by using blockchain contracts.
		Inconsistent information across organizational boundaries had blind spots that intervened the efficient flow of goods across the supply chain, this was also complex, cumbersome, time consuming, manual, and expensive. Risk assessments in traditional shipments lacked knowledge of the whole supply chain thereby not clearly stating solutions to shipment issues.
		The new GTD would make the process fast, secure and access to end-to-end supply chain formation that has better risk assessments and fewer interventions that are unnecessary. This would also lower administrative expenses.

5. Results and Discussion

Several factors were understood to contribute to the strategic advantage of firms when leveraging Blockchain technology towards their supply chain aspects. The most predominant ones were found to be in terms of transparency, visibility along the supply chain, decentralization, safety, removing information asymmetry, integrity, and immutability. There are several government regulations that are coming into effect as of 2021 in India to enhance use of blockchain and to streamline their operations and make supply chain very robust and therefore establishing that adopting upcoming technology will be the best way for economic growth to the country.

Some of the key enabling strategies that companies under their industry use are mentioned below:

Industry	**Enabling strategies for competitive advantage**	**Company**
Global Finance	Platform harmonization using blockchain and creating a seamless network in finance to mitigate global supply chain risk. All invoice details and insurance eligibility between bank and insurance was handled using this harmonized network with smart contracts.	**TradeIX**
Food Supply chain	Using blockchain and embedding sustainability into operations as a part of sourcing and creating strategic partnerships with companies that enable transparency and visibility.	**Coda Coffee and Bext360**
	The meat processing was made easier and transparent through blockchain technology, building an adaptive and agile supply chain with integrated production	**Walmart**
	In the exquisite wine industry, blockchain enabled integrating transparency and traceability into its	**Chateu Lafite Rothschild**

	core process of wine production. These two aspects will eliminate the risk of counterfeit wine enabling the organization to achieve a better reputation and larger consumer retention for their exquisite wine. This will eventually lead to a higher market share.	
Food processing	Producing fully integrated supply chain starting from the birth of the cattle to consumer and utilizing upcoming technology like blockchain for the same. It reduced costs across logistics and financing upon assuring best quality of meat across consumers.	**Beef chain**
Container, shipping, and transport industry	Strategic alliances created with top end companies like IBM for sustainable profit, integrating with their strategic component in the company. Provided integrated and harmonized delivery using the blockchain platform with better visibility in cross-border and global shipping using GTD.	**Maersk**
Health care	Ability to create a responsive and agile supply chain, integrating and managing real-time demand insights and supply efficiently with blockchain and reducing medical waste, counterfeit drugs and recalls. Aiming to capture larger market share and expand across countries in terms of charity pharmacy and giving unexpired medicines to the needy.	**Good Shepherd Pharmacy**
Fintech and Healthtech conglomerate	Creating an ecosystem using blockchain that is in-built with extensive budget spending to strengthen all their services and institute profitable innovation.	**Ping An**
Diamond Jewelry Industry	Putting up the price of blockchain diamonds same as the non-blockchain diamonds, thereby signaling that blockchain will be the future of diamond industry to reduce counterfeit and blood diamonds. The supply chain was well integrated at each step using time stamped data and was made visible across.	**Chow Tai Fook**
Automation, software, and cloud computing	Developed Rapid Supplier Connect and built the strongest ecosystem of buyer-supplier-product-service in the Trust your Supplier platform.	**IBM-TYS (Trust your supplier platform)**

	Used for distribution of PPE's during COVID-19 pandemic.	
Jingdong (JD)	Enabling e-invoice and emerging blockchain into core operations in a tactical way to electricize the VAT special invoice. Strengthened in-built blockchain using complex encryption keys to have a reliable supply chain. This significantly reduced the cost of maintenance.	**E-Commerce and retail infrastructure provider**

Upon discussing the benefits, there also lies some challenges for this use of Blockchain in supply chain:

1. **Significant budget requirement:** Outsourcing the key aspect of the supply chain may pose a threat to many industries and thus, they try to incorporate blockchain into their system itself, this would need an organizational change and require extensive spending and hence many companies may be unwilling to move towards blockchain. The best choice for such companies would be to use platforms of other reliable vendors for blockchain platforms in supply chain.
2. **Lack of understanding:** Any new technology or an emerging trend such as blockchain may not be fully understandable to companies that lack technology-wise, especially in developing countries. This is where government regulations play a major hand in investing in technologies like blockchain to stress the importance of technology for business and innovation.
3. **Immutability:** Although immutability is a strength, it can also pose as a weakness especially in cross-border transactions because any unintentional or erroneous change made can be difficult to rectify immediately in global transactions with multiple approvals.
4. **Choosing the best-suited blockchain:** Another serious challenge would be companies trying to understand which blockchain is best-suited for them, for this, the management and strategic decisions team needs to have a complete understanding of the over business and core competencies. This will aid them to decide which type of blockchain is to be used, whether it must be permissioned or un-permissioned, whom all to give access rights to and how it will be incorporated. This change may not only be budget-consuming but also time-consuming in a rapidly evolving dynamic market.
5. **Regulatory issues:** Blockchain is a technology that will significantly improve business. This would also mean increased profitability across industries; the regulatory bodies can levy tax on the use of such technologies alongside supporting it.

