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# Implementing Blockchain in the supply chain of FMCG companies for better demand forecasting and logistics operation.

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## Abstract

**Purpose-** This study aims to enact Blockchain in the corporate supply chain sector of FMCG companies to ensure better demand forecasting and logistics operation in Bangladesh. It aims to explore the problem of product shortage and demand fluctuation in any particular area.

**Methodology-** The primary data related to the study has been collected through surveys. Data related to the product sales and product demand is collected through a survey of 700 retail outlets situated in 7 major cities in Bangladesh. To find the facts regarding the problem of actual demand forecasting, an interview session has been taken with 40 Territory Officers in this field. Also, a questionnaire session has been taken for the study.

**Findings-** Results demonstrated that there is a problem with real-time data collection regarding the consumption of the products. For this, the management of the company cannot be able to predict the sales accurately. Management became misguided to produce the products. For this reason, the problem of product shortage arose.

**Practical Implication-** Blockchain can ensure real-time or end-to-end data for the company in the department of the supply chain. Implementing blockchain in the distribution chain sector can ensure better demand forecasting for the company. Also, the logistics operations can be furnished by accurate end-to-end tracking.

**Originality-** This study is the first attempt to identify the problem relating to demand forecasting and product shortage in the FMCG sector in Bangladesh. Also, this study is the first to implement Blockchain in the field of distribution to collect real-time sales data for the company.

**Key Words-** ***Blockchain, Logistics, Demand Forecasting, FMCG Company, Supply Chain Management***

## Introduction

The supply chain has been stated as the lifeline of all kinds of organizations. Since the beginning of human organizations, the importance of the supply chain was much focused on. Starting from Army to business organizations, all are deeply dependent on Supply chain management for effective maintenance of operations (Helo and Hao, 2019).

The world has been developed at a rapid pace which has given birth to many innovations and Blockchain is among them, which has the potential to change the entire world system. It is a decentralized network-based digital shared info storage. Because of its fragmented, authenticated, and distributed nature, it has an immense optimistic influence on the distribution chain of FMCG. Blockchain can be utilized in such a way to develop its logistics operations and generate better demand forecasting by analyzing the huge consistently updated database (Tan et al., 2018).

Following Allied Industry Research, the international FMCG industry is expected to meet 15,361.8 billion US dollars, rising at a steady 5.4% rate within 2025 (ARM). Despite Bangladesh's adverse economic times, the FMCG industry has expanded at a steady ratio of more than 9 percent. (Uddin et al., 2016).

Fast-moving consumers goods are completed items that are eaten in the home and are not used to replicate any commodities or services. These kinds of products are closely related to our day-to-day life. There are three types of consumer goods: persistent, nondurable, and service. FMCGs that aren't long-lasting. Fast Moving Customer Goods are products with a short shelf life and strong consumer demand (FMCG). Personal Care, Household Accessories, and Food and Beverage are the three categories in Bangladesh's FMCG business. Because of the insufficient facility, incompetent staff, and a lack of technical innovation, Bangladesh's FMCG supply chain remains susceptible (Sharma et al., 2020).

We intend to do research to identify existing SCM issues and obstacles. The research focuses on creating a supply chain utilizing blockchain and the global supply network's reaction to it. The research will look at changes in customer behavior, innovations, and supply chain improvements that can help Bangladesh FMCG prosper by utilizing Blockchain in the supply chain.

# 2. Literature Review

## 2.1 Theoretical Background

### 2.1.1 Supply Chain Management

Experts have found a way to make the distribution chain more effective and time-saving as well as the concept is being popularized. World-class multinational companies have placed a strong emphasis on rapid and convenient distribution network management to ensure that their sustainable competitive advantages are maintained (Deloitte, 2017).

