

Lead Time Optimization of RMG Sector Supply Chain in Bangladesh

Sharmon Hossain Arnob¹, Raisul Islam Atik², Mohammad Asif Ahmed³, Sibgat Mehedi Hassan⁴

(Islamic University of Technology, Bangladesh)

1 Abstract

Bangladesh is home to a number of manufacturing sectors with the highest market shares mainly occupied by these sectors, such as, Ready Made Garments (RMG), manufacture of textiles, manufacture of non-metallic mineral products and the manufacture of food products. Among these sectors RMG sector earned the title as the highest market share (48.8%). According to the latest reports published by BGMEA, Bangladesh is now home to 4621 RMG factories with RMG exports accounting for 84.2% of the country's total exports. In FY 2018-19, the value of RMG exports accumulated 34133.27 million US\$. The main apparel items which the country exports include shirts, trousers, jackets, sweaters and t-shirts. In order for the production stage of the country's lucrative RMG sector to function properly a minimization of lead time is imperative. In this paper we will discuss the management of lead time analysis in order to make the production process of the garments sector to function properly. We will be discussing the implementation of methods and strategies to minimize lead time and management processes of an efficient and sustainable supply chain of the garment sector.

Keywords: Lead time, Management, Supply chain, minimize, Garments, RMG

2 Introduction:

The BGMEA has recently announced an export goal of US\$50 billion by 2021. Although the goal is achievable it has still not yet come to fruit due a series of events such as the financial crisis of 2008, Tazreen fire accident, Rana Plaza collapse, the Trans-Pacific Partnership Agreement (TPP) and the withdrawal of the generalized system of preference (GSP) by America. Therefore, a proper supply chain is necessary to tackle the challenges of compliance, especially during this global crisis. To ensure a large foreign investment from foreign companies, the country must produce a sustainable Supply Chain Management which focuses on **reducing lead time, decreasing wastage and maximizing efficiency** to solidify itself a top position in the world RMG sector. A supply chain consists of several key factions such as Raw Materials, Manufacturers, Distributors, Customers and Consumers. There are other factions as well such as Customs, Export Promotion Bureau (EPB), Ports, Transport, Clearing and Forwarding (C&F) agents, etc. An effective Supply Chain would require a proper connection between all these factions.

Bangladesh today is considered an economic competitor in terms of international garment manufacturing by other countries of the region and beyond is an important development in the history of the country since gaining independence in 1971. (R3) The number of garment factories in the country has increased drastically since the independence of the country. The number of garment factories increased from 384 in 1984-85 to 4621 as reported in the fiscal year of 2018-19 (Source BGMEA). The garments manufacturing sector has now become the country's largest source of export earnings accounting for about 80% of the country's gross export earnings. A huge number of work forces are employed in this sector with women being a majority portion of this workforce. During the post-independence period, Industrial development of Bangladesh has been directed by several Industrial policies: Industrial Policy of 1973, the

New Industrial policy of 1999 followed by a number of other policies, with the latest being the Industrial policy of 2010 (Garment Industry in Bangladesh Mohammad Yunus).

The world is continuously evolving and is exposed to new challenges every day. As a result, the global supply chain must also evolve in order to meet new obstacles and be able to function properly. An efficient and sustainable SCM would be required to solidify the fluency and flexibility in the global supply chain market, a step which should be undertaken by every country. As the decentralization of the industry has already started, we must ensure that our economy yields the maximum strategic advantage from this situation. Being a developing country, utilizing current circumstances will give us a leverage in advancing the continuous progression. If we can seize this opportunity with proper planning and management, it can make our country out of the LCD countries list and an emerging economic power of the world in the near future.

We have to give all our support to this sector and build up the backward linkage industry to reduce the dependence on imported raw materials and to minimize lead-time. Therefore, we need to find some alternative supply mechanism to minimize lead-time. Here in this study steps also will be taken to focus on the lead-time management by presenting some successful and unsuccessful operations in the lead-time management process. The purpose of the present study is about analyzing the existing situation specially the lead-time management in the RMG sector of Bangladesh.

2.1 Implementation challenges:

2.1.1 Difficulties in Transportation:

Bangladesh's transportation logistics system isn't up to the mark in terms of both logistics infrastructure and services. The miserable condition of the highways displays a threat to the growth of RMG.

The core infrastructure for all modes of transport is in place, but there is a lack of intermodal facilities and the few facilities that do exist are poorly operated.

2.1.2 Poor Port Facility:

The Chittagong port, which handles nearly 85 percent of the country’s trade merchandise, suffers from labor problems, poor management, and lack of equipment. Chittagong port has only 4 key gantry cranes, two of which are now out of order, whereas it needs 26. It requires 52 rubber tire gantry cranes but has only 23 now. Only 87 container loading and unloading equipment are in operation at the country's largest port against the requirement of 299. The number of cargo handling equipment is 285 but should be 895. The port suffers from high Lead time as well for sea freight is increased by about ten days due to the lack of a deep-sea harbor needed for entry of the mother vessel.

