Internship Report

ON

“Value Chain Analysis at Nodes Digital Limited”

Course Title; Internship

Course Code: INT 4399

Topic

Internship report on

"Value Chain Analysis at Nodes Digital Limited"

Submitted to:

Dr Saad Hasan

Associate Professor

School of Business and Economics United International University (UIU)

Submitted by:

Shopno Sikder

111213037

Supply Chain Management

Submission Date: 24.08.24

Letter of Transmittal

Date: 24.08.24

Dr. Saad Hasan

Associate Professor

School of Business and Economics

United International University

Subject: Submission of Internship Report

Sir,

I'm pleased to submit my internship report on **"Value Chain Analysis at Nodes Digital Limited"**. I began my internship at Nodes Digital Limited's Corporate Office on January 2, 2024, and it ended on June 30, 2024. Throughout my employment, I learnt a great deal about the company's functions and operations.

I tried to finish the report using my observations and secondary sources. I have work hard to complete this report thoughtfully and properly feasible. I feel that the exhausting work will help you move forward with this type of enterprise. However, if you need any help deciphering this information, please do not hesitate to contact me.

I strongly hope that I can meet the objectives of the Internship program, and that you will accept it. Thank you again for your help and advice.

Sincerely yours,

Shopno Sikder

ID No: 111 213 037

Acknowledgements

First and foremost, I want to thank God for giving me with the chance to finish my internship report under the supervision of some beautiful individuals. I'd like to thank Dr. Saad Hasan for volunteering to oversee me while preparing the report. His enthusiasm to assist me at all stages motivated me to finish the report.

I'd also want to thank Shaiak Salahuddin Seaum, Head of Logistics and Field Operations, and Afsana Akhter, Project Manager, for their sincere concern, important time, advice, and consistent guidance in compiling the report. Finally, I want to express my heartfelt appreciation to Nodes Digital Limited executives who assisted me and provided me their important time in presenting me with the most essential material from which I generated this report. Their commitment and contributions made this study possible.

Table of Contents

Executive Summery

Nodes Digital Limited, located in Baridhara DOHS, Dhaka, Bangladesh, is an emerging Agritech company specializing in Precision Agriculture. By integrating AI, IoT, and Machine Learning, the company optimize resources and enhance productivity sustainably. Our IoT sensors collect field data, enabling data-driven decisions for farming practices and monitoring existing conditions. This approach saves resources like irrigation water and diesel while boosting productivity. Through innovative technology, Nodes Digital Limited is revolutionizing agriculture for a more efficient and sustainable future.

The first chapter of this report discusses the report's goal, objectives, research methods, and study limitations. The second portion of this study includes Nodes Digital Limited's corporate profile, purpose and goal, and product portfolio. The third chapter of the study describe value chain analysis of fish culture. value chain analysis of fish culture is critical for every Agritech enterprise. By following the right value chain for fish, Nodes Digital offer value to the organization. This chain has a variety of actors, each of them plays a significant role at some point. The fourth chapter of this study focuses on Nodes Digital Limited's inventory management. The goal of this section is to learn about how the company manages its inventory. The fifth chapter describes Nodes Digital Limited's sourcing and procurement procedure. This chapter discusses how Nodes Digital Limited acquires equipment and components from suppliers, as well as the entire procurement process. The report explains overall supply chain activities of the organization.

Chapter 1 Introduction

1.1 Purpose of the Report

This report is written as part of the internship program on the suggested topic “value chain Analysis at Nodes Digital Limited”.

1.2 Objective of the Report

(a) Broad Objective:

General goal is to learn about a company's operational operations as well as Nodes Digital's supply chain.

(b) Specific Objectives:

- Analyze the value chain of fish culture in Bangladesh
- To learn how to manage Inventory in a company
- To learn how a company procures different types of products from the supplies.
- To understand overall operational activities of the company.

1.3 Methodology

Two types of data source have been used to prepare this report- primary data and secondary data

- **Primary data:** This research was developed with considerable use of original data. It is gathered from the workers associated with this organization. The data was gathered through personal conversation. The staff at Nodes Digital Limited were questioned with open-ended questions about the issue. They also supply information for the report, which is written accordingly.
- **Secondary data:** In addition to main data, secondary data were collected to learn about the company's history, background, and supply chain network. Secondary data was collected from the company's website and publications.

1.4 Limitations of the Study

1. Organizational constraints made detailed action research impossible.
2. Due to their hectic schedules, staff were unable to allocate much time for me.
3. The report was prepared from an individual's perspective. As a result, not all of the findings are necessarily objective.
4. Due to a lack of past research, there are few available records in this area.

Chapter 2 Company Profile

2.1 Introduction

Nodes Digital Limited (NDL) is an innovative agritech firm headquartered in Dhaka, Bangladesh. Established in 2019, NDL specializes in using cutting-edge technology like artificial intelligence and build different types of Iot devices to give solution for sustainable agriculture. With a commitment to sustainability and data-driven decision-making, NDL aims to address the pressing challenges facing the agriculture sector in Bangladesh and beyond.

2.2 Vision and Mission

At NDL, the vision is to make agriculture sustainable and intelligent through the application of advanced technologies and data analytics. NDL strive to empower farmers with innovative solutions that enhance productivity, efficiency, and profitability while promoting environmental stewardship. NDL's mission is to develop and market disruptive agritech solutions that combine AI, IoT, and research to drive positive change in the agriculture community.

2.3 Product Portfolio

NDL's product offering includes a variety of solutions geared to farmers' unique demands across many agricultural industries. Their flagship products include:

- **e-irrigation for Grains:** A Smart AWD e-Irrigation system that optimizes water usage in rice cultivation, reducing water and fuel consumption while increasing yields. Groundbreaking solution for irrigation using IoT and AI that optimizes resources, saves energy and irrigations cost up to 30% and can increase yield up to 11% in rice and other grain cultivation. Advanced sensors and real-time data analytics delivers precise irrigation management. This ensures that crops receive the right amount of water, minimizing waste and promoting optimal growth. Automated Alternate Wetting Drying Practice (AWD) minimizes manual intervention and save energy up to 30%. Advanced generating AI models forecast plant stress levels to improve agricultural operations, minimize resource

requirements, and increase production. Farmers may remotely monitor and operate irrigation systems using an easy-to-use smartphone app and online interface.

