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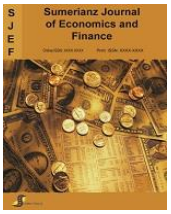

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Deployement of Block Chain Technology on Supply Chains: Opportunities and Challenges During Emergencies; A White Paper Analysis

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Abstract

Corona Pandemic, Covid 19 as it is called has been declared by the World Health Organization as a worldwide disaster. It has closed off countries and destabilized business. Coroan pandermic has had an unprecedented effected on global trade with China on lock down and other countires have also followed suit. Very many countries went on lock down with the 2nd wave hitting quite a number of countries. Other countries that are affected include Iran and United States of America. North African Countries haave closed their borders to Europe and thus we see an interesting dimension of a world wide disaster. Interestingly Africa is not very adversely affected in terms of infections abut the cross border business is affected. The aim of this paper is to find out the ripple effect of the Covid 19 pandermic on the global supply chain with a focus on Kenya and the business opportunities that the pandermic offers to Africans. Being a very new area, this is more of an analysis of trends and opportunities and hopefully create knowledge as we review information that is available. Blockchain analysis are what will be at the forefront of the paper. Supply chains are facing uprecedented challenges from Artificial Intelligence. This white paper will not look at the medical aspects but at the business side with a major bias on the supply chains using block chain technology and the major turbulances the pandermic will deal to the economies, opportunities and challenges offered in supply chain.

Keywords: Block chain; Covid 19; Supply chain; Internet of things.

1. Introduction

The financial crisis of 2008, made a group of activists to develop a decentralized, stable, autonomous and sustainable financial system that would not be influenced by any institution. Bit coin as both a payment and a digital currency, Cryptocurrency was launched in 2009 (Leemon, 2017) and by 2018, they were over 1300 digital currencies and 500 tokens. The concept of blockchain is evolving, and while the future of Bitcoin remains unclear (as it is for the most elements of the economy) it is evident that the blockchain holds enormous potential for large-scale improvements of many different areas of economic system.

The Covid 19, pandemic is an unprecedented worldwide epidemic that has shook the world at large putting nations on lock down and supply networks being destabilized and economies almost coming to a standstill. The pandemic has affected all continents of the world with many countries losing lives daily as there is no viral treatment or vaccination of the same. Mega economies are hard hit like China, Italy, Spain, France, United States, South Africa, Kenya among others (Jirenuwat *et al.*, 2010).

Blockchain technology, as a source of total supply chain efficiency is important in eliminating the dependance on trust-based business transactions. A suppy chain built on block chain technology would reflect efficieny in every stage of the chain thuis improving efficiency (Wangui, 2017). Nakamoto (2008), defined Block chain as a decentralized shared network of ledgers that have many other uses also (Reijers *et al.*, 2016) stated that first applied in the design of Bitcoin in 2008, emerged from a movement of anarchists, computer scientists and crypto-enthusiasts who saw the potential of the technology as a breakthrough in the long-awaited realization of an old “cypherpunk” dream of money that is free from the control of the state and other third parties, such as commercial banks;1 however, blockchains offer technological possibilities far beyond new ways of issuing money. They also offer scope for rethinking political organization, including enabling novel ways of creating, managing and maintaining systems of voting rights, property rights and other legal agreements.

Dujak and Sajter (2019a), state that Blockchain technology promises overpowering trust issues and allowing trustless, secure and authenticated system of logistics and supply chain information exchange in supply networks. The new implementations within supply chain are shifting from blockchain to a wider notion of distributed ledger technologies. Paper presents description and rationale behind current and possible future applications of blockchain in logistics and supply chain. Blockchain has found its applications and is under development in logistics and supply chain activities as well. Radio-frequency identification (RFID), telematics, barcode and 2D codes, sensors-enabled

technologies, Internet-of-things (IoT) and numerous other technologies are used for tracking products through supply chain (Dujak and Sajter, 2019a).

However, until recently their true potential was not fully exploited as the underlying data was available only within an institution, a company, or perhaps exchanged with limited group of trustworthy partners. Typically, there are numerous supply chain members each with their own information systems, but communication between these systems is limited at best. The main barrier was (and still is) the lack of trust in exchanging information. Blockchain technology promises overpowering trust issues and allowing trustless, secure and authenticated system of logistics and supply chain information exchange in supply networks. Based on these features and blockchain development in general, the pace of new implementations within supply chain is accelerating rapidly. Pilot projects are launched worldwide and supply chain industry is expecting changes (Dujak and Sajter, 2019b).

This paper aims to introduce and present the concept of blockchain and its current applications in supply chain management amid the Covid 19 crisis by presenting its characteristics, current applications and future trends, the goal is to provide basic material for academics and practitioners when considering its application in supply chain activities. We attempt to answer following research questions: what is blockchain and how does it function? What are the key features of blockchain applicable in the supply chain and in which supply chain areas are currently being applied? What are future possible development directions for blockchain applications in supply chain?