2.1.3 Lack of a Sustainable Model:

RMG in Bangladesh are facing this crucial question to adopt a sustainable model in operating their businesses due to lack of wastewater treatment plans and lack of recycling of waste products. The more the industry experiences rapid growth, the higher the demand for the implementation of sustainability. Sustainable models include impacts of industries on the natural, social and economic aspects with the introduction of new technologies.

2.1.4 Technological Drawback:

Printing, washing, sewing, cutting, and related activities are done using low-quality technology compared to developed countries. For this, it takes more time to convert the raw material into a finished product.

2.1.5 Warehouse Management:

Warehouse management is an important consideration that comes down to having procedures ready to fulfill orders and ship them out. Looking for new and better ways to find warehouse inventory accuracy and efficient warehouse layout will lower costs, save time, and increase both income and customer satisfaction.

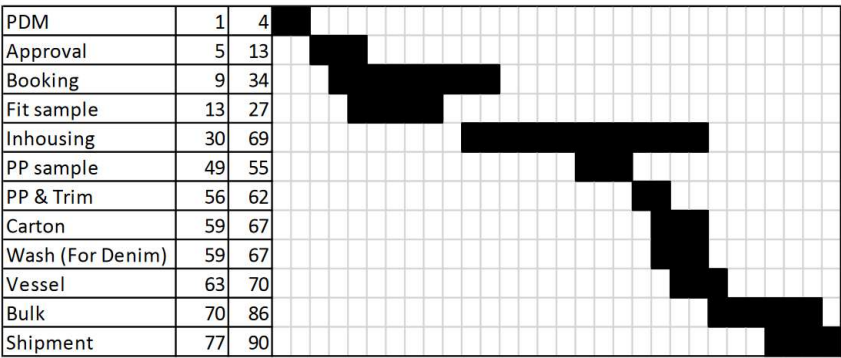


Figure 1: Gantt chart for a typical apparel industry with a lead time of 90 days

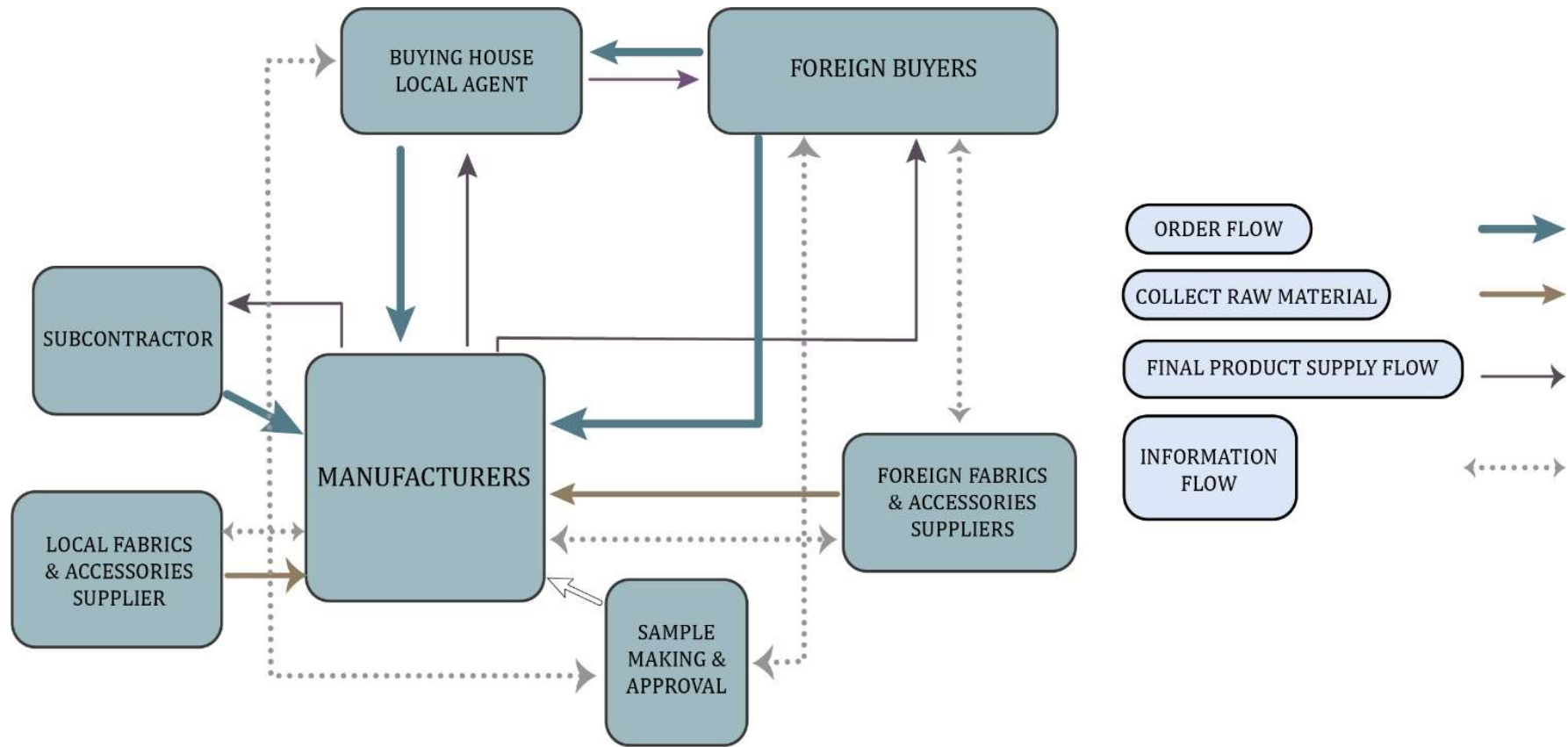
3 Literature review:

3.1 Current Supply Chain of Existing RMG

The BGMEA has recently announced an export goal of **US\$50 billion** by 2021. Although the goal is achievable it has still not yet come to fruit due a series of events such as the financial crisis of 2008, Tazreen fire accident, Rana Plaza collapse, the Trans-Pacific Partnership Agreement (TPP) and the withdrawal of the generalized system of preference (GSP) by America. Therefore, a proper supply chain is necessary to tackle the challenges of compliance, especially during this global crisis. To ensure a large foreign investment from foreign companies, the country must produce a sustainable Supply Chain Management which focuses on **reducing lead time, decreasing wastage and maximizing efficiency** to solidify itself a top position in the world RMG sector. A supply chain consists of several key factions such as Raw Materials, Manufacturers, Distributors, Customers and Consumers. There are other factions as well such as Customs, Export Promotion Bureau (EPB), Ports, Transport, Clearing and Forwarding (C&F) agent, etc. An effective Supply Chain would require a proper connection between all these factions.

Lead Time Optimization (LTO) – the optimized selection and management of inbound supply options with respect to (highly) uncertain demand and long production lead times, is critical to achieving significant supply chain savings in high-turnover fad-based industries such as apparel, textiles, toys, and consumer electronics where (high) markdowns and stock outs are critical to profitability and brand reputation.

Lead time is the time between a customer placing an order and the customer receiving the final product or service, i.e., the time required to process an order, to procure the raw materials and manufacture them into finished goods, and transporting them through the various stages of the supply chain. Lead time can be defined in two ways: i) customer lead time- which refers to the time between the customer order and customer receipt, ii) manufacturing lead time- which refers to the time span from procurement of raw materials to the final



product in the manufacturing process.

An equation for calculation of lead time, which is the summation of information lead time and manufacturing lead time. The information lead time includes the time when correspondence between buyers and the RMG factory merchandisers takes place to negotiate about the garments quality, color break down, cost/price per unit, order quantity and required delivery date. Order lead time can be defined as starting immediately after the order issue date and spanning up to the last shipment date, in general, at the Chittagong sea port. During manufacturing lead-time, factories source/buy fabrics, the main raw material, either from local markets or outsource from China, India, Pakistan, Sri Lanka, Indonesia or other countries. Sourcing fabrics is a time consuming factor in the RMG business and it is included in order lead-time. Order lead-time plus shipment time is the replenishment lead-time for the overseas merchants who procure garments from Bangladesh. The less replenishment lead-time is allowed, the more pressure there is on every supplier in the supply chain, which is a source of competition among manufacturers.

$$CLT = [\{ILT\} + \{OLT\}]$$

For Bangladesh garments (in general):

$$LT = MFT + FX + I + GM + FI + \text{buffer time (woven garments)}$$

Generally, it takes 120days LT in Bangladesh for woven garments.

$$LT = MFT + MGT \text{ (Knit garments)}$$

In case of knit garments it takes 90-110 days LT. Shipping time for import includes shipping time, unloading time and transport time from port to manufacturing point. Shipping time for export includes manufacturing time for final products and shipping time for export.