- **e-fisheries for Aquaculture:** An Intelligent Fish Monitoring System that monitors water quality and fish health parameters, enabling proactive management and maximizing yield. Revolutionizing aquaculture management through seamless digital integration. Real-time monitoring of critical water parameters such as pH, ammonia levels, dissolved oxygen, turbidity and temperature, ensuring an optimal environment for fish health. Advanced technology is used to examine the fish lifecycle, allowing for the detection of early indicators of stress or sickness, resulting in more immediate actions and healthier fish. Machine Learning based accurate growth predictions and yield optimization strategies, enabling farmers to maximize harvest efficiency and profitability. Automated aeration, constantly monitoring and adjusting oxygen levels to ensure healthy, thriving aquatic stock, promoting growth, and enhancing overall farm productivity.

- **Harvest Pro for Vegetables and Fruits:** An IoT-based Precision Agriculture system that enhances resource utilization, pest management, and yield prediction for vegetable and fruit cultivation. Advanced AI and IoT-powered precision farming solution for vegetables and fruits. Unified platform to manage irrigation, fertilization, disease control, and pest management seamlessly, streamlining crop care efforts. Utilizing advanced image prediction technology, the app allows to monitor crop health and pest attack in real-time. Detect and address issues promptly to ensure thriving crops. Harvest Pro optimizes crop yields by providing data-driven insights and effective decision-making support, resulting in increased farming output. The app's user-friendly interface makes it easy for farmers of all levels of expertise to access and utilize its features, promoting gender equity and farmers wellbeing.

2.4 Technology Integration

At the heart of NDL solutions lies the seamless integration of IoT devices, AI algorithms, and cloud-based analytics. Their engineering team designs, develops, and assembles IoT-based engineering systems using locally and internationally sourced components. Meanwhile, their agricultural and data science teams work to create machine learning models that evaluate sensor data and give farmers with actionable insights via easy smartphone applications. Sensor-based precision farming is not widely used in Bangladesh, and its potential has yet to be fully explored in agricultural field settings. Crop yield frequently varies owing to inefficient use of fertilizer, water, and pesticides in production processes. The conventional agricultural method is based on traditional surface broadcasting fertilizer, surface irrigation, and frequent pesticide application, which wastes fertilizer, water, and pesticide and, as a result, reduces yield, efficiency, and productivity. Given the current circumstances, the study evaluates the possibility of Internet of Things (IoT)-based precision agriculture for anticipating fertilizer, water, and pesticide usage in the field to improve crop output. This novel approach integrates technical and agronomic management features for eggplant production in the field.

Fish farming in Bangladesh is far away from reaching it’s full potential in Bangladesh compared to countries such as Thailand, Indonesia etc. For example, fish density in Bangladeshi ponds is significantly lower than in the aforementioned countries; feeding costs are high due to overfeeding; and, in general, fish farms in Bangladesh have trouble to maintain ideal pond habitat, increasing the risk of mortality and reducing yield potential. The adoption of IoT along with other SMART technology is an effective solution to the problem. Nodes Digital's E-fisheries system automates fish farming by combining real-time data analytics, IoT, and AI to monitor crucial parameters including water quality, temperature, dissolved oxygen, pH, and ammonia while optimizing decision support.

2.5 Strategic Partnerships

NDL has forged strategic partnerships with leading stakeholders in the agriculture sector, including iFarmer and Quality Feeds Limited. These collaborations enable NDL to market their agritech solutions effectively and expand their reach to farmers nationwide. Moreover, NDL collaborate closely with government institutions including the Bangladesh Agricultural Research Council (BARC) and Bangladesh Agricultural Research Institute (BARI) to promote precision agriculture and research. KGF also funded nodes digial limited in 2019 which is being carried by BARC and BARI.. The project made use of both globally available IoT equipment and an indigenously designed IoT system built by Nodes Digital. To NDL credit, cross system performance of NDL system has been equally reliable as IoT equipment sourced from reputed international brands. The project team believes that findings and success of the project would helpful to develop a guideline on sustainable agricultural practices to ensure food security in Bangladesh.

NDL has partnership with United International University (UIU), in the presence of acting vice chancellor Prof. Dr. Md Abul Kashem Mia, Dr. M Rashedul Hoque, Director of Nodes Digital Limited, and Professor Salekul Islam, director of AI and robotics, recently signed a Memorandum of Understanding (MoU) on behalf of their respective organizations.

Nodes Digital Limited & iFarmer also signed a MoU to develop and commercialize farmer centric digital solution. The primary focus of this partnership is to peruse new business opportunities jointly where both the companies can supplement each other’s offering to provide comprehensive solution to the client.

Nodes Digital Limited also partners with Quality Feeds Limited to work intensively in the agriculture and fisheries sector with a view to develop and commercialize farmer-centric digital solution. This Memorandum of Understanding (MOU) lays out the responsibilities and associated scopes. It also establishes a cooperative connection for the aim of evaluating the market feasibility of IOT-based and other digital solutions in the agriculture sector, which includes crops, livestock, poultry, aquaculture, and other related fields.

2.6 Future Outlook

NDL remains committed to driving positive change in the agriculture sector through innovation and technology. NDL is poised to expand our operations and scale our impact, with plans to deploy our agritech solutions to thousands of hectares across Bangladesh. Furthermore, NDL aspire to utilize key learnings and experiences to develop global solutions that contribute to food security and sustainable development goals worldwide. Nodes Digital Ltd. is dedicated to using cutting-edge agritech solutions to transform the agriculture industry internationally. To fullfull the vision Nodes Digital focuses more on mission they will work as a team to fulfill the demand.

NDl is working to transform agriculture into a data-driven, intelligent industry that can positively influence farmers' social and economic well-being through operations and decision-making at the field level. At present agriculture activities in Bangladesh are conducted based on generalized best practices and for that irrigation is a major contributing factor that affects sustainability. To mitigate these problems and make agriculture sector sustainable, NDL developed and implemented 4IR technology based Alternate Wetting and Drying (AWD) irrigation system which we brand as “e-Irrigation” The system is equipped with a number of IoT devices that gather field sensor data, which is subsequently evaluated by the system using machine learning algorithms. The solution can also be deployed integrated with solar based energy system contributing further to SMART Bangladesh and SDG goals. Use of our IoT and AI based technology solutions optimizes resources and saves irrigations cost by 25-30% and subsequent energy savings; and increases yield by 7 to 11% through optimized agriculture actions based on real-time field information. Significant reduction of water use in irrigation through the integrated Hardware and Software system developed will also optimize various input use associated with irrigation and hence reduce greenhouse gas emission. In addition, e-irrigation helps to achieve various Sustainable Development Goals (SDGs) relevant to agriculture such as climate action (GOAL 13), sustainable food (Goal 2) and Water security (Goal 6).