Paper is structured in five sections. After the introduction, the second section presents the current state of the progress in supply networks. Third section analyses the features of blockchain as it came from the cryptocurrency universe, while the next one presents its current implementations and advantages in supply chain and logistics. The fifth section concludes.

2. Supply Chain Networks

Supply chain networks are a network of fcailities and activities that deal with procurement of raw materials, transform them into intermediate and final goods, and finally ensuring that the products are delivered to the final consumer through the distribution channels. There are quite a number of relationships in these networks which include relationships with suppliers, distributors and customers at different levels and with different objectives. Thus activities in the networks include planning the ctivities, managing the ctivities, controlling the activities and managing the complex relationships that come with the supply chains.

As stated by Christopher (2011), materials management is part of supply chain networks that actually deals with upstream suppliers and the end product deals with down stream suppliers. These networks are quite complex and are gaining competitive advantage by competing among themselves and not organizations competing by themselves. The upstream suppliers include several tier suppliers from tier one to the last tier and downstream suppliers include distributors, wholes salers, retailers and final consumers and logistics which cut across and include inward logistics, outward logistics and reverse logistics.

Successful performance in supply networks requires ensuring proper supply network design and continuous optimization of processes that occurs within. Design of the supply network is primarily a strategic, long-term concern. Therefore, when designing a supply network, it is necessary to ensure that the supply chain configuration is effective in relation to the expected conditions, but also robust and flexible to adapt to unexpected changes in the surrounding conditions. Dujak and Sajter (2019b), design of the distribution or supply network is a form of strategic planning aiming to maximize the economic effects over a longer period of time and also present the consequences of strategic decisions on tactical activities such as the optimization of transport. Facilities in supply network (factories, warehouses, distribution centers, stores) constitute its structure and influence its performance and cost at the same time. While adding facilities enables better customer service (shorter lead time, increased product variety and availability, improved customer shopping experience, increased visibility of supply chain order and increased product return capability), it also means increases in inventory holding and facility costs, and decreases in transportation costs. Therefore, the goal of optimizing the design of the supply or distribution network is to find a trade-off between minimizing the total cost of holding inventory, warehouse costs and transportation costs, while satisfying customer demand related primarily to delivery time. Simply put, network is optimized, “when a minimum of distribution facilities that will meet the customer’s response time is reached” (Christopher, 2011).

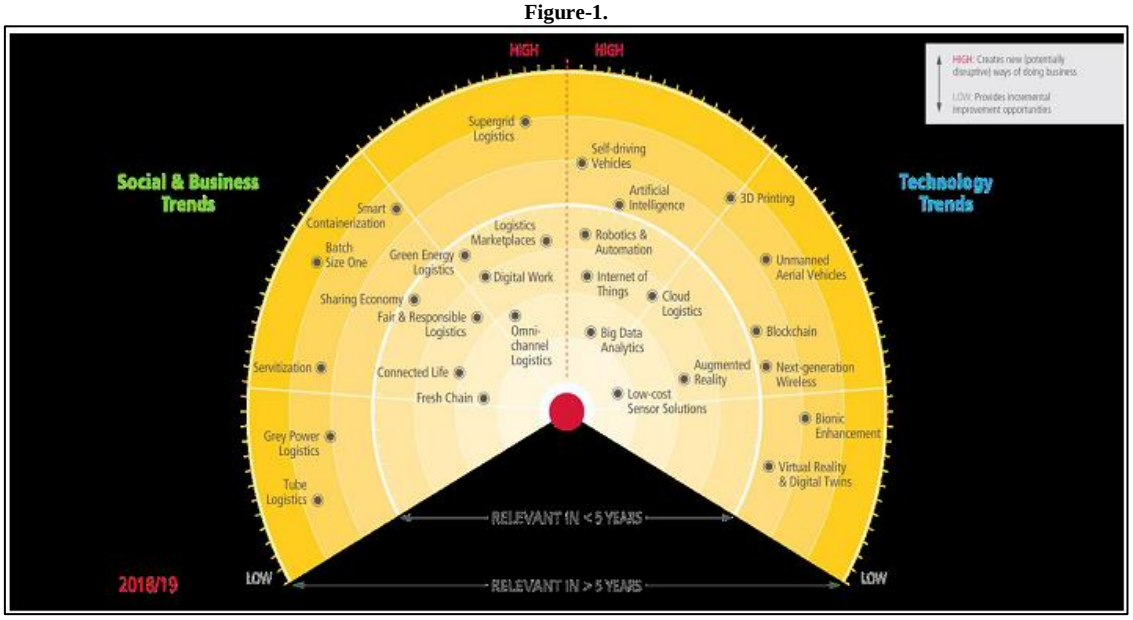
The 4th industrial revolution that is taking place can only work if supply chains are competitive and work efficiently and effectively. This in collaboration with the use of Artificial Intelligence and Block chain technology can then ensure that the opportunities that will come in will change the way business are done. World Economic Forum (2018), conference on block chain stated that block chain solutions in supply chain can iincrease GDP’s of countries by upto 5% due to the unexpolred opportunities of blockchain in supply chain. The report also stated that global trade will improve by upto 15% due to the ripple effect of the expansion of the trade from introduction of block chain in supply chain. The digitization of important documents in supply chain like bill of lading, packing lists, voyage report, voyage tracking, insurance etc than we rely on the importance of technology to ensure that the activites are not affected. The advent of 5G mobile network technology ensures that there is greater bandwidth and lower latency. This coupled with google baloons ensures that even the most remote areas have access to internet and technology, all they need is software and hardware to ensure that the supply chains use the technology.

