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Research Article

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# Root Cause Analysis to Reduce the lead time of Knit Garments of Bangladesh

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**Abstract**

*Bangladesh is a very popular choice for foreign buyers because of the pricing of the products in the garment manufacturing sector. In the recent age, buyers are very strict about the time to deliver the product because of some reasons called lead time. The main aim of this study is to reduce lead time according to buyers' instructions to sustain future orders. In this study, primary as well as secondary data have been collected in order to gain a better understanding of the current and exciting scenario of the garment manufacturing industries in Bangladesh. As part of this research, two renowned buyers have selected products that have two individual different colors in order to determine their true motivations. After analyzing the exiting data, the research team has conducted root causes analysis to know the actual reasons for delay in the lead time. A new model for Bangladeshi garment industries has been proposed after identifying the actual and definite reasons for the problem. This model can be adopted by other garment industries in the country. In addition, a comparative statement has been included for the reader's benefit.*

**Keywords:** Lead Time, Merchandising, Knit garments, Bangladesh.

## 1. Introductions

Lead time is the amount of time that passes from the start of a process until its conclusion. Companies review lead time in manufacturing, supply chain management, and project management during pre-processing, processing, and post-processing stages. By comparing results against established benchmarks, they can determine where inefficiencies exist. Reducing lead time can streamline operations and improve productivity, increasing output and revenue. By contrast, longer lead times negatively affect sales and manufacturing processes. There are three primary types of lead time; Customer Lead Time, Material Lead Time, Production Lead Time each must be considered in conjunction with each other to set overall expectations of a manufacturing process. Therefore, these three primary types often flow into a fourth type of aggregated lead time [1,2]. Bangladesh's Garment Industry's Lead Time Management: A Survival and Growth Strategy 618.One of the top exporters of ready-to-wear clothing on the international market is Bangladesh. For a developing nation like Bangladesh, the growth in exports in the textile and apparel sector presents several crucial problems due to the shifting nature of the global economic climate and the transformation of GATT into WTO comparable to Bangladesh [3]. Bangladesh must implement quick, practical measures that will help it compete more effectively in a changing business climate by reducing lead times. In the early 1990s, the lead time was 120–150 days, but by 2007 [4,5]. It had dropped to 30–50 days, meaning that it is now 90–100 days. China just needs 30 days because of its textile industry, other backward connection facilities, export-friendly management, and supportive policies. In Pakistan and India, the time is 45 to 60 days [6]. As a result, it looks that Bangladesh's won't be able to effectively compete in the global market under the current circumstances due to the extremely long lead time. The primary area of concern in the current body of research is precisely this [7,8]. Many authors discuss/talking about some factors such as, reason of effecting on lead time, lead time impact on product cost and brand reputation, maintaining short lead time industry need a higher capacity level, proposed a new mathematical model and solution, benefits of reducing customer lead time and so on [9]. In this Literature review they try to find the problem of extending lead time and share their discussion. There is no vast discussion and how they solve the problem. In this study we will discuss and point out the problems for lead time and give a scientific solution. The purpose of the present study is about analyzing the present situation especially of the lead time reduction. In view of the above purpose the specific objective of the study is to focus on reducing

the lead time in relation to the business process and supply chain management.

## 2. Material and Method

### 2.1 Material

Two types of material collected from Garments industry of Bangladesh. Given the below methods:

- Primary Data
- Secondary data.

## 3. Methodology

In this study, the research team took five (five) knit products (top and bottom) from 10 (ten) different buyers. The lead time for production was quite different from the estimated lead time. A variety of secondary sources have been used to gather the secondary data, including the internet, books, journals, etc. To understand the gaps in current research. After collecting data, the research team has found the desired method to reduce lead time. As a result of identifying the existing layout followed by the industry for different buyers, the research team developed a new layout based on route analysis for individual buyers, along with a comparative statement for future improvement.

## 4. Results & Discussions

### 4.1 The workflow of Gemo Buyer:

| Sl no | Country | Item | Order Quantity | Color | Lead time | Ex-Factory Lead Time |
|---|---|---|---|---|---|---|
| 1 | France | SHORT PANT | 10010 | LICKEN | 63 | 97 |
| 2 | France | SHORT PANT | 9500 | CITRUS | 63 | 86 |