Chapter 3 Value Chain Analysis of Fish Culture in Bangladesh

3.1 Introduction

Fish is a very perishable food whose quality quickly degrades. Areas for manufacturing and consumption are likewise significantly separated. By utilizing contemporary, scientific methods for fish culture and technology, the greatest feasible utilization of currently available domestic resources can result in an increase in cultured fish production. Bangladesh is on the top countries in the world for freshwater aquaculture, because to its wealth of various inland and coastal water bodies. Bangladesh has the fifteenth highest freshwater inland aquaculture production in the world. The expected annual total for fish production is 226863 tons. Many professional fishermen and fish growers work full-time in this business, as does a substantial section of the general population. The distribution and structure of a region's fish producing system is an important aspect. Distribution involves a number of various systems, ranging from fisherman to customers. Fish prices are largely determined by their distribution mechanism. Fish distribution in Bangladesh is divided into four types: primary, secondary, intermediate, and consumer markets.

3.2 Stage 1: Broodstock Selection and Maintenance

Activities: Ensure a supply of high-quality broodstock for breeding to produce healthy and genetically diverse offspring. ensure genetic diversity; maintain broodstock health.

Stakeholders: Different types of hatcheries and research institutions are involved in this process such as Fishtech Hatchery, Bismillah Hatchery, Nahar Agro Hatchery. They implement advanced breeding techniques and maintain high standards to ensure the health and productivity of their fish stocks.

Outcome: Fertile broodstock, prepared for fertilization.

3.3 Stage 2: Seed Production

Activities: Production of high-quality fry and fingerlings to meet the demands of fish farmers. There are three process involved in seed production spawning, hatching and rearing First they Induce broodstock to spawn using natural or artificial methods. Then they Incubate eggs until hatch into fry last they raise fry to fingerling stage in controlled environments.

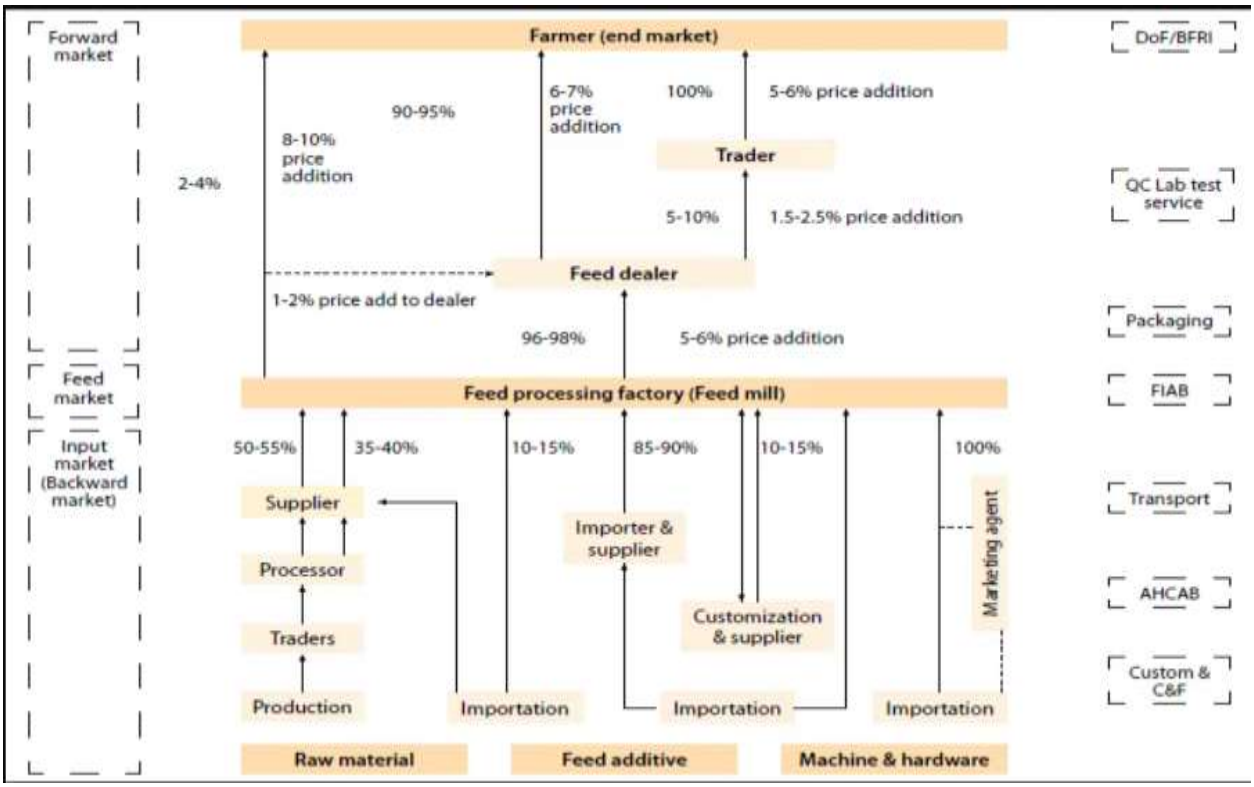
Stakeholders: Different feed production hatcheries such as Hatchery, Kazi Farms Hatchery etc and also different government breeding centers such as Bangladesh Fisheries Research Institute (BFRI), Jessore Fish Hatchery and Training Center, Shatkhira Fish Hatchery and many more.

Outcome: High-quality fry and fingerlings for stocking.

3.4 Stage 3: Feed Production

Activities: There are several steps involved in this process at first developing feed formulations that meet the nutritional requirements of different fish species at various growth stages. Then Manufacturing feed pellets using quality ingredients. Over the previous five years, there has been a significant increase in the production and consumption of fish feed in Bangladeshi aquaculture. Approximately one million tons of professionally prepared pelleted feed, as well as 0.3 to 0.4 million tons of feed made by micro- and small-scale firms at the village level, were produced. Testing feed for nutritional content and safety. Evaluating feed for safety and nutritional value. Ensuring that feed is delivered to fish farms on time.

Figure 1 Feed value chain in Bangladesh.



Stakeholders: Stakeholders: This procedure involves many feed producers and quality control organizations. Quality Feeds Ltd is Bangladesh's top feed company, manufacturing premium feed for fish, poultry, and animals.

Aman Feed Ltd. is part of Bangladesh's Aman Group, a multinational business. The firm offers a variety of animal feeds, including fish feed, with an emphasis on quality and sustainability. The company's present manufacturing capacity is 10 MT/hour, with a projected annual capacity of 6000 MT.

As a result, farmers may now get high-quality fish feed.

3.5 Stage 4: Equipment Supply and Maintenance

Activities: Fish farmers use a variety of equipment to manage and maintain their fisheries. The type of equipment required can vary depending on the scale of the operation, the species of fish being farmed, and the specific aquaculture practices used. Different types of aeration Systems which includes diffusers, paddle wheels, and air stones to maintain oxygen levels also Water Pumps and Filters are used for circulating and filtering water to keep it clean and oxygenated. There are different types of company which gives solution by Real-time monitoring of critical water parameters such as pH, ammonia levels, dissolved oxygen, turbidity and temperature, ensuring an optimal environment for fish health.