Boschi *et al.* (2018), stated that supply chains need to ensure that the ledgers in the blocks are well maintained in a trustless environemnt and this can only be achived through having smart contracts. According to them, a smart contract is a condition of the operation written on a code. The smart contract automatically executes the transactions and record the information onto the ledger without any human intervention. The aim of smart contracts is to provide security, which is superior to traditional contract law and to reduce other transaction costs associated with

contracting. It is explained as cutting costs to near-zero with a smart contract. Networked members mutually agree on the smart contract. It is a key component for establishing trust and efficiency between parties. Smart contract eliminates all the paperwork, streamlining the entire process and saving time and money. Thus, for supply chains to tap into the vast opportunities presented, they need to adapt to the changes and be dynamic to the environment.

A report by Kukelhaus (2019), analysed the trends of how supply chains will have to adpat in both the short term and the long t erm through various scenarios. He summarised it in a diagram as stated below.

Figure-1.



Source; (Kukelhaus, 2019)

And from the diagram, we can see areas like smart conternarization, wireless technology, blockchain, servitization, artificial intelligence and value chains as being quite important in ensuring that the supply chains adapt and tap into the next big things in the 4th industrial revolutions that is coming up. With the current environemntal changes that are affecting the world and the economies, changes are eminnet, how we dela and manage our supply chains becomes the reason why we remain relevant in the next era of supply chain changes that are coming soon. The risks that are coming up show how unprepared we are and as such what we can do to avert supply chain crises that are currently rocking the whole world due to lockdowns and unpreparendness for such magnitudes of disasters.

3. Features of Blockchain

The economic meltdown of 2008 led to tech gurus to develop the block chain technology through bitcoin so to avoid the impact of large banks and other companies holding institutions hostage. According to Nakamoto (2008), the developer of bitcoin and blockchain bitcoin was evolved due to third party mediation, increase in costs, and trust issues that wer erupting on the use of technology. He further stated that the cost of mediation increases transaction costs, limiting the minimum practical transaction size and cutting off the possibility for small casual transactions, and there is a broader cost in the loss of ability to make non-reversible payments for nonreversible services. With the possibility of reversal, the need for trust spreads. Merchants must be wary of their customers, hassling them for more information than they would otherwise need. A certain percentage of fraud is accepted as unavoidable. These costs and payment uncertainties can be avoided in person by using physical currency, but no mechanism exists to make payments over a communications channel without a trusted party (Nakamoto, 2008).

Since 2008, the development of Bitcoin became the first example of a Blockchain application. This widespread cryptocurrency provides a real-life solution to the challenge of trust in a decentralized system. It has the power of making transactions untraceable but also verifiable and permanent (Swinburne University of Science and Technology, 2019). A centralized bank becomes unnecessary in this case because every agreement, every process, every task, and every transaction has a unique digital record and a signature that can be identified, validated, stored, and shared. Valid transactions are collected into blocks that are permanently sealed. In the report by Swinburne University (2018), they further stated that Today, applications of Blockchain technology are emerging across all sections of society and industry. For example, in the finance sector, Blockchain can simplify business processes while creating safe, trustworthy records of agreements and transactions.

