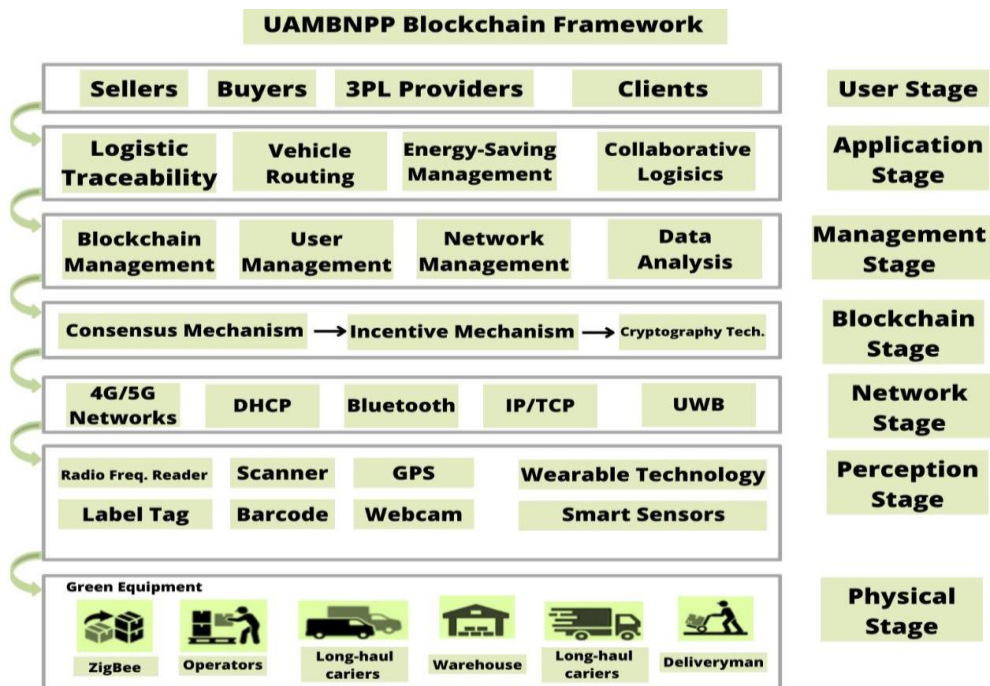


## Chapter 2

### Overview of the Research Setting

#### 2.1. Overview of UAMBNPP Blockchain Framework for SHP-SL

An outline of the UAMBNPP Blockchain Framework with seven stages as appeared in Figure 2.1. of the UAMBNPP blockchain Framework shown in this research methodology.



**Figure 2. 1 UAMBNPP Blockchain Framework for SHP-SL**

#### 2.1.1. User Stage

The user stage function/serves as the utility of the UAMBNPP Blockchain Framework for data inputting, monitoring, managing and the

analysis of logistics and supply chain process and identify the problems/errors. These are more or less the users/humans that are using the system. The stage is also used for generating both the public and private keys from the system. Data analytics is used for the processing of data which are stored within the blockchain framework of the software applications within the application stage.

### **2.1.2. The Application Stage**

The application stage diversify the applications used to manage the operations of the supply chain and logistics systems at SHP-SL. Such logistics and supply chain software includes the feasibilities and analysis from the management s and blockchain stage. The application stage is the hosting base of all applications running within the UAMBNPP Blockchain framework.

### **2.1.3. The Management Stage**

This stage serves as a management tool to enhance the operations of the UAMBNPP Blockchain framework designed for SHP-SL. These tools comprises of blockchain, user, network and data analysis. The UAMBNPP Blockchain management intend to manage and update the application and blockchain stages.

### **2.1.4. Blockchain Stage**

This stage collected data application that is stored within series of

blocks which are chained one after the other in a sequential order to makeup the blockchain at SHP-SL. The blockchain consist of a header with a body. The former comprises of a whole lot of meta-data and the latter stores processed or verified data. The UAMBNPP blockchain framework is the operational system which manages data processing including documentation and communications for SHP-SL. It enhance the facilitation of all supply chain and logistics business processes.