Stakeholders: Different Equipment manufacturers and suppliers provides comprehensive solutions for the aquaculture sector, including fish feed, water quality management products, aerators, and pond management tools. The actors includes ACI Agribusiness, FishTech BD, Aman Machinery Ltd, Aquatic Ecosystem Solutions (AES)

Outcome: Availability of essential tools and equipment for fish farming.

3.6 Stage 5: Financial Stakeholders

Activities: Provide financial support to fish farmers to facilitate the purchase of inputs and investments in their operations. Offering loans and credit facilities tailored to the needs of fish farmers. Providing insurance products to protect against losses due to disease, natural disasters, or other risks. And also offering financial planning and advisory support to help farmers manage their finances effectively.

Stakeholders: Different Banks, microfinance institutions and insurance provider the actors are Bangladesh Krishi Bank (BKB), Agrani Bank Limited, Grameen Bank, ASA (Association for Social Advancement). Insurance provider are Jiban Bima Corporation (JBC), Green Delta Insurance Company Limited, Asia Insurance Limited, and MetLife Bangladesh, Delta Life Insurance Company Limited.

Outcome: Financial support for fish farming operations.

3.7 Stage 6: Distribution Channel

Distribution is very much important function in fish culture. Because we all know that fish is a perishable item so if these items are not delivered right on time then the whole production process will be no use. There are several steps from first stage fish farmers to last stage customers or the end users. Every steps plays an important role in fish distribution in supply chain. The first step is the fish production where the fish is cultivated, when the fish is matured then it is ready to shipped. The fish farmers usually sell the fish to the middleman without middleman they cannot sell large amount of produced fish. The middleman includes wholesale market, retailers and so on. They are known as the paikers, atatdars. The middleman buy the fish from the farmers and they store the fish in the wholesale market where the retailers buy the fish from the wholesale market. In every region of Bangladesh there are many wholesale market (Arat) where the farkets from different region come the sell their fish. Here also many large organization buy fish directly from the farmers like brac, QFL and many others they also produce fish and also buy fish from farmers. They mainly do contract farming. Some government institution also buy fish from the farmers they support the farmers in producting good quality of fish. The retailers mainly buy fish from different arat with low price from the aratdars and then those the distribution to different parts of Bangladesh. Then the fish is distributed to different parts of fish market. In Dhaka city karwan bazar is considered the largest fish market where different types of fish we can get easily. In the last stage customers buy whose fish from different fish market like karwan bazar and many others. Here the price of fish increases in every steps. This happens because of transportation and many other reasons. The whole process does not take much time. Within 1 to 2 days it reaches to end customers. There are different types of fish is distributed like hilsa, shrimps, rohu, tilapia, and many more. Most of the hilsa and shrimps of large size are exported to other countries. Bangladesh is earning huge amount of money from selling those items. Bangladesh is one of the top exporters of these items.

a. Packaging system

Packing is very much important in fish distribution. If the packing system is good then there will be no risk of fish to be damaged. There are many ways of packing of fish ice packing is one of the common process of fish packing. We all know that fish is a perishable thing so fish is packed in ice container. Vacuum sealing is also one of the way of packing, frozen packing, live transport and many others. Table 1 below shows how the packing method works in him.

Packaging	**Materials used**	**user**
Baskets	Different types of rope, bamboo	Fish farmers and retailers
Ice Packing	Ice, box, rope	Exporters, wholesalers and many others
Vacuum Sealing	Polythene, rope	Exporters, customers and many others
Salt Packing	Salt, polythene, rope	Exporters, wholesalers, retailers and many others
Frozen packing	Ice, box	Exporters
Live transport	Tanks, water	Farmers, wholesalers

Table 1 Packaging System of fish distribution

b. Grading System

Grading system is very much important in fish distribution. With proper grading system fish is divided in 3 category large, medium and small. The price of the fish depends on the grading system. The price of large size fish is more in kg then the medium size fish. Grading is important for price distribution of fish. With proper grading price per kg of fish is fixed. The price of hilsa fish in Padma river is different from the price of other region because of it's test. Grading system is followed in every market. Table 2 shows the grading system of fish.

name	categories	Specification
hilsa	Weight per kg	More than 1.5 kg is considered large More than 1 kg is considered medium Less than 1 kg is considered small
Rohu	Weight per kg	More than 3 kg is considered large More than 1.5 kg is considered medium Less than 1.5 kg is considered small
Tilapia	Weight per kg	More than 250 gm is considered large More than 150 gm is considered medium Less than 150 gm is considered
Pangas	Weight per kg	More than 4 kg is considered large More than 1.5 kg is considered medium Less than 1.5 kg is considered small

Table 2: Grading system of fish distribution

c. Handling, transportation, and release of the fish

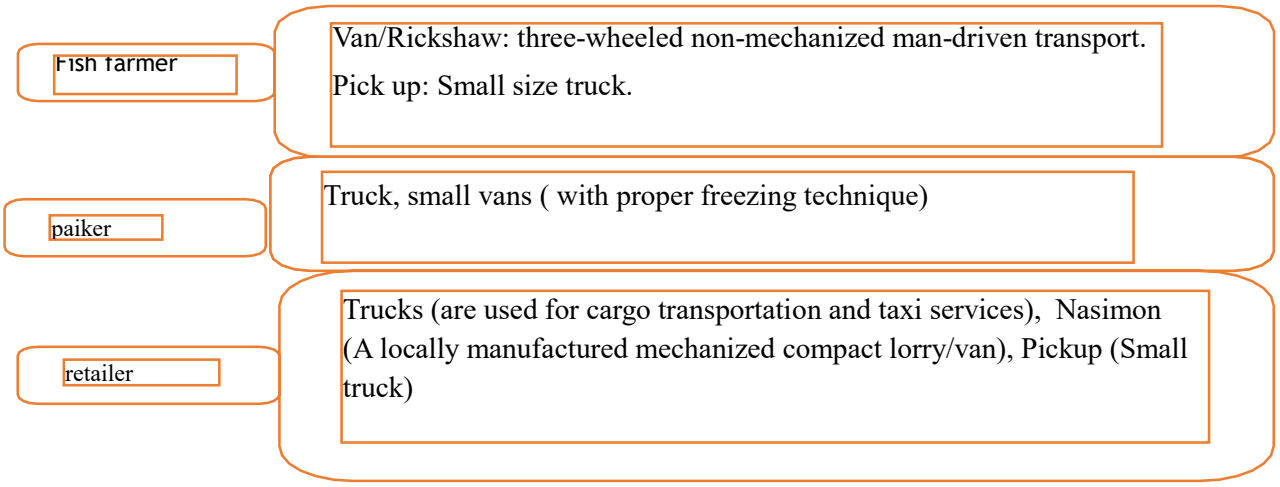
Transportation is very much important in fish distribution. without proper transportation fish cannot be delivered on time. We call know that fish is a perishable thing so it need to be transported as soon as possible. The proper hygiene of fish is determined by how fast the fish is transported to it's destination.. To carry products from production areas to consumers, fish

farmers and middlemen employ a variety of modes of transportation such as vans, rickshaws, trucks, passenger buses, pickups, Nasimons (locally built pick-up vans for transporting persons and goods), CNG, and so on. Sometime it takes long time to transport fish to point a to point b. Fish is transported from fish farmers vy road and then it is transported by ships to other countries.