Without any doubt, it can be said that the supply chain is indeed a delicate operation that may be severely derailed. Dozens of new mechanical components may strain some of the most reliable and consistent supply chain processes, from mass-producing through gathering, stockpiling, border checks, authorization, and transportation. For supply chain operations, transparency, ease of operation, cohesion, adaptability, and streamlining have widely been regarded as unbeatable privileges (Tezel et al., 2021).

Manufacturing and fabrication can be limited by the availability of information transfer and imprecise integration across the departments of a corporation. By making the perfect use of data gathered from various supply chain operations, Enterprise Resource Planning (ERP) applications may assist businesses to create better utilize their resources (Cole, Stevenson, and Aitken, 2019).

There is always found out a severely restricted quantity of data. Accordingly, there is no disciplined approach to appropriately gathering data from the supply network to develop capacity planning and efficiently arranging logistical tasks. As a result, demand specification often differs significantly from actual figures. There is also a bottleneck in logistical fields as an outcome of this. Eventually, businesses' logistics are compressed extremely narrow. To acquire the appropriate cost-effectiveness, they must mitigate logistical operations as much as financially viable (Moosavi et al., 2021).

### 2.1.2 Blockchain Technology

Blockchain is usually a dispersed, encrypted database that is introduced to make it easier to track operations and manage the resources in a corporate network. On something like a blockchain network, for illustration, absolutely everything worth may be recorded and sold, mitigating business risks and minimizing expenses for all participants involved. It's a decentralized distributed ledger technology that makes the records of any digital asset observable and unalterable without the implication of a mediator facilitator. It is generally a legitimately trailblazing platform that's generating a lot of excitement attributed to its ability to reduce vulnerabilities and corruption on a global scale (Akter et al., 2020).

After successfully assimilating into multiple industries, Blockchain was introduced into many sectors as well as the supply chain. As an evolving innovation, blockchain inside the supply chain is still a unique concept that has sparked

huge attention from experts around the globe. This has the potential to transform the data that is sluggish in the supply chain function into a great strategic resource that might grant corporations key advantages against their rivals. Using the Blockchain, corporations can collect and distribute valuable data that can surely help to forecast demand and utilize logistics resources for the achievement of strategic operational and organizational goals (Seyedan and Mafakheri, 2020).

In the blockchain network, supply chain transactions are either initiated by the authorized supply chain entities or dynamically enforced by smart contracts in response to pre-defined circumstances. To reduce potential security issues, supply networks generally use approved blockchains, which allow relevant data about supply chain events and transactions to be validated only by authorized and trustworthy supply chain participants with particular credentials. Specific user groups, such as end-users, are only authorized to access data on the blockchain network (Kawaguchi, 2019).

After being evaluated and anonymized with a hash algorithm, blockchain data is preserved in timestamped blocks that are connected in chronological order. The blocks are used to work together for the formation of a shared archive that may be utilized so that the supply chain techniques can be traced like the asset and inventory provenance can be verified. According to blockchain networks that provide a fragmented, unified viewpoint, blockchain-implemented supply chain solutions provide approved parties with improved transparency throughout all supply chain processes. Even one unplanned event is enough to trigger a chain reaction of the distribution channel disruptions, but the blockchain supply chain mechanism utilizes consensus protocols that engage autonomously when pre-determined market opportunities are achieved. This enables the user's near-real-time visibility into what is going on indeed, as well as the opportunity to interact immediately if something goes wrong (Lohmer and Lasch, 2020).

## 2.2 Hypothesis

### 2.2.1 Hypothesis 1

After implementing the proposed system of distribution, the company will be able to make profits that we're unable to make because of product shortages.

### 2.2.2 Hypothesis 2

The proposed system will ensure better data management and handling system which will help managers make better strategic decisions.

### 2.2.3 Hypothesis 3

Distribution costs will be reduced and the company can reach every retail shop in the respective territory

### 2.2.4 Hypothesis 4

By implementing the proposed system, companies would be able to get real-time data which would help them gain a better understanding of demand and logistics needs which may help them to transform the traditional supply chain into a more agile or flexible supply chain model.