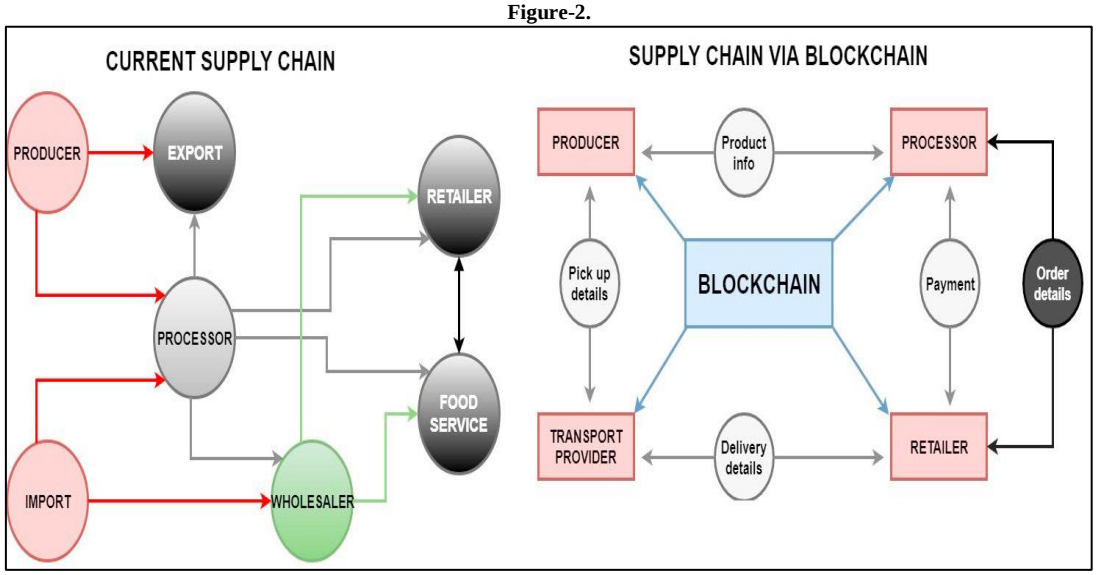
A global consortium of more than 80 institutional members has formed to develop proof of concepts and prototypes of finance systems that are disrupting the finance sector by automatic execution of finance transactions in real-time. Furthermore, in case of food supply chains for example, a Blockchain-enabled ecosystem can facilitate an end-to-end service that alleviates interruptions in supply chain occurrence of fraudulent products. By integrating supply chain management with an Internet of Things (IoT) system that supports an automated machine-to-machine communication an optimal and safe value transfer can take place across the entire process (Swinburne 2018). Succeeding in the next industrial era requires manufacturing companies to define and shape their core value drivers enabled by digital technologies. Industry 4.0 will drive operational efficiencies through Smart Factories and Smart

Supply Chains as well as grow opportunities through innovation and bespoke solutions to increase customer value. They will ultimately lead to completely new business models and service-offerings enabled through digitalization.

According to Casino and Patsakis (2019), the number of cryptocurrencies illustrates blockchain's importance, currently exceeding 1900 and growing. Such a growth pace could soon create interoperability problems due to the heterogeneity of cryptocurrency applications. Furthermore, the landscape is rapidly evolving as blockchain is being used in other fields beyond cryptocurrencies, with *Smart Contracts (SCs)* playing a central role. In principle, a blockchain should be considered as a *distributed append-only timestamped data structure*. Blockchains allow us to have a distributed peer-to-peer network where non-trusting members can verifiably interact with each without the need for a trusted authority. To achieve this one can consider blockchain as a set of interconnected mechanisms which provide specific features to the infrastructure, as illustrated in Fig. 1. At the lowest level of this infrastructure, we have the signed *transactions* between peers. These transactions denote an agreement between two participants, which may involve the transfer of physical or digital assets, the completion of a task, etc. At least one participant signs this transaction, and it is disseminated to its neighbours (Casino and Patsakis, 2019).

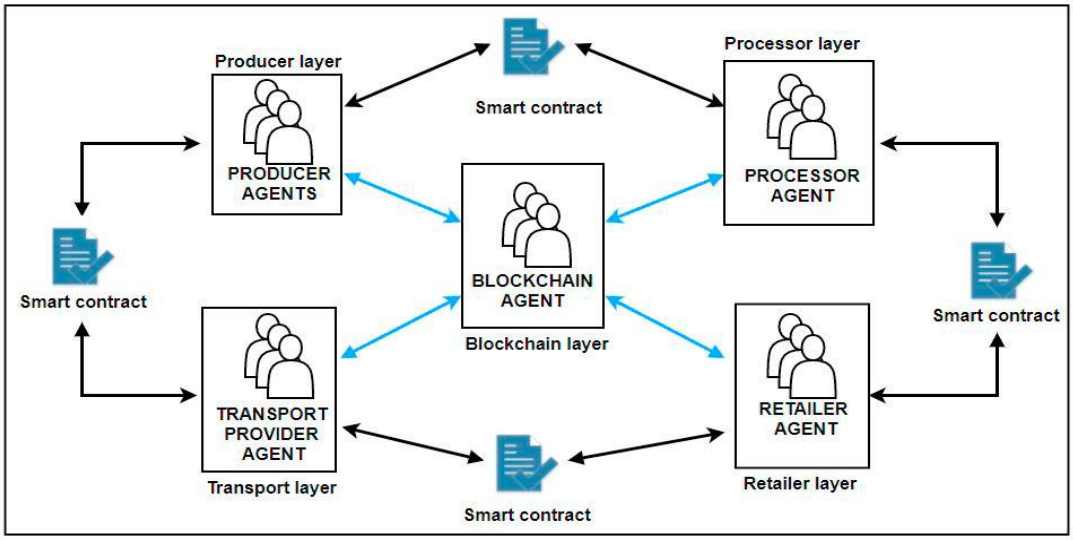
In the context of Casado-Vara *et al.* (2018), stated that current supply chains are linear economy models in nature and as such directly or indirectly fullfils the supply chains needs. According to them, this model was not quite adequated and they did a comparative model as hown below which shows the integration od block chains into supply chains. Below is the comparative models as developed by Casado-Vara *et al.* (2018).

Figure-2.