#### **2.1.5. Network Stage**

At the network stage there is a provision for communications through which data channels are facilitated. The data from the subsequent perception stage is transmitted into the blockchain stage via the communication channels. The internet protocol/transmission control protocol, ultra wideband etc are all the communication means that facilitate easy data communication within the UAMBNPP Blockchain framework. The network stage of this framework is conducive for the handling of fast data transmission for real-time network/data safety and securely SHP-SL.

#### **2.1.6. The Perception Stage**

This stage make available the capability of SHP-SL for monitoring and perceiving the individual status of supply chain and logistics machineries/resources via a broad variety of sensitive devices which are made up of radio frequencies and identification technology, barcode

readers, labeling tags and scanners. The aforementioned equipment are used by SHP-SL for the identity of goods to uniquely ascertain the location of delivery and ownership. Furthermore surveillance equipment such as Webcams are utilized for the monitoring of the workplace environment, the stores including the protection, security and safety of goods with and out of the worksite. Global positioning systems or GPS are embedded in their trucks, vehicle and other delivery vans so that as to capture real-time positions of their delivery equipment. At SHP-SL wearable innovations are applied towards their logistics and supply chain equipment in the fact that this technologies has the potential to improve the capacity's revenue and reduce the workload of the logistics and supply chain equipment operators.

#### **2.1.7. Physical Stage**

This is the last stage in this framework which is made wholly for green logistics and supply chain resources that is part of the logistics and supply chain business processes. This stage is highly supportive to the operations of green supply chain and logistics. In accordance with this UAMBNPP Blockchain framework. The resources has been classified into three various kinds. These are goods awaiting to be transported to their located destination(s). Next is the kind of logistics and supply chain operators that are responsible to move the goods to their designated location(s). Third and final one is the selection of the logistics and supply chain equipment which are required to carry such goods. For instance

vehicles, forklifts, trucks, cranes etc.

Blockchain administration points to oversee and upgrade the blockchain. Client administration is mindful for overseeing examination of the supply chain and logistics handle in supply chains, and logistics issues clients and producing open and private keys (Hameed et al., 2022). Organize administration is utilized to control communication channels. Enormous information analytics has utilized the ways to handle information output from the blockchain applications.

## **2.2. Units of Analysis of the Designed Blockchain System**

Blockchain companies are another potential analytical unit that programmers and scholars wish to comment on. Blockchain companies include businesses, universities and even healthcare. At the company level, a study of staff performance towards green supply chain and logistics equipment can find out how different staff keeps tack of this green equipment performance. This research is not interested in the experience of individual staff, rather interested in the diversities in performance between green and non-green equipment in terms of output and efficiency. Based on the above, this research proposed a structured blockchain framework to address green supply and logistics in order to improve performance and accelerate business growth.

For the purpose of this research, the unit of analysis of the proposed structured blockchain framework system will be around 70% - 80% of the

administered questioners, our of 100 targeted sample size of Individual company staff.

**Table 2. 1 Units of analysis: An example using a hypothetical study of the Blockchain framework**

Research question	Unit of analysis	Data collection	Sample Size	Analytical Size
What alternative structured blockchain framework that is more efficient to address the problem of green supply chain and logistics for better performance and output at SHP-SL?	Individual Staff	Survey of Structured blockchain for green supply chain and Logistics	100 Individual Staff questioners will be Administere d	A target of 70 - 80% of the questioners are expected to be analysed