Fish have two types of layers: live fish and dead fish. Live fish usually alive in water and they are transported live in the truck this fish may include koi, shol, magur etc. on the other hand the dead fish are transported in ice packing because they are not alive. This fish may include hilsa, shrimps etc. they are carried by trucks in dufferent parts of Bangladesh and they are distributed to different fish markets. And the end users buy those fish from the fish markets.

Many dead fish are exported to foreign countries as the demand of hilsa and shrimps is high in foreign market so these are delivered to foreign countries.

Fig 2: mode of transportation of fish



Fish is bought from different parts of Bangladesh from jessore, Khulna, coxsbazar, Chittagong and many other regions. These are bought by proper freezing technique and it is bought through truck. The use of ice is common in transportation because the condition of the road is not certain sometimes it takes 10 hours more to travel from one place to another.

So the use of use is common. And the supply of the ice is very much important in fish distribution because if the supply of ice does not meet the demand when there will be huge problem in the fish market and as a result the business man and the fish farmer will bear huge loss because we all know that fish is a perishable thing so it need to be in freezing consdition.

D. The characteristics of intermediaries

There is a huge role of the middleman in the fish distribution in fish supply chain. Without the support of the middleman the transaction will not be possible. The middleman are the middleperson who create a bridge between the fish farmer and the end consumer. The middleman may include the informer who provide information between the two point. And they receive commission from the wholesaler and retailers. Fish business is a profitable business in Bangladesh because Bangladesh is a land of river and ponds. There are plenty of ponds where different types of fish is cultured in that pond. Padma is known as the largest river in Bangladesh and plenty of hilsa is produced in this river. Here the informers plays an important role in hilsa distribution. In Bangladesh fish is collected with the help of aratdar which is known as wholesalers. They collect fish from the fish farmers with reasonable price and sell it to retailers where the retailers purchase from different arat. The retailers do not have permanent location they sit in the market and sell their products. Shrimps is one of the leading fish which is exported in the global market many tons. Here the LC paikers ship those products to the global market. The demand of shrimps is huge in the global market. Huge amount of shrimps are been exported to us, uk and middle east countries. As a result Bangladesh is earning huge amount of profit from these sections. The role of these intermediates is so important for proper flow of fish supply chain.

E. Role of Government and financial institution

Government and different financial institution plays an important role in fish distribution in Bangladesh. We all know that Bangladesh is full of river and wetland. Every year huge amount of fish is produced in our country. The number is huge and they are transported everyday so there is a huge transaction and supply chain is involved in this case. The proper distribution is possible if the supply chain network of every steps is strong. Government is playing an important role in

ensuring proper supply chain of fish distribution. Government police is also ensuring proper safety of the distribution. Safety of goods is very much important if proper safety is not given properly then there will be huge problem for the country. The bepari will not be interested to do business in our country and as a result there will be shortage of financial fund. Also the safety of the truck driver is important so government is working hard to ensure the safety of the goods.

Bangladesh fisheries institute is also working for the farmers so that every farmer can produce good quality of fish. Bangladesh fisheries institute is providing huge support they are providing fish feed to the farmers they are aslo providing transport support to the farmers. There are different types of financial institution playing an important role in providing micro credit to the farmer so that any farmer can start their fish farming business. There are different types of NGO which are working all day for the farmers brac is one of the good example. They are doing different types of campaign for the fish farmers, for different intermediates which are involved in fisheries business. Different types of machineries, different types of supporting activities are provided by different types of NGO. Different non-profit organization are working all day long for the farmers. Bangladesh is now one of the top exporter of shrimps in the global market this is only possible for the support of different financial institution, NGO and government.

Chapter 4 Inventory Management of Nodes Digital Limited

4.1 Introduction

Inventory management means tracking of inventory in every stages and also managing of organization inventory level when to order and how much to order. Inventory management is very much important for any organization if the inventory of any organization is not managed properly then the company will be in huge loss. They will not be able to identify how much inventory is needed for the organization.

Nodes Digital Limited is a Agritech focus on IoT and AI based precision agriculture so different types of sensors and components are needed by the IoT Engineers and to run the operations there are different types of equipment which needed to make the device ready. Inventory is very much important for any organization. Every organization have its own inventory some has more and some has less but these inventory is managed by following different types of software. There are different types of software management system to manage this inventory which are also called ERP. They also maintain log book to manage the inventory.

4.2Types of Inventory in Nodes Digital Limited:

There are four main categories of inventory.

A. Raw Materials

Raw Materials are the items which are used in the production for making a complete products. Raw materials are very much important in the production process. Without raw materials a full production of any products will not be possible so we should have balanced raw materials in our inventory level.

Nodes Digital Limited gives solution to the farmers through IoT devices. To make a complete node different types components and sensors are needed. So these components are outsourced from

china as well as from Puran Dhaka. These components may include Dissolved Oxygen Sensor, pH Sensor, Turbidity Sensor, Sensor Wire, Acrylic Protection box and many other components. The proper sourcing is very much important in inventory management because if we select low quality then our holding cost will be more as well as our node maintenance cost will increase. This components are listed with proper SKU number and are managed properly.

B. WIP Inventory

Work in progress means the products are not completed yet they are in the production site. They are not ready for sale in the market.

Nodes Digital Limited have some demo nodes which are mainly used for testing purpose. This nodes are deployed in Mymensingh, cumilla and some other reasons. The objective of these nodes is to collect data and analyse the data to test the node. These nodes are not ready for sell rather they are used for testing purpose.

C. Finished items.

Finished goods are the finished items which are ready for sale in the market. These items are ready products which are able to sale in the market in any time. These items are the finished products which are keep in the distribution section in any factory.

After Proper testing this nodes are ready for sale and then they are deployed to different fields and ponds as per the work order. Before deployment these nodes are properly tested the sensors are tested properly that the data are going in the server or not. After final testing these notes are deployed with proper branding of Nodes Digital Limited.