## 3. Research Objectives

1. Ensuring a concise distribution channel through the use of the application software.
2. Implementation of blockchain
3. Enhancement of sales
4. Reducing the product shortage problem
5. Minimizing distribution costs
6. Better storage handling system
7. Better Demand forecasting
8. Better logistics handling method creation.
9. Optimizing logistical Operations to make our inventory system more effective.

## 4. Research Methodology

### 4.1 Quantitative & Qualitative methodological approach

The current supply chain of FMCG companies is not efficient enough with its data structure and lacks the agile and flexible supply chain traits to take quick decisions that may give the company a strategic advantage. So, here we collected both quantitative and qualitative information, as well as empirical findings, for the research work, with the prime portion of the data deriving from primary research sources.

We used most of the primary data collected from market research and partially used secondary data. This was difficult to obtain market information and a real competitive scenario. Lack of information on the Company's website and lack of unified supply chain data structure was another challenge in this research area.

We gather experimental data by controlling and manipulating variables. The challenges during this study were evaluated carefully. Since there are very few researches conducted on Demand forecasting of products in Bangladesh (specifically for FMCG products).

### 4.2 Methods of data collection

We used the quantitative method of data collection. Data has been collected from surveys. Primary data is collected through a survey of 700 retail outlets in 7 major cities and 40 territory Officers around Bangladesh.

#### 4.2.1 One on One Interview

The interview is arranged with Shop owners and Territory officers of 5 leading FMCG companies.

### 4.2.2 Face to face interview of Retailers

For authentic primary data collection, we have visited around 700 retail outlets situated in 7 major cities in Bangladesh. The following questions have been asked to the retailers:

1. How is the duration between two frequent orders?
2. What is the basis of giving product orders?
    1. Previous sales data
    2. Future prediction
    3. Company suggestion
    4. Customer's request
3. How is the delivery time after the order?
4. Is this very common being a product out of stock? If yes, what time does it stay and how do you solve the "out of stock" problem?

### 4.2.3 Face to Face Interview with Territory Officers

For the research, we have taken an interview with 40 territory officers of 5 different FMCG companies. A questionnaire session has been taken. Following questions have been asked,

1. Is this very common being a product out of stock?? If yes, how much time is required to make the product available?
2. How does the time required to make unavailable products available?
3. Do retailers buy products from other companies if you can't supply them with your products?
4. Is it possible to increase sales by ensuring a demand emergency supply of the unavailable products?

## 4.3 Methods used to analyse data

We have Used **Statistical Package for the statistical Science (SPSS)** as the main tool for data analysis. Under this analysis, we have calculated Arithmetic Means, Variance (Including Analysis of Variance), and Co-Relation.

# 5. Results and Discussion

After analysing the data properly, we have found the following information,

1. Average Order Taken by Sales Agent / Executive = **1 order/week**
2. Product Delivery after order **= 1 day after the order**
3. Average Product out of Stock of any particular product in a retail shop = **4.8 days**
4. Average Product out of Stock of any particular Product in a Warehouse of the company= **4.2 days**
5. **87.84%** of retailers suggest the customers buy an alternative product if the desired product is out of stock.

6. **66.21%** of customers purchase alternative products if the desired products are unavailable.
7. **84.34%** of retailers and 37 out of 40 territory officers believe that the company's sales will go up if the products are always available.

In this case, there is a hidden loss arises due to the shortage of the products. This problem (shortage of products) represents that there is a gap in collecting real-time data. Also, there is a lack of actual prediction of the product's consumption.

### 5.1 Problem that has been found

After analysing all the valuable data, we have found the problem which is the ultimate reason for being the product unavailable. The problem is that there is a lack of real-time data collection regarding the consumption of the products. For this reason, the management of the company cannot predict the actual sales. Management can be misguided to produce the products if there is a problem regarding the sales forecast (Hastig and Sodhi, 2020).