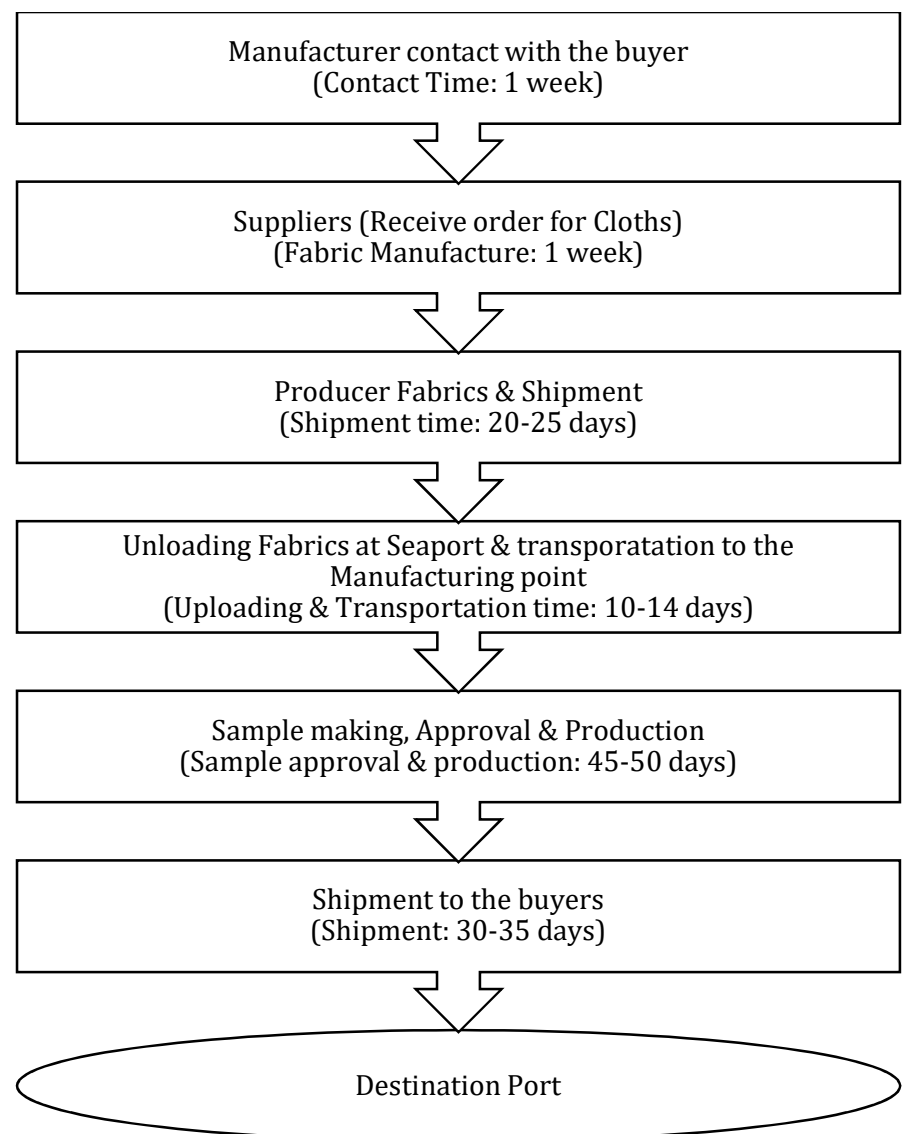


Figure 3: Lead Time

4 Methodology:

4.1 Joint Route Planning

Increasing Traffic Congestion is leading to rise in transportation costs for RMG sectors, and a high level of congestion is also increasing the lag time. All these signals are a huge disadvantage for the RMG sector as the rising transportation congestion is having a huge detrimental effect on the delivery time of the products. In order to tackle congestion-companies can look to undergo joint route planning.

Joint route planning helps to decrease costs of production through the collaboration of supply chain trading partners and service providers by sharing a common route and executing the process with the help of horizontal cooperation and outsourcing. The companies take advantage of economies of scale by collecting orders collaboratively and providing route schemes for those particular orders. This helps in

Figure 2: Supply Chain of RMG Industry

reducing the pressure in the main highways, especially during peak time, thus, reducing lag time and time of delivery.

Usage of Joint route planning decreases cost and the number of kilometers driven by 30.7% and 30.8%. In addition, the number of trucks decreases by 30.2% largely due to maximum utilization of volume. The average load taken by a truck (load factor) increases by 43.2%. In conclusion, it is evident that joint route planning is more efficient and is a better approach.

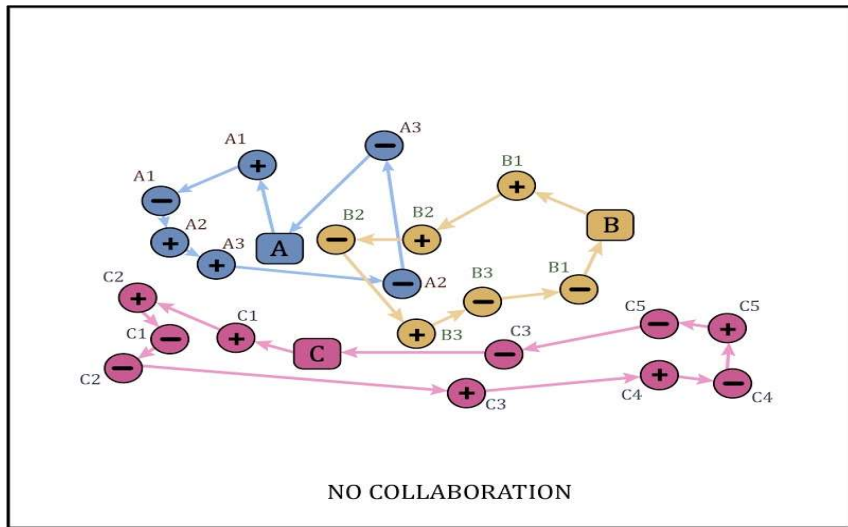


Figure 4: Non-collaborative vehicle routes of three LTL carriers with pickup and delivery requests.