D. After sale Service MRO supplies:

MRO are not end products they are used in the manufacturing process. Different kinds of goods are required during the production of nodes these equipment's are used in the production process for example soldering iron, DC Power Supply (30V,5A), Soldering Stand and many others.

After the deployment of the node there comes the maintenance and repair section. These nodes need to maintain after some period and sometimes if data are unable to send in the server than this

nodes are also need to maintain. The IoT team goes to the field to maintain the device. Different types of issue are created in the field sometimes the sensors stops sending data in the server so proper maintenance is required in order to run the device properly. If proper maintenance is not done properly there will be many issue will be created and as a result our company goodwill will be hampered. The maintenance can be after 2 month or more it depends on the climate and usage.

Different types of cost is involved in maintenance period this includes travel cost and different types of expenses.

4.3 Inventory counting system of Nodes Digital Limited:

There are three kinds of inventory counting systems.

- **Periodic System**
- **Perpetual System**

A periodic system is a inventory counting system where inventory is counted at the end of any accounting period not than every sale and purchase of the products. This method of inventory counting helps a company counts it’s inventory at the beginning and ending periods.

Perpetual System

This system continuously tracks inventory deletions, allowing it to provide information on each item's current inventory level.

Nodes Digital Limited Keep their Inventory record on a continuous basis with the help of Good Received Note and BOM (Bill of Materials). GRN is basically when new components or equipment is purchased by the company a GRN is issued by the supply chain department then the components are stored in the inventory section. With the help of the Goods Received Note inventory is registered in the computer and log book. On the other hand when a complete node is made with the help of BOM supply chain department remove the components which are used in making the node are removed from the inventory list. Nodes Digital generally uses the perpetual inventory method, and they verify their inventory at the conclusion of each accounting period.

4.4 ABC Analysis of the NDL Inventory

The ABC classification of inventory categorizes inventory items depending on their importance. The ABC analysis categorizes inventory into three categories: "A" goods are the most significant, while "C" items are the least important. The ABC analysis can help determine what items of inventory should be prioritized in regards to inventory levels and reordering. It might also help you decide what parts of your inventory are most critical for you to track and manage.

ABC analysis is very much important to find the value of inventory category wise. 'A' goods are extremely vital to an organization. A goods are the items which consists of much weight compared to other products. B goods are important but not more important than a category. And c category goods are less important than b category goods.

Nodes Digital Limited organized its inventory into three categories: A category things, B category items, and C category items.

A Category Items:

A category items are expensive and this have a tight control the items includes different types of components and office electronics equipment the components are Ammonia Sensor, Dissolved Oxygen Sensor, pH Sensor, Turbidity Sensor, Ultrasonic Sensor and office electronics equipment may include different types of laptops, air conditions. These are considered high value items and have tight inventory control.

B Category Items:

B category items are those that fall between the high-value, low-quantity A items and the low-value, high-quantity C items. They are moderate in both value and quantity, often representing a middle ground in terms of consumption and importance. These items may include different types of components such as 3D Printing Filament, PCB, ESP-32, solar panel, Water Quality Tester, Multimeter different types of office equipment chain, table and many others

C Category Items:

C category items are those that contribute the least to the overall value of the inventory but make up the largest proportion of the total number of items. They are low-value and high-quantity items that typically require the least amount of management effort compared to A and B items.

These items are requited bulky amount to made a node but they are low value items the components are BMS 1s, Nut+Bolt, USB port (Male& female), DC Jack, JST 2 pin, Glue Gun, Screw different types of office stationary stapler machine, file, A4 Paper and many other items.

ABC classification is very much important to understand or to classify the inventory of the organization into category. Company focuses on A category items more than B category items and C category items is less important but they are used in bulky amounts.

ABC class example are given below:

- A category items holds 70% of annual usage value.
- B items holds 25% of annual usage value.
- C items holds 5% of annual usage value.

Category	**Items**	**Monthly Usage (Units)**	**Cost per Unit**	**Monthly Consumption Value**	**Percentage of total Taka usage**
A Category	Dissolved Oxygen Sensor	5	26990	134950	74.11%
B Category	PH Sensor	5	7994	39970	21.96%
B Category	ESP 32	5	450	2250	1.23%
C Category	Port GX16	20	200	4000	2.19%
C Category	JST 2 Pin connector	20	20	400	0.22%
C Category	Zip Tie	100	5	500	0.27%

Table 2 ABC Analysis of Nodes Digital Components

Chapter 5 Sourcing and Procurement of Nodes Digital

5.1 Introduction

Sourcing is a component of the procurement cycle that involves identifying, analysing, and choosing vendors or suppliers from which to get products, services, or essential elements for the organization. Sourcing is very much important for any organization because organization much know about their suppliers and also the procurement process must be fast. If the procurement process is slow than the production schedule will be delayed and as a result company will face huge loss. In contrast, procurement refers to the complete process of procuring goods, services, or works from outside sources. It covers assessing needs, sourcing, negotiations, buying, receiving and inspecting items, billing, payment, and managing suppliers.

Nodes Digital Limited mainly gives solution to the farmers. They strive to empower farmers with innovative solutions that enhance productivity, efficiency, and profitability while promoting environmental stewardship. We need different types of components to build node. So these components may involve different types of sensors and many other components. Some of these components need to source from china and rest need to procure from local market.

5.2 The Sourcing Decision of Nodes Digital

There are two types of sourcing Decision.

- Insourcing
- Outsourcing

Nodes Digital mainly sources their most of the components outsourced because to insource high investment in machinery is required. Different types of sensor and other components are outsourced from china. Nodes Digital mainly follows multiple sourcing strategy. Nodes Digital distributes its business over several providers. There is no single supplier; nodes digital works with several suppliers to obtain various types of components.

In selecting supplier 3 things need to keep in our mind **Price, Quality** and **Delivery Reliability.**

Price: what is the price the supplier is proving we need to keep in our mind? Nodes Digital always tries to get the components with proper price.

Quality: if we just focus on price but the quality of the product is not standard then there will be problem with the relationship with the customers/clients. Quality is very much important for our components which we are dealing with. So we need to select the supplier which are proving best quality with average price.

Delivery Reliability: we need to focus on delivery/ lead time if the supplier miss the lead time then the manufacturing time will increase and the product will miss the delivery time to the client. So we need to select the supplier who are reliable and punctual about his/her time.