Thus the new model is non-linear but interactive and simple in its context of implementations. According to them, blockchain uses multi agency approach so as to achieve its objectives vs a linear economy to a circular economy. Samrt contratcs are there at every node so as to ensure that the data is viable and realtime. Below is a model that also shows how blockchain can be used in multiagency approach with different levels of smart contratcs across the chain.

Figure-3.



One model of understanding blockchain is through comparing it to the new application layer for Internet protocols because blockchain can enable both immediate and long-term economic transactions, and more

complicated financial contracts. It can be a layer for transactions of different types of assets, currency or financial contracts. Moreover, a registry and inventory system for recording, tracking, monitoring, and transacting of all assets could be managed with blockchain. No one can change the information in blocks because they are chained to each other. Concerning Bitcoin, every node in the network has its own copy of Blockchain, synchronized with other nodes using a peer-to-peer protocol. This demonstrates the uselessness of a central authority and consequently leads to confidence of participants in the integrity of any single entity. Blockchain enables to process different transactions and securely reach consensus without third parties (Sadouskaya, 2017).

Thus, we can say that the fundamental concepts of block chains are; -

Node. Peer or Node is a computer with the special software that maintains a Blockchain. All nodes are connected to the Blockchain network so they can receive and submit transactions.

Network. It is a result of cooperation of all nodes that run Blockchain software to communicate with a *Smart contracts*. These are contracts converted into codes to be carried.

Submit transaction. When users submit transactions, they are sent to the nodes on the network who subsequently send them to other nodes.

Transaction Validation. All transactions are cryptographically validated by the nodes on the Blockchain network. Invalid transactions are ignored.

Block. It is a group of transactions collected by nodes into a bundle. To be valid blocks must be formed according to pre-determined set of rules: They must not exceed a maximum size in bytes, contain more than a maximum number of transactions, and must reference to the most recent valid block.

Blockchain. It Is a chain of blocks that is organized by the following system: Each new block is attached to the most recent valid block.

Consensus. It is an agreement of all nodes in the Blockchain. To enable distributed system operation, multiple processes cooperate with each other. Faults in such systems can occur anywhere, that is why they use consensus protocols.

Hash function. It is a one-way function that reflects an input of selectable size to a fixed sized output called hash. Properties of a cryptographic hash function: 1) easy to generate the hash given the input, 2) infeasible to generate the original input given the hash, 3) virtually impossible for two similar inputs to have the same output in a so called “collision”. SHA256 – example of cryptographic hash function.

Further to the above we have the smart contracts which represents a product licensing agreement,

bill of material requirements or some other agreement between the parties, the sequencing of blocks in a transaction can only take place if a given step in the process is consistent with the Smart Contract (Boschi *et al.*, 2018) A smart contract should provide

a. Autonomy: can be developed by anyone, no need intermediaries such as lawyer, brokers or auditors
b. Efficiency: removing process intermediaries often results in significant process efficiency gains
c. Backup: a Blockchain and smart contract deployed to it can provide a permanent record, allowing for auditing, insight, and traceability even if the creator is no longer in business
d. Accuracy: replacing human intermediaries with executable code ensures the process will always be performed the same
e. Cost saving: replacing intermediaries often provides significant cost reduction

Block chain technology will now drive the 4th industrial revolution and change the dynamics of the industries through which supply chains operate and destabilize traditional methods of financial transactions setting an unprecedented use of artificial intelligence in the world at large.

There are basically three types of block chains as stated by Dujak and Sajter (2019a). These are:-

a) Permisionless Block chain – these include bitcoins and Etherium, that are decntralized and institutionless, fully public peer to peer netwoks where any members can join.
b) Permisionned block chains – this is almost like a federation where members form a group and new members have to be refeered to by old mebers – almost like a members club
c) Private block chain – wher permissions are centralized with one organization which manages all the chains.

4. Opportunities of Block Chains in Supply Chain

Since supply chains deal with ensuring the 12 rights of supply chain are adhered to which are the right price, right quality, right time, right place, right source, right quantity, right attitude, right contracts, right materials, right transportation, right condition and right customer. For these services to be well delivered, then a number of activites and processes need to take place and a trusted system of suppliers and consumers in place. As we have seen, block chain consists of a trustless system of automation and documentaion systems that ensures tracking of activities while they cannont be changed. Leaders in slogitics and stirage, DHL, are the pioneers of using blockchain in limited areas but then the commercialization of this technology will go a long way in reshaping the chains. With the worl at a near standstill due to the covid-19 pandermic, many activites have been affected and as such new ways of thinking and solving problems have to come into play.

Most universities are doing research on block chains in supply chiasn and logistics and thus it is still in the development stages. Super powers like USA and China are also developing open source block chain technology to help ensure that the SME’s can get the opportunities that blockchains deliver to its users. Most of the issues in supply chain can be summarized in the dicgram below which will show areas of blockhcin integration in supply chain and their benefits. Regardless there are also other areas that we shall be looking at and developing linkages to supply chains.