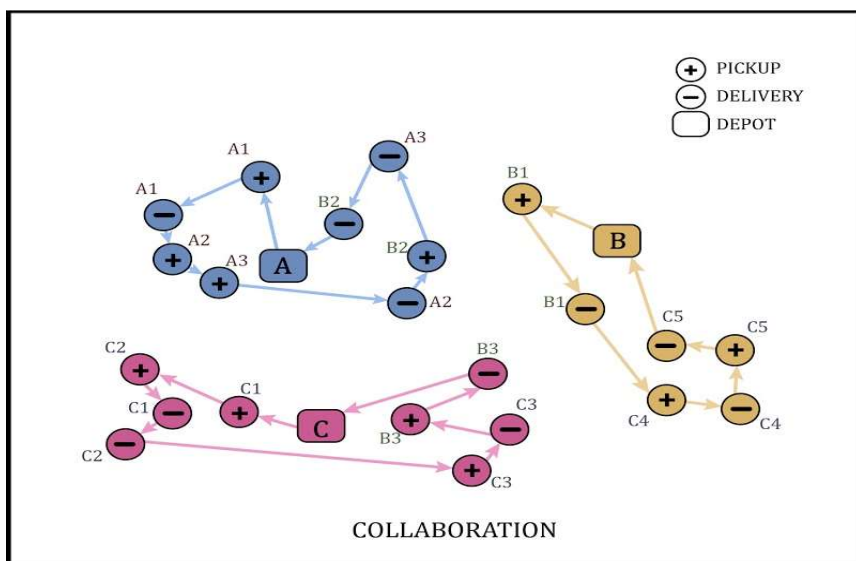


Figure 5: Collaborative vehicle routes of three LTL carriers with pickup and delivery requests.

4.2 Updated Warehouse

When warehouse operations are smooth, the entire company can rely on a reliable supply chain to prevent shortages and holdups. Most of our industries are using a traditional warehouse. But an updated warehouse can play a huge impact in overall production.