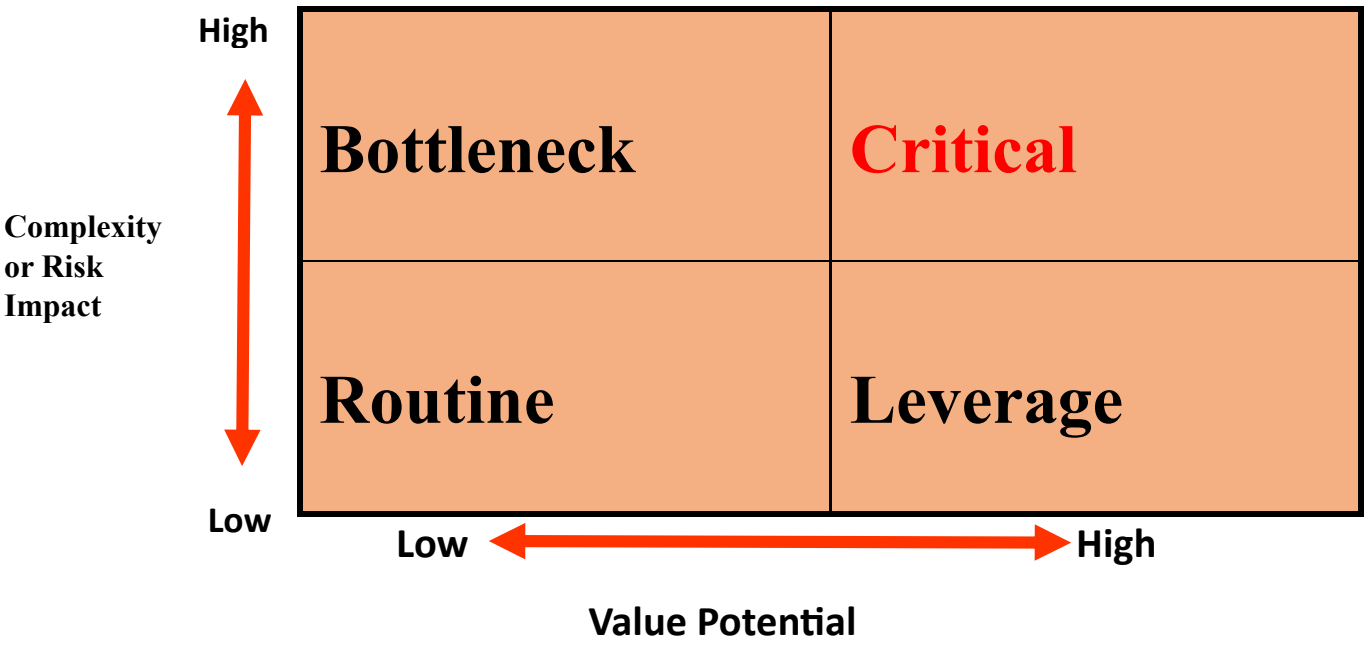
Nodes Digital always try to maintain these 3 thing in selecting a supplier.

5.3 Portfolio Analysis of Node Digital Limited

Portfolio analysis in sourcing is a strategic tool used by organizations to evaluate and manage their procurement activities. It involves categorizing and analysing different types of goods and services that an organization procures, based on their impact on the business and the complexity or risk associated with their supply. The primary goal is to develop tailored sourcing strategies for different categories of purchases to optimize cost, reduce risk, and improve supplier relationships.

Nodes Digital need to procure different types of components from different part so it need to maintain positive relationship with the supplier. To ensure efficient supply of components portfolio analysis is very much import by doing this analysis it will be easy to know in which quadrant we are in and how to deal in this situation. What will be our strategies with the supplier?

Figure 2 Portfolio Analysis of Node Digital Limited



By doing portfolio analysis our product is complex and risk is associated value potential is high the strategy will be **critical**. There are few qualified sources of supply the expenditure is high. Critical design and quality. The components specification is complex and rigid.

Strategy:

We need to create partnership with the suppliers. By creating partnership it will be easy the run the operation.

Tactics:

We need to increase selected suppliers. If we have more supplier then we can go for more negotiation.

Actions:

When we select more supplier from china. We need to go for heavy negotiation. We need to have clear supplier process management. Our process need to be streamline so that we can easily order and get our components from the selected supplier. There should have contingency plans. If our

selected supplier is unable to deliver the products then there should have another supplier from where we can get our components and it will not impact on our lead time. We need to analyse the current market properly to have clear idea about the current situation our main objective is to get quality components with average market price. We need to minimize our procurement cost.

5.4 Types of Purchases of Nodes Digital

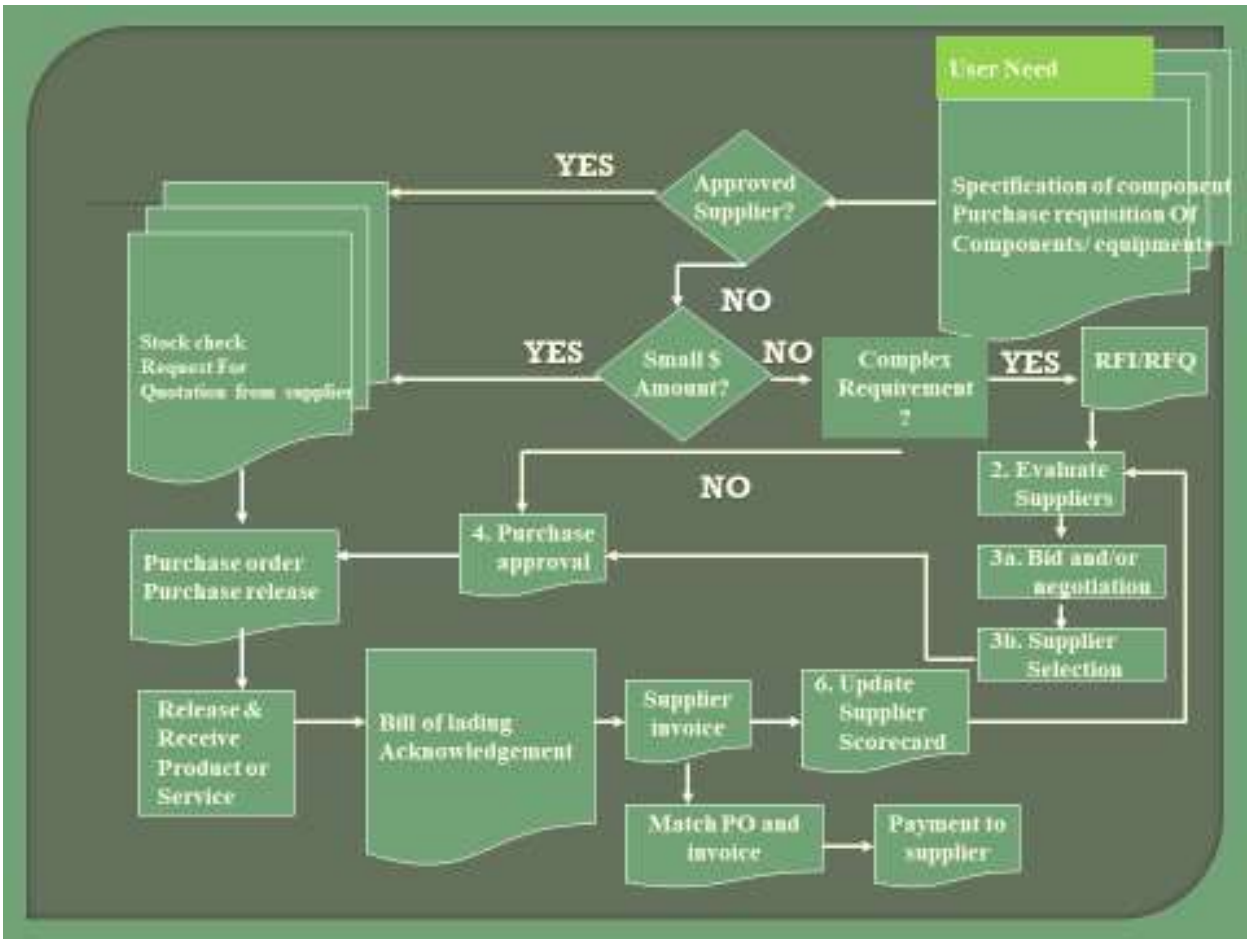
Nodes digital procures different types of components from different suppliers. This may involves insourcing and outsourcing. Different types of **office equipment** are procured from different places and there are many suppliers from where procurement is done.