## 6. Existing Supply Chain Model

Supply Chain Model helps a product be distributed to the final consumer from the manufacturer by several mediums. Manufacturers Take production decisions basis on the sales forecast (Caro et al., 2018).

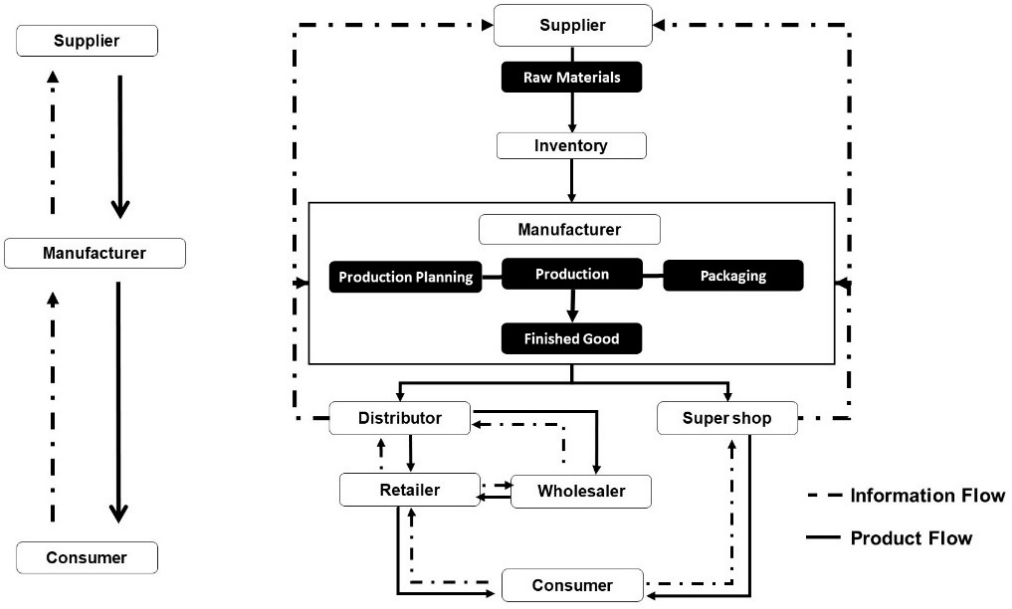



Figure: Supply Chain Model of FMCG Companies in Bangladesh

And these sales forecast largely depends on previous sales data rather than demand forecasting. A manufacturer produces products from raw material and sends them to the distributor on account or cash, he then distributes them

among wholesalers, some retailers, and also some super shops. Some Retailers also buy from the whole seller later because company Sales Representatives only take orders a day a week. Sometimes their stocks are not able to supply the demand increase. Most of the supper shop has some contract with direct Distributor and others buy from the whole sellers. Final Customers buy from either Retailer or Supper Shop. In this whole system, everything is predetermined, like Manufacturer manufactures depending on previous sales, distributor distributes depending on their supply, retailers also order or buy what numbers of products they usually buy except push selling, they have no real-time data of demand forecasting (Helo and Shamsuzzoha, 2020).

In this traditional supply chain, information flow is very complex which creates a gap of information in the logistical functions which ultimately reduces the efficiency of demand forecasting and logistical operations (Vu, Ghadge, and Bourlakis, 2021).

For this reason, most of the time retailers face stock outage problems due to the sudden increase in the demand for a product, Distributors of some territories failed to deliver for several days, on the other hand, there are surpluses in other territories' warehouses. Our research found problems hiding inside this traditional supply chain model and with the help of multiple supply chain experts from different FMCG companies, we have identified a solution that can help us to mitigate some major problems in the traditional supply chain model (Dujak and Sajter, 2018).