4.1. Track Product Flow Visibility

Due to the increase transparency and automation of documents and activities, it is quite possible to track product flow from supplier through the transporation schedule to pint of delivery covering a number of principles. As such, clearing and forwarding agents cannot lie, or delay in service selivery as the procurement officer can know when to start which process depending on the service level agreements that have been set. As such, product loss is minimized to eliminated compeletely leading to an efficient supply chain process.

To increase tracking of products through the supply chain, radio frequency identification technology (RFID), and transponders (Tags) are used to carry the information required and they can be read through the scanners and the information that is shared will vary depending on the size of the tag on the product.

4.2. Demand Forecasting

Demand forecasting is ine of the most important things in supply chain as it helps in knowing what to buy and whento buy to ensure that there is constant flow of materials during production taking into consideration consumption patterns, distribution, upstream supply chains and lead times. While forescasting, environemtal issues and risk management are taken into consideratons so as to ensure that the forecast is as accurate as possible. Proper forecasting ensures that the bullwhip effect in supply chain is eliminated and efficiencies and effectiveness and

By being able to use Enterprise Resources Planning softwares and integrating them with materials management and Manufacturing requirements planning will enable prompt demande forecasting. This coupled with effieicent tracking of products means that product turnover will be quite high in the stores and that means less losses in terms of obsolescence and less stock being held. At the end of the day efficiency and effectiveness in demand forecasting and usage of stock will be achhieved leading to lean supply chain. Exchange of data between upstream suppliers, buyers and downstream suppliers is essential for demad forecasting to be effective.

4.3. Open Access to Information

Being a technology enabled activity means that there are threats of cybercrime among others. On the other hand, its is a trustless transaction activites and as such ther is access to information among the nodes or blocks in the block chain. This access to information ensures that the suppliers know whome they are dealing with and so do the customers. Access to information normally leads to longterm collaborative realtionships that help build competitive advantages of the supply chains. This colaborations can be in product development, research among other partnerships.

Digitization of socuments and trackingof activities avoids communication between supplier and buyer as they can access the information in the block chain ledgers that is secure, authentic, and verified. This is one aspect that is most important in any business and any supply chain as a whole. Information wil be accurate and realtime as it is updated frequently within the blocks.

4.4. Decrease in Fraud and Counterfeit Risks

Since the information made in these chains cannot be changed, it is easy to track who made the information, source of the products among all the information required to trace authnenticity of the products and services. Accounting activities shall be approved usig digital signatures and as such thre will be reduction in fraud and counterfeit risks. Trustless transcations that are authentic will ensure that there is legitimate businesses going on that have an audit trail of all activities and information that cannot be erased once entered.

By using the distributed ledgers, information is verified and secure throughout the chain as it is stored in a manner similar to RFID, this means security, authenticity, regulated, visibility, and verifiable information on products, documentation and services related to blockchain technology. Drugs are most prone to counterfeights and by use of this technology it is able to track the drugs through the ledgers from pint of origin to point of consumption thus reducing fraud and counterfieghting.

4.5. Transaction Automation

Blockchains uses technology and Internet of Things and as such any organization will have to automate before it can embrace it. Integrating ERP with block chain means that automation is mandatory. By using technology efficiency and effectiveness will be improved and speed improved. The initial cost of automation may be high but the lifetime costs will be lower. Tax rebated and carbon footprints are also reduced due to the fact that the paper documentation is reduced and electronic documentation is increased.

Block chains also work with smart contratcs that are already incorprated in the system. This then cascades to all and there is no need for third parties like banks in the contratcs. Aspects like fuel consumption, fuel reimbursesments, fleet management can all ne automated and use block chain in their activities. It is also improtant to know that you can work with organizations that offer environmetal friendly products and services and since their information is available than it can be verified and we use the tripple bottomline, people, planet and profits in our activities in the supply chains.

4.6. Envirnment Conservation

Since automatin of most if not all activities is being done, paper trail is not there conserving the environment in many ways. The blue and green technology is used alongside sustainability. Use of blockchain opens diverse opportunities in many areas inclusing telecommuniting, and thus focus can be on all aspects of the tripple bottom

line, people, planets, and profits. Other scenarios in use can be reuse, reduce and recycle concepts in supply chain both upstream and downstream.

Being able to track all products from source to consumption, the reverese is also possible to ensure that the carbon footprints are reduced and work with compnaies that ensure proper environmental conservation.

4.7. Smart Contracts

All Block chains have smart contracts embedded in them that govern what organizations do. The first successful implementation of a blockchain-based smart contract was Bitcoin Script, a purposely not-turing-complete language with a set of simple, pre-defined commands. As simple forms of smart contract, standard types of Bitcoin transactions, such as pay-to-public-key-hash (P2PKH) and pay-to-script-hash (P2SH), are all defined with Bitcoin Script. In addition, there also exist platforms that enable more complex contractual functionalities and flexibilities, e.g., Ethereum, which adopts a turing-complete language for smart contracts. Newer blockchain platforms such as Neo and Hyperledger Fabric allow smart contracts to be written in various high-level languages (Hu *et al*., 2019).