Most of the sourcing is done on buying different types of **components** in building a Node. Most of the sensors for example DO sensors, PH sensors, Turbidity sensors, Ammonia Sensors these are outsourced from china. And other components are locally procured from different places in Dhaka city (Puran Dhaka, Techshopbd, RoboticsBd and many others. DO Sensors, PH sensors , Ammonia sensors these sensors are expensive and these sensors are procured by proper way. Different suppliers are evaluation properly then the best supplier are selected for these items and then PO is issued after that order is placed to the supplier. We also have logistics support we take the logistics support from different logistics support companies they bring the components in Bangladesh and hand over to us.

5.5 Procurement Process of Nodes Digital

Nodes Digital procures different types of components and other equipment from different places. They follow some process.

Figure 3 Procurement Process of Nodes Digital



- **User Need:** The Iot Team provides Purchase requisition of different components/ equipment of different specification.

If we have approved supplier than procurement department check the inventory stock and if needed they communicate with the supplier for quotation. If we do not have any approved supplier than we request to the supplier to provide RFQ (Request For Quotation).

- **Evaluate Suppliers:** procurement department evaluate supplier by RFQ. There are multiple supplier by properly checking RFQ we evaluate the supplier by shortlisting the supplier. After the evaluation then comes the biding/ negotiation.
- **Supplier selection:** with proper negotiation supplier is selected by giving proper information.

- **Purchase Approval:** when the supplier is selected purchase is conformed to the supplier and receive purchase order from the supplier.

Then product is received from the supplier or from **the agents (Logistics Support Company)**

Along with bill of lading and supplier invoice. Then match with PO and Invoice if it is ok then full payment is given to the supplier or sometimes payment is given earlier it varies on some conditions. Then the procurement department issue a GRN (Goods Received Note) and keeps record of the supplier in the vendor's database.

Chapter 6 Recommendation and Conclusion

6.1 Recommendation

It is really tough to make recommendations with just five months of job experience, and it would be bold of me to make suggestions to people with greater knowledge and insight than me. I have work with the team and learn lots of new things which will be very much helpful for me. I have worked with inventory management of nodes digital where I have managed plenty of inventory. I have also worked with procurement team about the quotation of raw materials. I have also negotiated with the supplier. I have worked by giving logistics support. I have supervised the activities from point A to point B. I have also work with HR related administration activities where my role was to deal with Employee Leave Management, Employee attendance report management and admin related activities. Within 5 month of my internship I have learn many things about the supply chain activities in a company with the support my seniors and I am confident that will use this learning for my better future. My internship experience is very much good and I have learn many thing practical and this will help me to increase my work efficiency in any organization.

However, there are a few areas where I believe the organization can make improvements:

- The Procurement unit's administration and commercial co-coordinators must be accountable for their actions and activities before entering into contracts with vendors. The gap between management levels must be reduced. Supervisors must be conscious of the state of purchasing activities and projects managed by officers. This will allow contract management to have accurate information about the vendors, making the process easy for both parties.
- To improve work efficiency, the procurement team's number of people should be increased. More team members will boost work speed and efficiency because the procurement team is critical to the organization's vendor selection and other tasks.
- When selecting providers for the organization, the supply chain department must work together more closely. The team in charge of supply chains should manage vendors well to ensure product quality.

- More technical efficiency is required for their departments to function efficiently. A suitable enterprise resource planning system should be implemented to avoid any delays. The more powerful the technology, the more benefits the company receives.
- The current Supply Chain Management structure must be modified to ensure that the department is ready for the digital age. Various forms of AI-based technology should be utilized.
- A vendor helpline should be established to provide guidance to interested vendors. A box for suggestions should be provided so that merchants can let Nodes Digital know what modifications they want.
- Management should streamline the process in procurement and inventory so that process becomes more efficient.

6.2 Conclusion

In conclusion, Nodes Digital Limited is at the forefront of the agritech revolution in Bangladesh, pioneering AI and IoT solutions that empower farmers and enhance agricultural sustainability. With a relentless focus on innovation, collaboration, and impact, NDL is poised to shape the future of agriculture, one data-driven decision at a time. The overall operational activity of nodes digital limited will help the company to achieve its vision. The smooth the supply chain network the more lead time will reduce in delivering the product. Smooth supply chain network is very much important for any organization.

References

1. https://www.ibm.com/topics/inventory-management
2. https://assets.ctfassets.net/hfb264dqso7g/3KMzofgMM9PAaDvXHTeLXJ/cf96f49029129793bd82811b43406ac7/inventory-management-pdf.pdf
3. https://www.nodesdigitalbd.com/about-us/
4. https://kissflow.com/procurement/sourcing-vs-procurement/
5. https://openknowledge.fao.org/server/api/core/bitstreams/c92e5208-f966-4059-a72b-f003943e3f85/content
6. https://www.netsuite.com/portal/resource/articles/inventory-management/inventory-management.shtml
7. https://www.researchgate.net/publication/347367084_Value_chains_in_aquaculture_and_fisheries_in_Bangladesh