6. Conclusion

We aimed to highlight on the adoption of blockchain for supply chain activities and the operational strategies that contributed to market competitive advantages in various industries in this research paper. Our model of the study was to use case studies and understand the work of blockchain on various industries, upon reading the cases, prominent success factors emerged and were captured. Common success factors can be seen across industries, however, using it to their strategic advantage is narrowed down to organizations. The understanding of where and how to leverage blockchain is very crucial to reap the maximum cost and value benefits. This is where our study of enabling strategies helps to identify the niche area of an industry where blockchain can be used. However, during our case analysis, there were also several challenges organizations faced to adapt to blockchain technology and the same was understood. This study can be furthered with more narrowed down industries and the niche markets they function in to help industries easily take up this emerging technology.

References

Aste, T., Tasca, P., & Di Matteo, T., Blockchain technologies: The foreseeable impact on society and industry. Computer, 50(9), 18–28, 2017.

Biswas, K., Muthukkumarasamy, V., & Tan, W. L., Blockchain based wine supply chain traceability system, Future Technologies Conference, Vancouver, pp. 56-62, Canada, December 2017.

BeefChain: Blockchain and the Dynamics of Traceability, Quality and Value Capture in the Beef Industry. Available at: https://store.hbr.org/product/beefchain-blockchain-and-the-dynamics-of-traceability-quality-and-value-capture-in-the-beef-industry/IN1704

Borgatti, S. P., & LI, X. U. N., On social network analysis in a supply chain context. The Journal of Supply Chain Management, 45(2), 5–22, 2009.

Chaudary, S, Alstyne, M and Parker, G, Platforms and Blockchain Will Transform Logistics, Harvard Business Review.
Available at: https://hbr.org/2019/06/platforms-and-blockchain-will-transform-logistics, August 30, 2021.

Chow Tai Fook: Blockchain for the Diamond Industry. Available at: https://store.hbr.org/product/chow-tai-fook-blockchain-for-the-diamond-industry/W20143

Danese, P., Mocellin, R., and Romano, P., Designing blockchain systems to prevent counterfeiting in wine supply chains: a multiple-case study. International Journal of Operations & Production Management, vol 41 No.13, pp 1–33, 2021.

Grandori, A., & Soda, G., Inter-firm networks: Antecedents, mechanisms and forms. Organization Studies, 16(2), 183–214, 1995.

Goode, H and Gogan, J, Good Shepherd Pharmacy and Remedi: Will this Blockchain Deliver Donated Drugs to Needy Patients? Available at: https://store.hbr.org/product/good-shepherd-pharmacy-and-remedichain-will-this-blockchain-deliver-donated-drugs-to-needy-patients/NA0613

JD: E-Invoice with Blockchain, Available at: https://store.hbr.org/product/jd-e-invoice-with-blockchain/W20197

Kshetri, N., Blockchain's roles in meeting key supply chain management objectives. International Journal of Information Management, 39(June 2017), 80–89, 2018.

Lal, R. and Johnson, S., Maersk: Betting on Blockchain, Available at: https://www.hbs.edu/faculty/Pages/item.aspx?num=54373

Li, Z., Wang, W. M., Liu, G., Liu, L., He, J., & Huang, G. Q., Toward open manufacturing. Industrial Management & Data Systems, 118(1), 303–320, 2018.

McCauley, A., Why Big Pharma Is Betting on Blockchain, Harvard Business Review. Available at: https://hbr.org/2020/05/why-big-pharma-is-betting-on-blockchain, August 30, 2021.

Omar, I. A., Jayaraman, R., Debe, M. S., Salah, K., Yaqoob, I., & Omar, M., Automating Procurement Contracts in the Healthcare Supply Chain Using Blockchain Smart Contracts. IEEE Access, 9, 37397–37409, 2021.

Queiroz, M. M., and Fosso Wamba, S., Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. International Journal of Information Management, 46, 70–82, 2019.

Sampson, S. E., Schmidt, G., Gardner, J. W., & Van Orden, J., Process coordination within a health care service supply network. Journal of Business Logistics, 36(4), 355–373, 2015.

Stolze, H. J., Murfield, M. L. U., & Esper, T. L., The role of social mechanisms in demand and supply integration: An individual network perspective. Journal of Business Logistics, 36(1), 49–68, 2015.

Sydow, J., & Frenkel, S. J., Labor, risk, and uncertainty in global supply networks – Exploratory insights. Journal of Business Logistics, 34(3), 236–247, 2013.