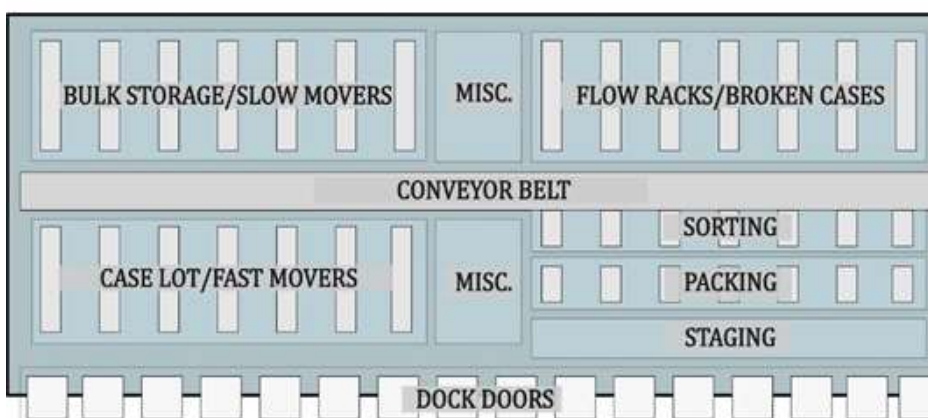


Figure 6: A Traditional Warehouse Layout

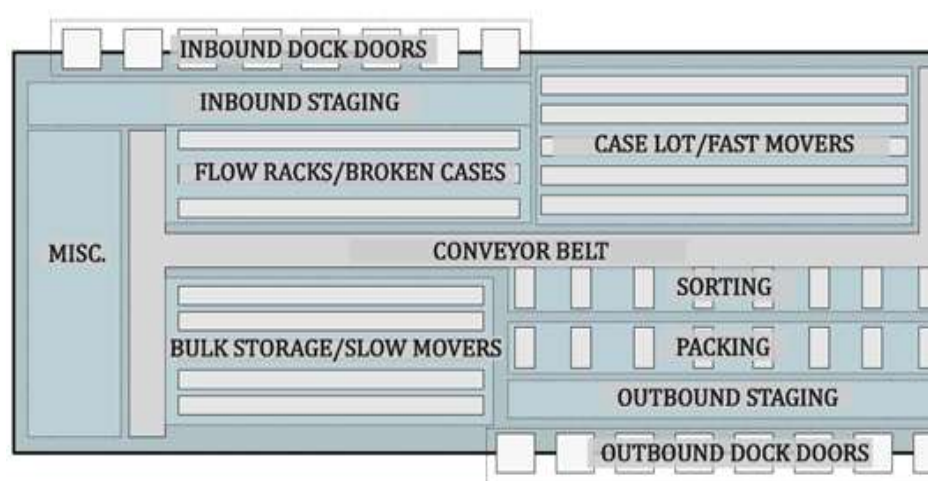
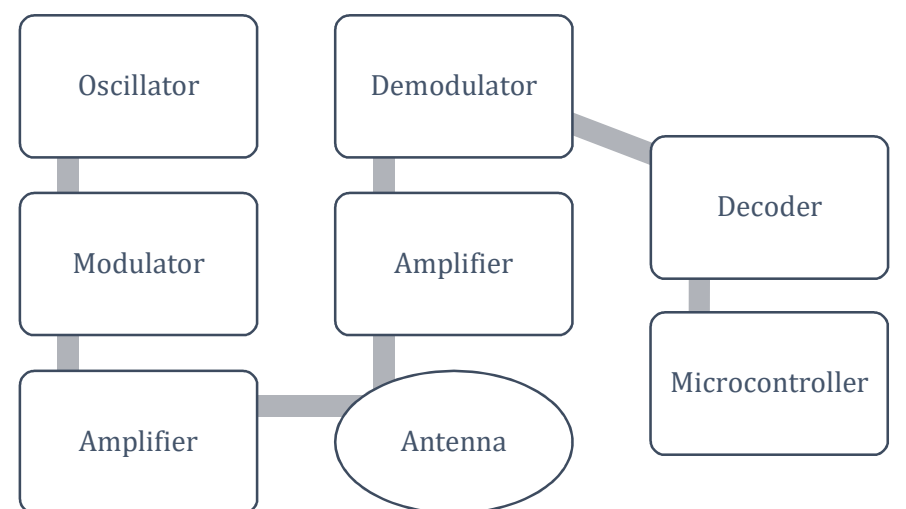


Figure 7: Better Warehouse Layout



Significant improvements over the traditional layout:

- Two docking areas allow us to concentrate on specific tasks without impeding each other. Since the staging areas are typical bottleneck places that block the efficient flow of products, we added two staging areas that will develop the flow in and out of the warehouse.
- We also utilized the racks so they run along the long side of the building. This strategy increases overall space utilization.
- We expanded the space provided to the case lot/ fast movers compared to the other storage areas. Since most of our time is spent on fast movers, it is more efficient to allow them more space.
- The conveyor belt system is more elaborate, but we have extended it for easier access from the end of each isle.
- The miscellaneous areas are combined and moved to one side of the building so as to not impede the flow within the warehouse.

Since buyers want to source more fashionable products with a shorter time period, the high lead time has become one of the largest bottleneck hampering of our garments industry. In Bangladesh, the average lead-time varies between 90-120 days, whereas the time for China and India can deliver the products within 50-60 days and 60-70 days respectively Vietnam takes 60-120 days, Thailand consumes 45-60 and Philippines needs 120-145 days for similar products.

4.3 Product Tracking:

To ensure real-time update of the product's geographic position we propose to track the product from manufacturing to hand over to the buyer. This procedure will be executed by the assistance of two tracking technologies. They are:

4.3.1 Radio Frequency Identification (RFID):

The term **RFID** stands for **Radio Frequency Identification**, as the name defines the operation of the device based on the Radio frequency signals. The RFID system consists of RFID Reader and a tag which is normally used in identification and tracking of objects. Before discussing more about the RFID, let's see the uniqueness of this technology and its general application. Today in most cases barcodes are used for identifying an item in a warehouse or a supermarket using a barcode scanner, this existing system can be upgraded with the RFID technology. Similar to barcode the RFID can also give unique identification numbers to all products but the added advantage is unlike the barcode system's line of sight, this system can detect the RFID tag within its proximity range. Meaning you do not need a human to search for the barcode and point the barcode scanner on it. With this feature most of the system can be automated and human intervention can be minimized because the tag can be scanned and billed automatically when it reaches the **RFID reader**. **RFID door locks** and **RFID attendance systems** are very popular

nowadays and many hotels provide RFID tags to their customer to lock and unlock the door.



4.3.2 Global Positioning System (GPS)

A space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. GPS will be used for tracking the product from factory to port.