### 2.3. Advantages of the UAMBNPP Blockchain Framework

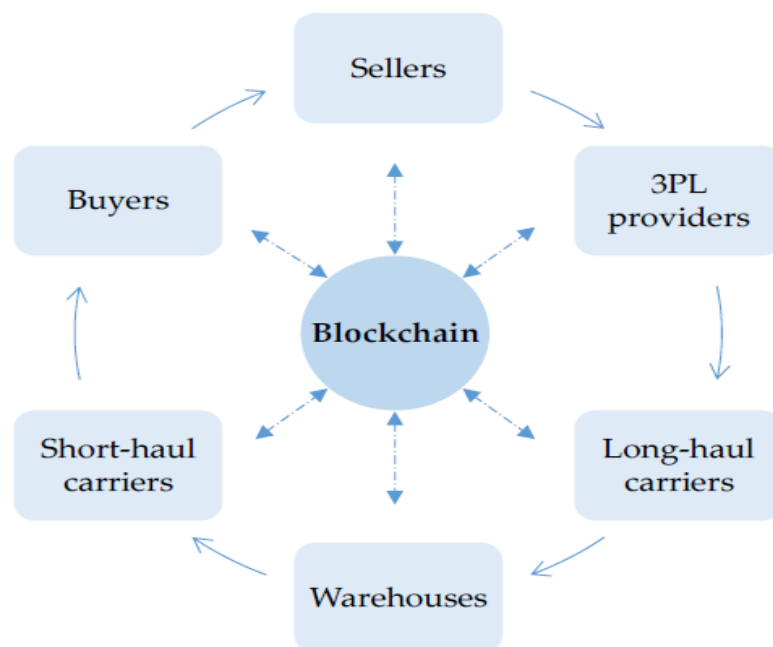
Below are some of the unique advantages of the UAMBNPP blockchain Framework.

#### 2.3.1. Unique Traceability in this Framework

This framework is essential and more vital in the application and improvement of traceable logistics and supply chain equipment. It gives related partners with the capacity to follow and track merchandise with the selection of the blockchain framework (Buğra et al., 2022), as appeared in Figure 2.2.

This framework encompasses a incredible features on the exigency of logistics and supply chains, goods' security and just-in-time conveyance execution. Through logistics traceability empowered by blockchain innovation, partners can effortlessly get steady and solid

information and data on the logistics handle of products. Based on the reliable and solid information relating to proper data collection and spare vitality (Sheu, Chou, & Hu, 2005). For instance, logistics companies can appropriately select diverse sorts of vehicles (green vehicles and diesel vehicles) beneath distinctive scenarios through this application. Vitality sparing administration can decrease natural contamination and solve the issues that perplex enterprise supervisors. It is additionally one of the foremost imperative ways to set up a green supply industry promptly (Aldakhil et al., 2018).



**Figure 2. 2 Traceability for the Proposed Blockchain System**

### 2.3.2. Vehicle Direction-finding

The vehicle flow-direction in this framework, points at finding ideal

courses for different vehicles to visit a set of clients. This framework plays a significant part within the logistics and supply chain plan. With real-time information, vehicle courses can be optimized in genuine time to dodge activity jams and decrease carbon emanations. Hence, vitality utilization can be decreased altogether and secure the environment of the green supply chain system (Aldakhil et al., 2018). All necessities and shipment stipulations are logged within the blockchain system and clients can recover them from blockchain and set optimization targets to calculate ideal outputs. Vehicle flow-direction can grant rise to way better green logistics and supply chain plan choices for making strides the supportability execution.

### **2.3.3. Reservation of Energy Management**

The energy reservation administration is a valuable instrument to screen, control and oversee the utilization of energy (Y. Liu et al., 2020). Expectedly, vitality cannot be overseen and controlled appropriately since there's a need of solid information on vitality utilization. Logistics companies cannot in general assess natural execution. With physical objects prepared with smart sensors, real-time information on energy utilization can be collected and after that recorded within the blockchain.

Logistics companies can utilize information to conduct vitality investigation without manual information control and utilize the examination comes about to look for vitality sparing arrangements. Enormous information analytics can give an generally arrangement to spare vitality (Al-Aomar & Hussain, 2017). For instance, logistics



companies can appropriately select distinctive sorts of vehicles (green vehicles and diesel vehicles) beneath distinctive scenarios through this application. Reservation of Energy administration can diminish natural contamination and unravel the issues that confuse undertaking directors. It is additionally one of the foremost imperative ways to set up a green supply chain.