There are many ares of usage for block chain and they include health care records where patients records can be accessed by health providers across the chain. Another ares is identity management by countries, counties and organizations where records of an individual are kept at a central point ans used by those who require. Banking is another area where smart contracts can be used to help in financial transcations and eliminate the need for third party partners. Electronic voting is also another area where smart contracts can be used and information remain safe. Finaly though not limted to these ones only smart contracts can be used in sinstituting insurance agreements.

4.8. Smart Containerization

As an underlying technology, blockchain lends itself to processes that involve multiple participants, contracts, ransactions, levels of approval, legal contracts, and security requirements. Supply chains are perfect examples of these complex, multi-party processes. Supply chain partners can use blockchain-based applications to meet different business needs. Smart containers are the only equipment that offers visibility into transport execution and cargo conditions from door to door. They generate valuable real-time physical tracking and monitoring data. For example, smart containers can generate data about events such as a door opening or closing, arrival or departure at a geofenced area, or temperature, humidity, and shock events occurring during the journey. This raw data is collected and processed according to the parameters of a specific use case. Attributes such as provenance, volume, timing, content, correct labeling, and others are critical for accurate supply chain analysis.

Unlike traditional business intelligence (BI) tools that cannot control data collection, require skilled users, and take extended periods of time to deliver meaningful information, AI-based analysis provides insights that matter in real time. With unprecedented insight into the cargo's journey, AI based services provide a lever for supply chain stakeholders. When this information is secured in a blockchain, it is "fingerprinted" and can be trusted by all stakeholders. The powerful combination of AI and blockchain technologies enables stakeholders to automate and accelerate decision-making with trusted information. Smart container physical data, AI, and blockchain bridge the physical world with document flows and enhance distributed business processes. Smart container analytics can be shared with shippers and other members of the supply chain to: Reduce cargo loss, damaged goods, packaging costs, and non-quality costs Levy fines (or reduce them) and assess legal costs or insurance fees, accelerate investigation processes, quickly remediate deficiencies, and minimize the impact of unavoidable delays Reduce back orders, cancelled orders, and delivery of defective products

5. Financial Transactions

Financial institutions around the world find themselves continually barraged by external innovations they are often unable to absorb and internalize. The emergence of innovative digital financial technologies has challenged traditional players in the sector by demonstrating new ways to deliver value across the entire financial value chain. Blockchain, or distributed ledger technology, is just such a disruptive and possibly game-changing innovation. Distributed ledger technology is still in an early stage of development and deployment, yet it is widely thought to have the potential to deliver a new wave of innovation to the financial technology, or fintech, ecosystem by providing a ‘trustless’ distributed system to exchange value. Current developments show that use cases that are relatively simple to design and implement are appearing. For instance, digital wallet AliPay is adding a bitcoin option for its customers. Visa has partnered with blockchain company Chain to build Visa B2B Connect, an enterprise blockchain infrastructure to facilitate international financial transactions for their corporate clients. Established financial institutions are more likely to use blockchain for intra-organizational projects intended to reduce organizational complexity, improve efficiency, and reduce costs.

Banks and major financial institutions are working both collaboratively and independently to develop blockchain technology, as seen in the proliferation of global consortia (International Finance Corporation, 2018). Blockchain’s potential to disrupt the financial services ecosystem has been widely discussed, including its capacities for operational simplification, regulatory efficiency improvement (real-time monitoring of financial activity between regulators and regulated entities), counterparty risk reduction (agreements are executed in a shared, immutable environment), disintermediation for clearing and settlement of transactions, and transparency and fraud minimization in asset provenance and capital raising.

Other areas include anti money laundering and customer identification programs, trade finance and global payments, risk analysis and risk management programs, capital markets and derivatives transactions, and financing

and cryptocurrency activities among others. A Kenyan company bitpesa is making inroads in this arena in Kenya and East Africa and has been able to raise venture capital to expand its territories.

5.1. E-commerce

The increasing spread of information and communication technologies, specifically the Internet; the global business community has been able to move towards electronic commerce. It is providing many new features such as the possibility of providing all goods on electronic platforms, providing detailed information of goods, about the products offered. Through the technologies of blockchain distributed ledger, consensus mechanism, identification, smart contract, encryption algorithm, etc., system optimizes the e-commerce business model, improves operational efficiency, and ensure financial security. A blockchain-based business service platform, has the features of distributed data storage, timeseries and tamperproof data, intelligent execution of smart contract, security and privacy protection. Build blockchain-based trusted system such as e-commerce, finance, and new energy. Blockchain technology can enhance the transparency of financial transactions, strengthen the flexibility of system operation, and automate processes. Which will have a profound impact on the business model of finance, e-commerce, data storage, accounting, and payment methods. The distributed ledger uses consensus mechanism to negotiate the contents of the ledger, uses cryptographic algorithms and digital signatures to ensure the integrity of e-commerce, finance, and energy transactions (Zhu and Wang, 2019).