## 7. Proposed Supply chain Data collection Model

If a company can collect real-time sales data, then definitely it (company) will be able to predict accurate sales for the future. In Bangladesh, still, the order is taken by the sales representatives manually. In most cases, they go to the retailer shops and take the orders in a traditional system. For this reason, it is very hard for the company to predict the future demand accurately. Although it is not possible to predict 100% future sales. But a company can go very close to the actual sales if there is accuracy regarding information (Krystsina Sadouskaya, 2017).

In that case, application software can ensure real-time sales data. If companies use software to take orders, then they can collect real-time data and use it when the data is needed (van Hoek, 2019).

Our proposed plan is all about ensuring real-time data by implementing blockchain. For this, application software is needed to collect sales data on time.

The software application under the proposed plan will have three interfaces. They are as follows:

### 1. Sales Representative Interface

This interface will be used by the sales representatives of the company. They will be able to collect data regarding:

I. Taking orders
II. Separately identifying the route
III. Monitoring product shelf time
IV. Monitoring product return

### 2. Territory Officer Interface

In this interface, territory officers will be able to do the following functions

i. Monitoring territory distribution roots
ii. Maintaining connectivity with nearby territories.
iii. Forecasting product demand.

### 3. Management Interface

In this interface, the management of the company will be able to use it for the following reasons.

i. Monitoring nationwide product sales
ii. Nationwide distribution root monitoring
iii. Real-time data analysis for better demand forecasting.

Integrating these features into the **Sales Information Systems (SIS)** a diagram is shown below:

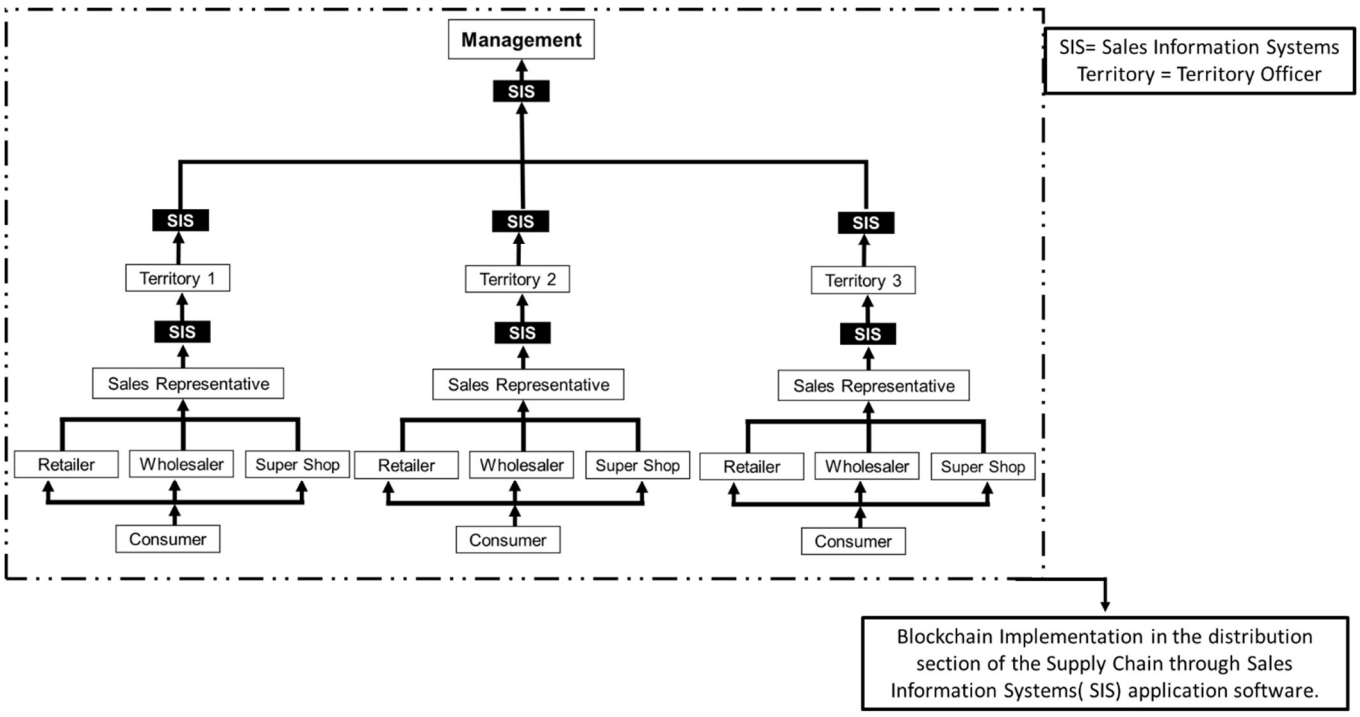



Figure: Proposed model for data collection

Usually, the consumer data relating to the sale of a product is the most valuable asset for any corporation. This data can lead the corporation in strategic and creative decision executions that may grant competitive advantages due to effective demand forecasting and optimizing logistics to supply products where they are most demanded (Akter et al., 2020).

Using this proposed model, sale data can be collected from the retailers, wholesalers, and super shops through sales representatives on time by utilizing the Sales Information Systems (SIS) software (Kawaguchi, 2019).

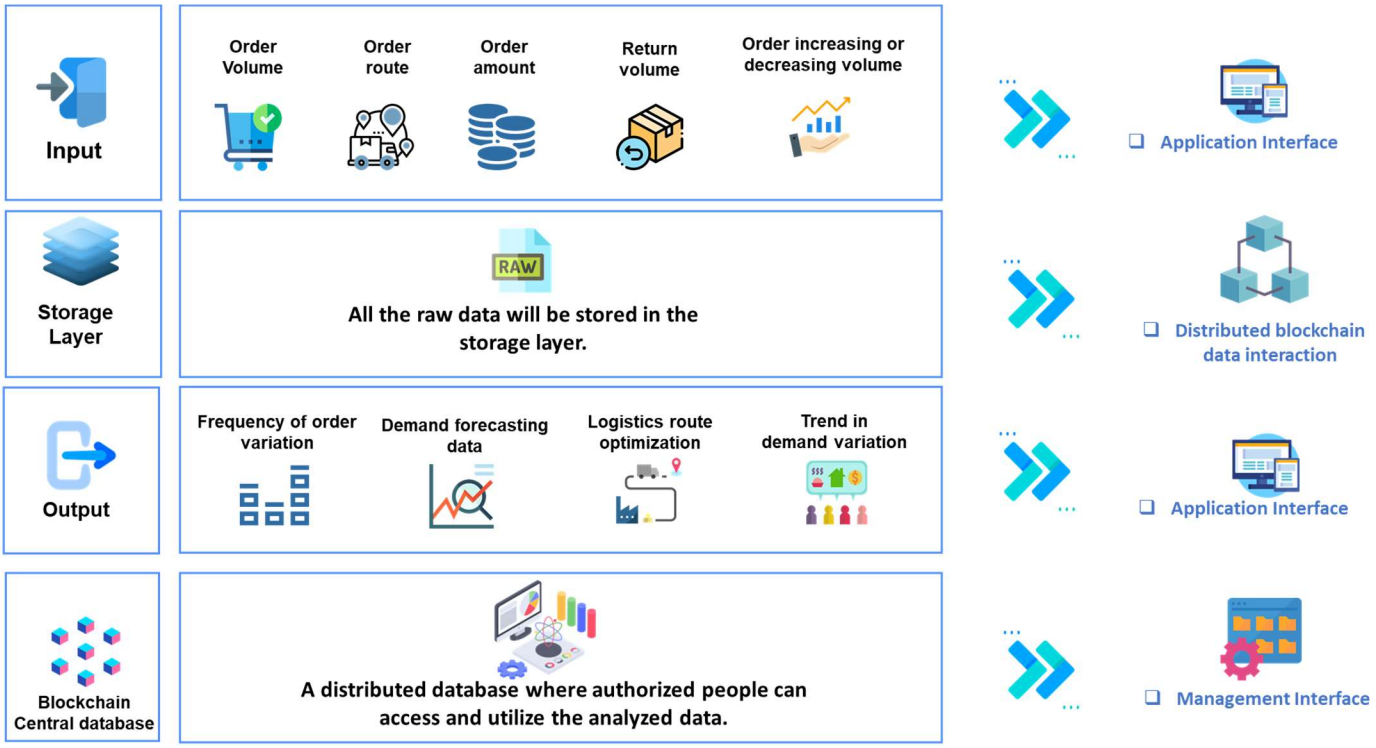
When sales representatives input the sales data, it (data) will be saved to the server. The territory officers will be able to monitor the sales information. Management of the company also can see the information regarding sales. Any authorized party can use the data whenever he wants for the betterment of the company's sales (Vivaldini, 2020).