#### **2.4. Supportive Green Supply Chain and Logistics for Blockchain Systems**

This system empowers logistics businesses to collaborate with each other to serve a set of clients whereas diminishing cargo logistics costs and maximizing capacity utilizations of offices [59]. This collaboration among logistics companies can diminish vitality utilization and carbon outflows, and increment benefit. By and large, there's a collaborative logistics advertise with different specialists who need to exchange their logistics assets or logistics assignments (Fiorentino & Bartolucci, 2021). Due to energetic request and supply, conventional collaborative logistics markets discover it troublesome to apportion logistics assets and errands. By receiving blockchain innovation, a P2P collaborative logistics advertise can be built up, which permits Supportive logistics.

There are immense advantages in an instance wherein blockchain is connected to any logistics industry. Examples are as follows, straightforwardness, trust, transparent collaboration and inclusive participation. These partners are not at all like conventional approaches for information sharing, partners can recover information from the

blockchain administered in real time (Cha, Singh, Kim, & Park, 2021). Hence, information on the logistics is prepared promptly and will be accessible to conclusion by clients.

### **2.5. Founding Reliance for Blockchain Systems.**

For the most part, it is difficult for partners to set up believe and trust. With the execution of blockchain, the execution of logistics companies can be assessed based on their recorded execution, such as on-time conveyances and pickups. Also, logistics companies too can screen the execution of clients, such as the fulfillment of contracts (Hader et al., 2022). In expansion, power contracts can be issued to encourage the inshighment and estimating prepare. Once all conditions are fulfilled, inshighment forms can continue automatically.

### **2.6. Ornamental Teamwork and Collaboration in Blockchain**

Considering the foundation of trust among partners, they will be ended up willing to collaborate and participate with each other. In this way, within the logistics prepare, partners can look for universally ideal arrangements to decrease in general costs and progress productivity. In expansion, due to real-time information sharing, partners can alter their organized and planned based Blockchain-enabled peer-to-peer collaborative logistics advertised suppliers Long-haul carriers Distribution centers Short-haul carriers Request Comes about (Yin, Feng, Lin, Cao, & Sun, 2021).

## **2.7. Benefits of the UAMBNPP Blockchain Framework**

With its decentralized and trustless nature, Blockchain innovation can lead to unused openings and advantage businesses through more noteworthy straightforwardness, improved security, and less demanding traceability. Noteworthy most Blockchain systems characteristics stems from the truth that its exchange record for open addresses and those open data are to be seen by the partners within the blockchain. Blockchain innovation has advanced incredibly since the presentation of Bitcoin in 2008, the primary decentralized peer-to-peer electronic cash framework (Yin et al., 2021). Nowadays, trend-setters in different areas are realizing the benefits of the innovation behind Bitcoin. From medication to finance, many sectors are seeking out for ways to coordinated blockchain into their foundations.

### **2.7.1. Greater Limpidity in Blockchain systems**

Exchange histories are getting to be more straightforward through utilization of blockchain innovation. Since blockchain could be a sort of disseminated record, all involved members share the same documentation as restricted to person duplicates. That shared version can as it were be upgraded through agreement, which suggests everybody must concur on it. To alter a single would exchange record requires the change of all consequent records and the conniving of the whole organize (Aslam, Saleem, Khan, & Kim, 2021). Hence, information on a blockchain is more precise, steady and straightforward than when it is pushed

through paper-heavy forms. It is additionally accessible to all members who have permissioned get to. To alter a single exchange record requires the modification of all ensuing records and the collaboration of the complete administration.

### **2.7.2. Enhanced Safety in this Blockchain framework**

There are some ways blockchain is more secure than other record-keeping systems. Trades must be concurred upon a few period of time. As of late, they are recorded after a trade is supported by it mix and associated with the past trade. This, at the side the reality that information is put away over a organize of computers instead of on a single server, makes it especially troublesome for software engineers to compromise the trade data (Aslam et al., 2021). In any industry where guaranteeing tricky data is urgent — financial organizations, government, healthcare — blockchain has an opportunity to genuinely change how fundamental information is shared by making a distinction to dodge blackmail and unauthorized activity.