Based on the blockchain architecture, the transaction system, payment system and trust system in ecommerce, it realizes the interconnection and intercommunication of e-commerce information value chain. Application blockchain technology optimizes the process and operational architecture to enhance the user experience. Blockchain Technology has just touched the surface of the business world, however, it is progressing gradually in the e-commerce world to upgrade its existing system to crypto-world. The decentralized marketplace will capture the traditional market keeping records in the distributed ledger resulting reduction in transaction charges. The consumer will confident to keep their financial and personal information with a merchant or suppliers in blockchain network that will create easy transaction using blockchain based platforms. Undoubtedly, the technology will be a crucial part of business or e-commerce in upcoming time which will lead the market world (Sheikh *et al.*, 2019).

5.2. Inventory Management

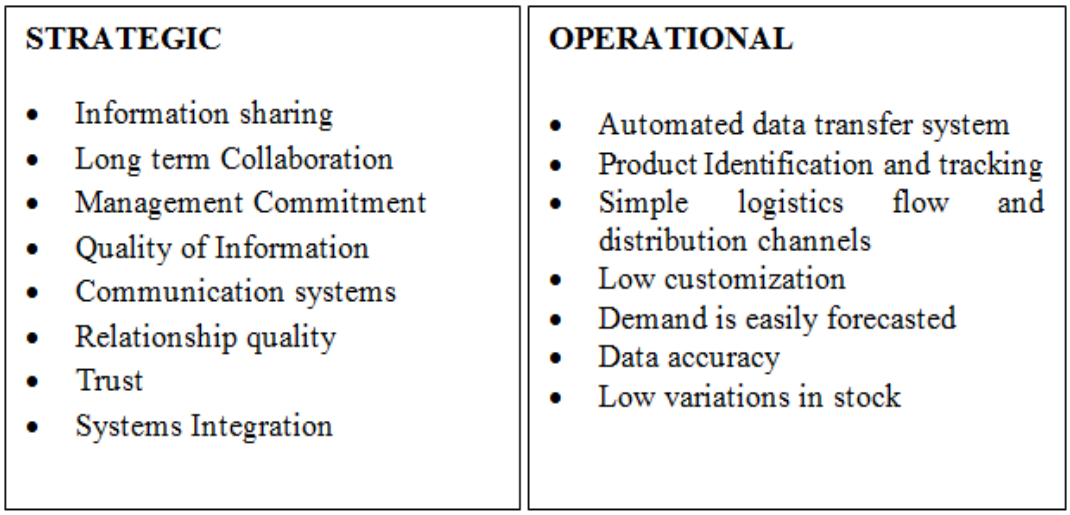
A very good opportunity to control the inventory was presented during Blockchain Summit in April 26th in San Francisco by Ernst Young (EY), where they demonstrated how the visibility of inventory can be improved on supply chain management. The supply chain operations efficiency impacts an organization's competitiveness and is shaped by numerous factors. Information sharing methodologies such as vendor managed inventory (VMI) create efficient replenishment models without the need for traditional orders (Boschi *et al.*, 2018).

In theory, the blockchain can work, but supply chains are very hard to change and adapt (Mougayar and Buterin, 2016). Mougayar thinks, that companies spend years putting supply chains in place and refining them. It is not very easy to insert a new technology inside established supply chain systems because the integration challenges are not to be underestimated." (Mougayar and Buterin, 2016).

5.3. Vendor Managed Inventory

Vendor-managed inventory (VMI) is a very common supply chain (SC) management approach for improving multi-firm SC performance while establishing a mutual beneficial relationship between a vendor and a retailer. The main idea behind VMI is that the vendor is authorized to oversee product inventory for the retailer; therefore, the vendor is responsible for tracking, monitoring and replenishing the retailer's agreed-upon inventory. VMI is a streamlined approach to inventory management and order fulfillment in which both the retailer and the vendor may smoothly and accurately control the availability and flow of goods across the SC (Casino and Dasaklis, 2019). Sometimes VMI is called Just in Time (JIT) II. For VMI to we need to understand the requirements of VMI.

Figure-4.



From the above figure we see that implementation of VMI is in tandem with implementation of VMI and it ensures that all the atributes of blockchain are also with VMI at both the operational and strategic levels. Thus this implementation will see a reduction in stock held, capital held in stock, cost of stock, cost of obsolescence among other stock holding issues and streamline operations to ensure lean supply chain and JIT operations.

6. Conclusions

With the world crisis that has shut down most operations in production and fince and seeing stock markets crashing, we need to think outside the box and look for solutions to make sure that the systems don't crash or are disrupted. Supply chains being the active areas that ensure supply of goods, services, information and people suring these times have to handle complex obstacles to achieve ehat they have and as such dimesions like blockchains are areas that may be adopted in the context of "working at home" to ensure continuity of services without crashing od stock exchanges among other activites. There is more to be looked into but that is the beauty of research, entrepreneurship and trying new things in new ways. You may jyst have invetions that solve business problems way easier. The technology world in the way to go and how we use the technology enusres we stay afloat in the dynamic and unpredictable world full of risks and uncertainities.

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