## Governance

Here is also a detailed statement of what will be the governance structure of our Blockchain integrated data channel.

To maintain our integrated blockchain data structure, we would be utilizing a parallel command structure under the Top management. Here a dedicated input team will be monitoring and cross-checking the data that were collected through the application interface by Retailers.

Another team will be monitoring the storage layer where all the raw data collected from the market will be stored through a distributed blockchain database. From there these data will be



delivered to the output department where the results will be crossed checked with the imputed market information before handing over the final data to the Management interface under the Top Management of different companies. This way, data theft will be easily prevented and false data could be identified.

This will enable us to make better demand forecasting and optimize logistical operations to gain better profitability and effective decision-making.

## 8. Impact of the proposed model

Since our proposed model deals with real-time sales data, it will help the company to predict the sale for the following periods. The product shortage problem can be reduced by handling the efficient demand. The product's shelf time can also be minimized. A territory officer can be connected with the nearby territories and also can take any kind of logistics support regarding transportation. Management of the company can use data for their ERP system. Management will also be able to know which products should be produced more and which products production should be stopped (Akter et al., 2020).

## 9. Limitations and Directions for Future Research

In our country Lack of Awareness is strongly visible among the people of the country. People are not aware of technologies. For this, sometimes wrong information and lack of information may mislead the desired data. This will create a barrier to the proper implementation of the process. Though blockchain is new in the FMCG sector, it's really hard to regulate after starting and it will consume high energy (Lohmer and Lasch, 2020).

Related information is scarce in Bangladesh. For this, it was very difficult to find out which is the ultimate problem for product shortage. The market situation in Bangladesh fluctuates rapidly due to the price hike, inflation, political issues etcetera. These factors may also contribute to the problem of product shortage. Sometimes excessive demand for the product can be the cause. Seasonal products have also another problem. These become obsolete in the off-season (Tan et al., 2018).

In Bangladesh, so far Sales Representatives traditionally take orders. It takes time to utilize those sales data. Unlike many other countries, continuous changes in income in Bangladeshi people are gradual and sudden. For this, demand in the market changes randomly. If anyone wants to study the field of blockchain, he must consider the stated situations. Problems found while doing this study will help to make better strategic decisions (Sharma et al., 2020).

## 10. Conclusion

Usually, product shortages may happen for many reasons. Companies must deal with this problem effectively. Otherwise, customers' concentration can be shifted from the company's product. If customers shift their eyes from the company's product, it can be a long-term threat to the sale of the company. Not only that, there is a hidden loss that arises due to the shortage of the product. Because "No Sale, No Profit". Effective sales prediction can help the company to minimize the shortage of products. For this, it is crucial to gather all data based on sales promptly and utilize them in such a way that it can make sense of the prediction of sales. Implementation of blockchain in the distribution section can be a better idea to solve the sales-related problem. The product shelf life can also be minimized by transferring the product where it is most demanded. If the proposed plan is implemented, the company's sales will go up. A big change can be seen in the overall supply chain of the company if the proposed idea is taken.

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