### **2.7.3. Improved Record Tracking in Blockchain**

In case your company bargains with items that are exchanged through a complex supply chain, you're commonplace with how difficult it can be to follow an thing back to its root. When trades of merchandise are recorded on a blockchain, you conclusion up with an review path that appears where an resource came from and each halt it made on its travel

(Aslam et al., 2021). This authentic exchange information can offer assistance to confirm the genuineness of resources and avoid extortion.

#### **2.7.4. Increased Efficiency and Speed in Blockchain**

After you utilize traditional, research-heavy processes, exchanging anything may be a time-consuming handle that's inclined to human mistake and regularly requires third-party mediation. By streamlining and computerizing these forms with blockchain, transactions can be completed speedier which is shared among participants, you don't have to be accommodating numerous records and you conclusion more productively. Since record-keeping is performed employing a single advanced record up with less clutter (Aslam et al., 2021). And when everybody has get to the same data, it gets to be less demanding to believe each other without the requirement for various mediators.

#### **2.7.5. Reduced Costs for Blockchain**

For most businesses, lessening costs may be a need. With blockchain, you don't need as numerous third parties or go between to form ensures since it doesn't matter if you'll be able trust your exchanging accomplice. Instep, you fair need to believe the information on the blockchain (Aslam et al., 2021). You so won't get to audit so much documentation to calculate an exchange since everybody will have permissioned get to to a single, permanent version.

### **2.7.6. Unique Improvement using this framework**

The basic improvements of the Blockchain design methodology are safety and security, non-centralized, non-mutable and transparent. The blockchain system give access to verification with no dependency on the side of third parties.

The structure of the data within a blockchain is append only. Therefore, it is not possible for the data to be altered or deleted. The use of protective cryptography that ensure secured data ledgers within the system. Again, current ledgers are dependent on their adjacent full blocks to complete their cryptographic process.

The entire transactions with their data are attached to the block at the end of the process for the highest trust verification process. A consensus of all ledgers, including participants on the block. Transactions are recorded in chronological order. Thus, the blocks within the blockchain are time stamped enabled.

Shared across each node is the ledger within the blockchain which represent the participants. The stored transactions within the blocks are held in millions of computers serving as participant in the chain. Therefore, the possibility that data lost cannot be retrieved does not exist. The transactions which take effect are transparent and efficient. Data can be viewed by individuals who provided their data. The initial point of data can be tracked along the chain. Since several consensus protocols are needed for the validation of the each entry. For smart contracts,

businesses conditions can pre set on the blockchain. When the conditions are met, the automatic transactions are triggered.

## **2.8. Safety Precautions for Investing on this framework**

A wide scope businesses having interest in investing in blockchain should do a kind of strategic evaluation to ensure the certainty of their business objective and conclude whether there will be assurance for a positive business turnover for their business model. A broad range of companies may not experience a return on investments (ROI) during their initial years. Strategic failures may occur as a result of estimated implementation of a blockchain model or framework.

Hence, companies are advised to perform thorough assessment at the level of a use case to determine the various application that are to be utilized within the blockchain framework. Significant impact assessment needs to be applied to indicate the position at which the model will make a valid impact with the specific use cases design. Therefore, an appropriate strategic approach is needed to leverage maximum benefits out of the Blockchain framework.

## **2.9. Industries where this framework is more appropriate**

This Blockchain framework can be applied appropriately in any of the following industries: Agriculture, banking, healthcare, education, e-business, retail, transport and logistics, entertainment and automotive (Wan, Gao, & Hu, 2022). Having a thorough understanding of its implementation is a stepping stone to yield highly competitive advantage

over competitors.

## **2.10. Influence of this Method to Economic Development**

It is finally developmental economics where blockchain technology appears to have not just immediate application but also great promise. Because the objective of blockchain is to eliminate the intermediary in transactions or the necessity for institutions to remain private and independent in its operations. Notwithstanding, it is also apparent to particularly see relevance of deploying blockchain in developing countries where institutions may not always be reliable and efficient. (Ahmad, Salah, Jayaraman, Yaqoob, & Omar, 2022).