Tichy, N. M., Tushman, M. L., Fombrun, C., & Tushman, M. L., Social network analysis for organizations. The Academy of Management Review, 4(4), 507–519, 1979.

Toyoda, K., Mathiopoulos, P. T., Sasase, I., & Ohtsuki, T., A Novel blockchain- based Product Ownership Management System (POMS) for anti-counterfeits in the post supply chain. IEEE Access, XXX(XXX), 1–13, 2017.

TradeIX: Blockchain-enabled Trade Finance in Global Supply Chains. Available at: https://store.hbr.org/product/tradeix-blockchain-enabled-trade-finance-in-global-supply-chains/W20650

Wagner, S. M., & Buko, C., An Empirical Investigation of Knowledge-Sharing in Networks. The Journal of Supply Chain Management, 41(4), 17–31, 2005.

Yen, B and Huang, M. Can Blockchain Help Château Lafite Fight Counterfeits? Available at: https://store.hbr.org/product/can-blockchain-help-chateau-lafite-fight-counterfeits/HK1237

Yin, R.K., Case Study Research and Applications: Design and Methods, 6th Edition, Sage Publications, Thousand Oaks, California, 2017.

Youngdahl, E. W., Coda Coffee and Bext360 Supply Chain: Machine Vision, AI, IoT, and Blockchain. Available at: https://store.hbr.org/product/coda-coffee-and-bext360-supply-chain-machine-vision-ai-iot-and-blockchain/TB0539

Youngdahl, E. W and Hunsaker, B, Rapid Supplier Connect: Leveraging Blockchain for Urgent Sourcing of PPE and Medical Supplier. Available at: https://store.hbr.org/product/rapid-supplier-connect-leveraging-blockchain-for-urgent-sourcing-of-ppe-and-medical-supplies/TB0621

Zelbst, P.J., Green, K.W., Sower, V.E. and Bond, P.L., The impact of RFID, IoT, and blockchain technologies on supply chain transparency, Journal of Manufacturing Technology Management, Vol. 31 No. 3, 441-457, 2019.
Zhu, F.,Woo K.A., Dai H.N., Ping An: Pioneering the New Model of "Technology-driven Finance". Available at: https://hbsp.harvard.edu/product/620068-PDF-ENG

Biographies

Ms. Saranya Muthuraj is a student of "Amrita School of Business, AMRITA Vishwa Vidyapeetham University, Bangalore, India and is also pursuing her dual degree as Master of Information Science (MS) in Systems: Business Analytics from University at Buffalo SUNY, New York, USA. She holds a Bachelor of Technology (B.Tech) degree in Biotechnology from SRM University, Chennai, Tamil Nadu India. Catering to follow one's own passion, she kick-started her career in Biotechnology at Syngene as a Research Associate in Clinical Operations and moved to specializing in Business Operations during her Masters. Her prime area of interest lies around Supply Chain, Logistics, Blockchain and technology.

Dr. Shekar Babu is a Professor and Director of "Amrita Center for Responsible Innovations and Sustainable Enterprises", "ARISE" Labs. He is also the Founding Head, Department of Management (DoM), Bangalore Campus, AMRITA Vishwa Vidyapeetham University, Bangalore, India. Dr. Shekar holds a Bachelor of Engineering (BE) degree in Electronics and Communications from Bangalore University and a Master of Science (MS) degree in Electrical and Computer Science from California State University, Los Angeles, and a Doctoral Degree in Strategic Management from Amrita University. He is a Management Consultant with over 30 years of experience in working at Price Waterhouse, Hewlett-Packard Co, and AMRITA University. His research areas are Environmental Social Governance (ESG), Corporate Social Responsibility (CSR), Corporate Governance (CG), Strategy and Social Development and Sustainable Goals (SDG). He has taught courses in Strategic Management, Leadership, Management Consulting, Marketing and Business Ethics.

Shijith Kumar PM is an Assistant Professor at SolBridge International School of Business, Woosong University, South Korea. He is also associated with Amrita School of Business, Bangalore as a visiting faculty teaching in the graduate and executive programs. Shijith holds a bachelor's in engineering (Industrial Engineering & Management) from Dr. AIT, Bangalore, an MBA (Operations) from Amrita School of Business, Coimbatore, an MS in Research (Management Science) from IE Business School, Madrid and is in the process of completing his PhD from IE Business School, Madrid. He is also APICS, USA certified CPIM. Shijith has successfully completed pedagogy seminars and courses from Babson College, Boston, USA and Stanford D-School, USA. Shijith has published his research in a leading journal, Production & Operations Management (POM) and has also presented his research and views at different academic (such as INFORMS, USA; Behavioral Decision Research & Management, Boston; Society of Operations Management, India, etc.) and practitioner forums (such as, APICS, NASSCOM, IIIE, etc.). He also serves as the column editor of the INFORMS DA Newsletter. Shijith has worked as a business analyst/operations & supply chain management consultant for over six years in a leading IT & consulting organization.