Tag type/quantity	100	500	1,000	5,000	10,000	20,000
Wet Inlay/Smart Label	\$1	\$1	\$0.5	\$0.3	\$0.3	\$0.2
Metal Mount Hard Tag (Higher Price Range)	\$10	\$7	\$5	\$4	\$3	\$2.8
Metal Mount Hard Tag (Lower Price Range)	\$3	\$2.8	\$2.5	\$2	\$1.5	\$1.3
High Temperature Hard Tag	\$3.5	\$3	\$2.5	\$2.5	\$2	\$2
Flexible Laundry Tag	\$3.5	\$1.9	\$1.5	\$1.5	\$1.3	\$1.3

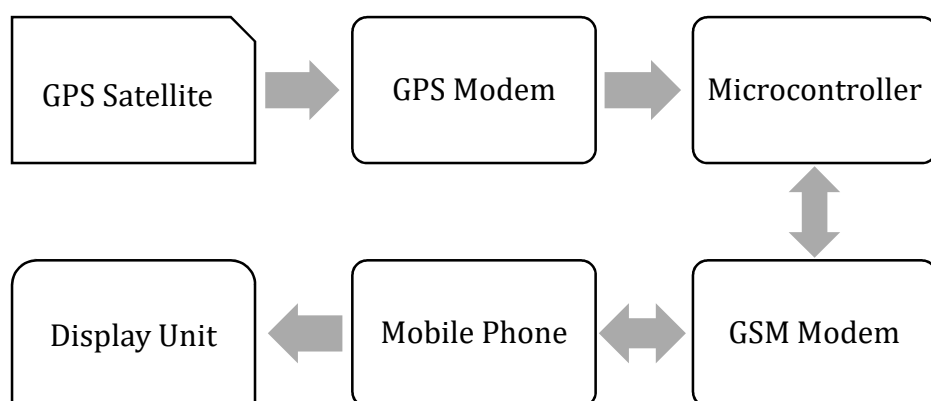


Figure 9: GPS System

The tracking will happen in two steps:

Step-1: Assembly line: The technology can bring innovation and value when properly applied to manufacturing and warehousing. RFID uses electromagnetic fields to automatically identify and track tags attached to objects. The tags collect and electronically store specific information that stays with the product; down the production line, to the warehouse, and on to the customer. In order to get more accurate current and forecast location of objects in the assembly line, RFID technology emerges to be a promising yet cost effective means to be used in such a flexible manufacturing process. The RFID-assisted object tracking system helps to locate the object in an

assembly line and improves decision making as regarding when and where to process the working objects in the assembly.

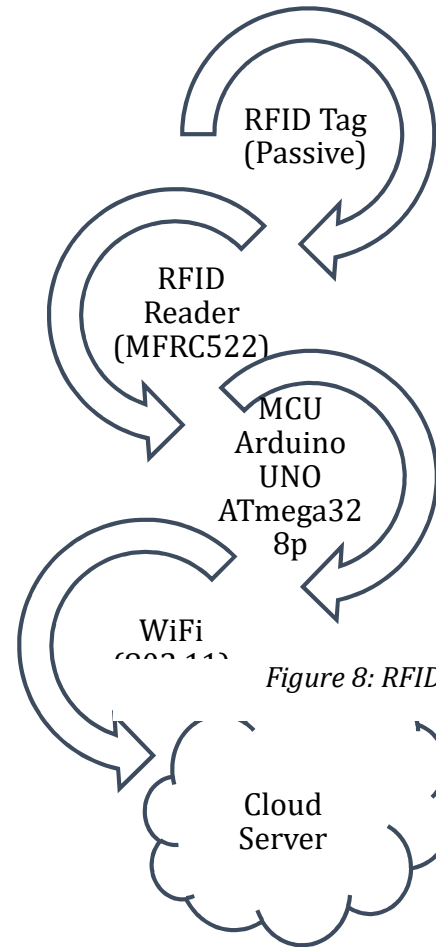


Figure 8: RFID Tag System

Figure 10: RFID Tracking

4.3.3 Estimated cost of RFID:

Step-2: From factory to port: The vehicle tracking systems work in a loop of GPS, GSM/GPRS, digital maps and special software. Mobile data devices mounted on vehicles transmit two pieces of information they get from satellites – real time when the satellite information was transmitted and position of the satellite in orbit at the time of transmission -- and transmit telemetry information such as temperature to control and communication centers via the GSM/GPRS network. Information received as such is then compiled thanks to special software and recorded in a database on servers. On the user side, vehicles can be tracked on their instantaneous and history records via a computer and smartphone / tablet by using special software making it possible to visualize all information from vehicles, and to modify alarms and program statuses of vehicles. This structure forms the basis for functioning of the vehicle tracking systems.

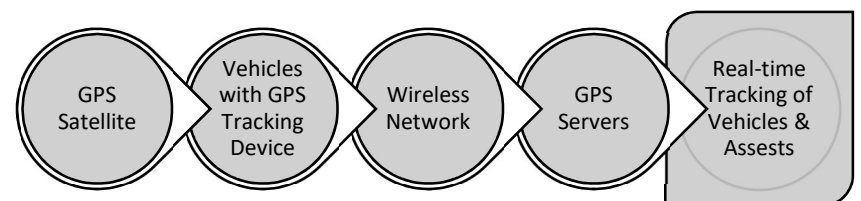


Figure 11: GPS Tracking

4.4 Port Management

The country was unable to achieve its export target for RMG in last FY16-FY17 due to longer lead time at the port. However, RMG exporters from Cambodia, Sri Lanka and India who are the main competitor of Bangladesh achieved their export target because of shorter lead times and their excellent management performances. Due to delay and traffic at the Chittagong port, Bangladesh is lagging behind exporters are forced to use a more expensive mode of transportation, i.e., the air shipment to maintain the strict deadlines of the international buyers. Port users have stated that it is easier to transport goods at a very minimum cost from ports in Malaysia and china rather than using the Chittagong port, which they are reluctant to use.