Furthermore, blockchain allows users to use alternative cryptocurrencies instead of national currencies, which can be especially useful in nations where inflation is high. Blockchain technology also opens up new possibilities for financial and insurance services, which is especially beneficial in nations with large levels of unfunded and uninsured people available (Piao, Hao, Yan, & Jiang, 2021). Lastly, blockchain possess the potential to enhance donor activities by sending funds for international assistance and making cross-border transfers highly secured and cost-effective. Here are five ways we believe blockchain may enhance economic development and poverty reduction.

### **2.10.1. Failing Institutions to be Replaced by Blockchain**

Base on the views of several established economists, the slow economic convergence of developing countries is a direct result of the



instability of their institutions and the consequent corruption and inefficiencies. For the majority of economists, in order to promote the growth and development of developing countries, it is necessary to focus on improving the systems of developing countries. (Piao et al., 2021).

Property rights are one precise example of an institutional challenge in maximum growing international locations. A critical number of households in growing countries can't trust any institution to preserve a very good and cozy file in their land-possession rights or belongings rights (Piao et al., 2021).

These countries often lack the legal and political security and maturity that other Western nations can benefit from. Instead, the recording systems of these countries are often fragmented, and citizens tend not to trust the politicians and officials behind them because of political instability and fear of corruption.

Therefore, Blockchain offers an interesting alternative to these unreliable institutions, proposing a safe, transparent and unchanging environment that eliminates the need for public institutions and intermediaries. Instead of a centralized system of ownership that provides corrupt officials with an easy range of operations and capsizes, blockchain is a decentralized ecosystem in which transactions are processed by multiple nodes (or miners) on the network. There is an advantage. The immutable properties of the blockchain are of particular (Shen, 2021).

For example, a blockchain system guarantees the immutability of a

block in a chain of validated transactions by including a block header that references the previous block in the transaction chain. So if someone tampers with a block (or a set of properties in this case), the changes propagate to the chain and everyone knows that a malicious actor tried to change the block.

### **2.10.2. Blockchain becoming an Alternative Capital Source**

Access to bank loans is often difficult for both modest individuals and small businesses in developing countries, as most banks require extensive collateral and insurance that these agencies do not have. Financing issues are very important in developing countries. Without banking services, many African homes borrow money from each other in very informal situations (Kusi-Sarpong, Mubarik, Khan, Brown, & Mubarak, 2022).

Published in the World Bank Economic Review in 1990, "Credit as Insurance in Rural Economy" is a mechanism by which dry enforces within local communities and informally.

Blockchain provides an interesting alternative to these informal lending processes and helps agents find safer sources of funding. Several new startups have emerged that offer custom financial services using blockchain to address the issues surrounding informal lending. For example, startup offers a decentralized wallet and asset agonist value exchange for those without a bank account, within the existing reputation-based trust network and community instead of formal insurance and credit

institutions. (Z. Liu, Li, Min, & Chang, 2022). The investment problems that seeks to foster monetary inclusion via way of means of the use of biometric authentication for identity. In all of those use cases, blockchain gives an thrilling center floor among formal and casual lending and permits methods to be greater nearby at the same time as making sure broader enforcement mechanisms.

### **2.10.3. To Avoid Fluctuating Currencies, Use Blockchain**

In many developing countries, inflation and hyperinflation force currencies to devalue rapidly, making everyday products prohibitively expensive and imports prohibitively expensive. Venezuela, for example, has experienced massive inflation over the last six years. Venezuela had reached astronomical highs of 80,000 percent inflation by the end of 2018. As a supplement to a country's fiat currency, cryptocurrency has the potential to solve this problem by providing a decentralized digital form of payment. (Hughes, Park, Kietzmann, & Archer-Brown, 2019).

In many developing countries, stable coins, for example, are often tied to a different asset, such as the US dollar or gold, but they lack the backing of a central bank (Hughes et al., 2019). As a result, stable coins can be used as a medium of commerce, a store of value, and a unit of account. This allows cryptocurrencies to be used for more everyday transactions and as an alternative store of wealth in high-inflation environments (Carvalho, 2021).

#### **2.10.4. Cross-Border Payments on Blockchain**

Many fees are currently charged by companies that enable cross-border payments. However, blockchain has the potential to reduce these expenses to 1%. Blockchain also ensures real-time cross-border transactions and mitigates the risks associated with currency changes. Companies such as Abra, for example, have created platforms that allow consumers to change fiat cash into cryptocurrencies that can be instantaneously withdrawn in their native currencies.(Z. Liu & Li, 2020).

Various middlemen benefit from commissions in international money transfers, which allow them to stay in business, such as SWIFT, which collects a small share of every transaction across borders. The use of blockchain technology eliminates the need for middlemen and eliminates the requirement for central organizations to manage payment processing fees. Furthermore, because there is no need to wait for central institutions to process money transfers, blockchain has the capability of allowing near-instant money transfers (T. Qiu, Zhang, & Gao, 2019).

#### **2.10.5. Foreign Aid and Blockchain Systems**

Finally, blockchain can assist in even more basic ways, such as in the area of international charity. The problems with foreign aid to developed countries today are numerous: donations are frequently subject to significant overhead costs to compensate for all actors and third-parties involved in the process, which often disincentives potential donors; donations frequently lack data transparency, both in terms of how the

money gets to its destination and how it is used and beneficial for the cause; and, finally, donations are frequently seen as counterproductive for an underdeveloped country. (Zheng, Hu, Chong, & Tan, 2022).

Blockchain provides an intriguing answer to these issues since it reduces the number of middlemen engaged in the contribution, lowering overhead costs that are "lost" in the process. Rather than paying many actors involved in the processing and conversion processes, blockchain enables targeted donations to reach the intended recipients without the involvement of a third party, owing to automated mechanisms facilitated by smart contracts. Donations can thus become considerably more efficient, transparent, and trustworthy for the donor thanks to blockchain. Furthermore, without the need to trust a single organization, blockchain provides real-time and traceable data on donations.

New startups like Alice and Bankymoon, for example, use blockchain technology to deliver real-time and transparent statistics on donations. "The performance of each project is publicly available," according to Alice's website, "making it easier for funders (philanthropic organizations, impact investors, and small donations) to find and help expand social programs that succeed."

### **2.11. Challenges**

With the proposed framework, there are challenges that might discourage the supply chain and logistics industry from embracing blockchain innovation to create green supply chain and logistics, counting

motivating force instruments, information capacity and transmission as well as execution taken greater scope. The world is full of information. These days, the sum of information increments quickly; Google should prepare more than 24 petabytes of information per day and Facebook can transfer more than 10 million photos per hour [60]. So also, within the logistics industry, an expansive sum of information can be collected and put away each day. In this way, this postures a danger to the application of blockchain (Zhou et al., 2020).

To begin with, as the sum of information is collected, each hub within the blockchain arrange needs a expansive capacity since information is put away over and over in each node. This will result within the squander of capacity. In addition, power is additionally expended, which damages the initial deliberate of green advancement. Moment, when a expansive number of Web of Things (WoT) gadgets are conveyed, real-time collection will lead to arrange blockage that diminishes the quality of administrations. As a result, the steadiness of blockchain cannot be ensured. In this manner, information transmission may be a gigantic challenge for the supply chain and logistics.

In arrange to execute this blockchain for green supply chain and logistics, taken a high and hazard are obstructions for the supply chain and logistics industry. High taken a high may be a burden on supply chain and logistics companies. There are a few sorts of costs, counting gadget costs, preparing costs, operation costs and support costs. In spite of the

fact that potential benefits have been expounded, most of them have not been accomplished. Instead of making an expansive speculation, companies might lean toward not to embrace blockchain. Other than, high chance is another burden. How blockchain can be utilized is still being investigated. As a result, the operations of supply chain and logistics companies are defenseless to disturb once there are specialized issues.

In crypto currency frameworks, diggers in a blockchain organize are remunerated. Be that as it may, the logistics industry gets few rewards when logistics companies record information on the logistics handle. Consequently, they cannot be persuaded to do so. Without the association and engagement of logistics companies, blockchain cannot be set up, and applications and administrations cannot assist utilization to encourage supply chain and logistics operations. In this manner, motivating force components are vital.