Figure 12: Ports of Bangladesh

If the port facility is improved, it may help to reduce lead time about 14 days. The containers must be loaded and unloaded to the ship without any delay. Turnaround time of feeder vessels in Chittagong Port is now seven to 10 days while it is two days in Bangkok and one day in Singapore. The maritime transport costs account for 14 per cent of the cost of Bangladeshi textile exports to the US, compared to less than eight per cent for countries like India, Thailand, China and Taiwan. So, improving the turnaround time and to redesign the maritime transport costs are essential. Improvement offering vessels and port management will certainly contribute towards improvement of lead time.

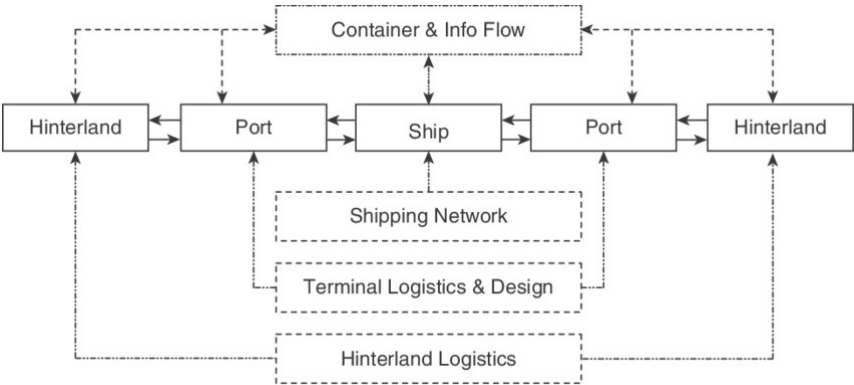


Figure 13: Port Management Flow Chart

4.4.1 Deep Sea Port:

In the 1960s a proposal of constructing a deep sea port in Kutubdia channel was submitted to the government, but still hasn't been materialized. Considering many facts about the whole scenario, specialists have finally selected Sonadia as the appropriate location of deep-sea port. The mother vessels that cannot enter the Chittagong port at present will anchor at the deep-sea port. The present volume of 30 billion US\$ export-import business will be doubled by 2020. Deep-sea port will play a vital role for the economic development of Bangladesh like Singapore, Hong Kong and Sri Lanka. China and other development partners have already expressed interest in helping Bangladesh regarding a building of deep-sea port. A deep sea port will definitely reduce the lead time to a great extent.

5 Discussion & Results:

By implementing the proposed solution, we can shorten the overall lead time approximately by **10%**. Joint route planning helps us to decrease the time to transport fabrics by **30%**. The tracking system and updated warehouse facilities help to reduce time in garments manufacturing and garments final inspection and sent to Chittagong seaport. A detailed chart of the reduction in average lead time is given below.

Table 1: Lead time Comparison for Proposed Supply Chain

LEAD TIME ANALYSIS	CURRENT SUPPLY CHAIN	PROPOSED SUPPLY CHAIN

Fabric Manufacturing Time	25	25
Time To Import Fabrics	28	22
Fabric Inspection / Other Processing	7	7
Garments Manufacturing (Cutting, Sewing, Washing, Finishing And Packing)	20	18
Garments Final Inspection And Sending To Chittagong Sea Port	5	4
Buffer Time (Woven Garments)	5	5
Total Lead time	90 days	81 days

6 Conclusion

Bangladesh has entered in the quota free market after 2005. After entering the free market Bangladesh apparels face competition from others competitors. Analysis has been found that import dependency on backward linked industry is the main factor for long lead time. More than 80% imported. Absence of sufficient backward linkage industry and for this reason a total additional 55-75 days are spent in the import process of fabrics by RMG sector of Bangladesh. As a result, this sector is facing long lead time which is 90 to 130 days on the average. From the analysis it is clear that the impact of information lead time is very negligible on total lead time. In conclusion considering the above analysis it has been found that import dependency is contributing 50% or more in the problem of long lead time and it is the main factor for the problem of long lead time in the RMG sector it is the standard lead time to compete with the other manufacturer and exporter of the world. It becomes possible only for avoiding import of fabrics. When the RMG sector ensures the availability of fabric from the local market by developing backward linkages industries especially in the oven sector and by establishing textile mills by the buyer for their own consumption.

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