**Table 1: Gemo Buyer Details**

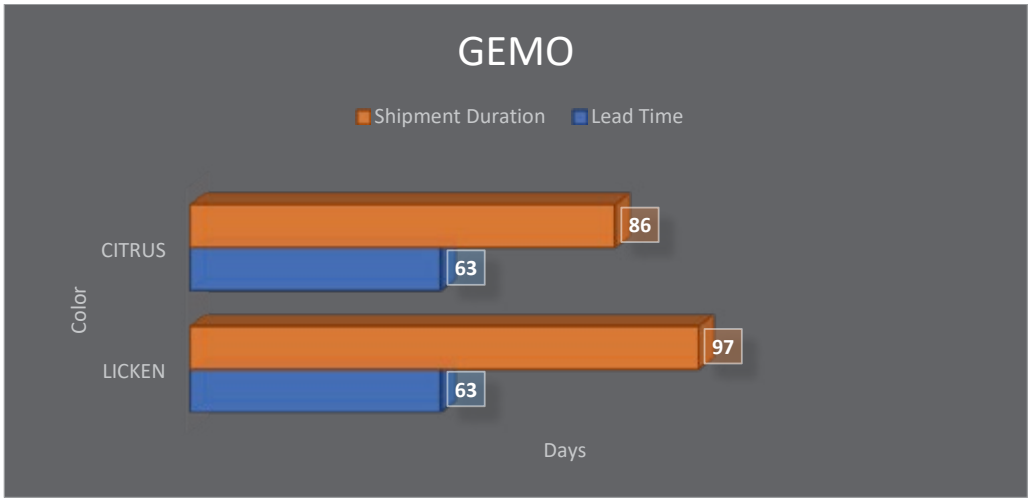


**Figure 1:** Comparisons of Gemo Buyer Lead Time & Factory Lead Time

As shown in Table 1, the research team chose Gemo buyers with short knit pants containing two colors, such as Licken and Citrus. The buyer placed the order with a lead time of 97 and 86 days for Noir and Licken, which are 10010 and 9500 pieces, respectively, but the buyer gave 97 for Licken and 87 days for Citrus. So, there is a 34- and 23-day delay from the actual lead time for both colors.

| | | |
|---|---|---|
| 10/8/2020 | Order Place | Duration |
| 10/16/2020 | Sample Knitting & Dyeing Program | 8 |
| 10/28/2020 | Grey Fabric Deliver to Dyeing | 12 |
| 11/10/2020 | First time Shade submission and reject | 13 |
| 11/25/2020 | Second time Shade submission and approval | 15 |
| 12/11/2020 | Pre-Production Sample Sent for approval | 16 |
| 12/22/2020 | Pre-Production Sample Receive & Approve for Bulk Production | 11 |
| 12/24/2020 | Time waste in Yarn In-house & Bulk Production section | 2 |
| 1/13/2021 | Bulk Production | 20 |
| | Total time | 97 |

**Table 2: TNA of Licken Color**

From the table 2, the total time need to produce garments by using the 5 (Five) sections are Sample knitting, Sample Dyeing, PP approval, Bulk production, Yarn in house of Gemo Buyer in Licken color. Here, the most time spending on Sample Dyeing, PP sample approval and Bulk production which together accounted about 75 days of the total lead time. While Yarn in house and waste time generated the least amount of time of production. Buyer total lead time requirement is 97 days for Licken color. Sewing Capacity of Rupa Fabrics Ltd. 40,0000pcs/month, and Dyeing Capacity of the Factory 30 Ton/month. The highest time spending on Sample Dyeing is about 28 days for Licken color. Because of no standard quality machineries in the dyeing lab so it's took more time to meet the requirement. PP approval placed 2nd highest no of time is 27 days that is closely like sample dyeing. For a reason it doesn't match to buyer requirements for approval. On the other hand, Bulk production takes 20 days to produce 10010 productions. Likewise, in Sample knitting and Yarn in house takes the 12 and 8 days respectively. Lastly waste time takes 2 days for some technical problems that is considerable.

| 10/9/2020 | Order Place | Duration |
|---|---|---|
| 10/13/2020 | Sample Knitting Dyeing Program | 4 |
| 10/22/2020 | Grey Fabric Deliver to Dyeing | 9 |
| 11/11/2020 | First time Shade submission and reject | 20 |
| 11/21/2020 | Second time Shade submission and approval | 10 |
| 12/4/2020 | PP Sample Sent | 13 |
| 12/14/2020 | PP Comment Receive & Approve for Bulk Production | 10 |
| 12/16/2020 | Waste Time in Yarn In-house & Bulk Production Program | 2 |
| 1/3/2021 | Bulk Production | 18 |
| | Total time: | 86 |

| Section Wise Duration | |
|---|---|
| Yarn In-House | 4 |
| Sample Knitting | 9 |
| Sample Dyeing | 30 |
| PP Sample Make & Approval | 23 |
| Bulk Production | 18 |
| Waste Time | 2 |
| Total time | 86 |

**Table 3: TNA for Citrus Color**

From Table 3, the total time needed to produce garments by the 05 (five) sections is: sample knitting, sample dyeing, PP approval, bulk production, and yarning in-house by Gemo Buyer of Citrus color. As can be seen from Table 3, most of the lead time was spent on sample dyeing, PP sample approval, and bulk production, which together accounted for about 71 days of the total lead time. While yarning in the house and wasting time generated the least amount of time for production, the buyer's total lead time requirement is 86 days for Citrus color, the sewing capacity of Rupa Fabrics Ltd. is 40,000 pieces per month, and the dyeing capacity of the factory is 30 tons per month. It takes about 30 days for citrus color samples to be dyed. Because there are no upgraded machines in the dyeing lab, it took more time to meet the requirement. PP approval placed 2nd highest number of times is 27 days because of multiple time shade does not meet the buyer requirement, so sample approval takes more time. On the other hand, bulk production takes 20 days to produce 9,500 units. Likewise, sample knitting and yarn-in-house knitting take 9 and 4 days, respectively. Lastly, waste time takes 2 days for some technical problems, which is considerable.

### 4.1.2 Proposed New Layout for GEMO Buyer

For some reason total lead time became extend from 63 to 86 days for Licken and 97 days for Citrus color. So, the research team has proposed a new layout in "Rupa Fabrics Ltd." for reducing the lead time:

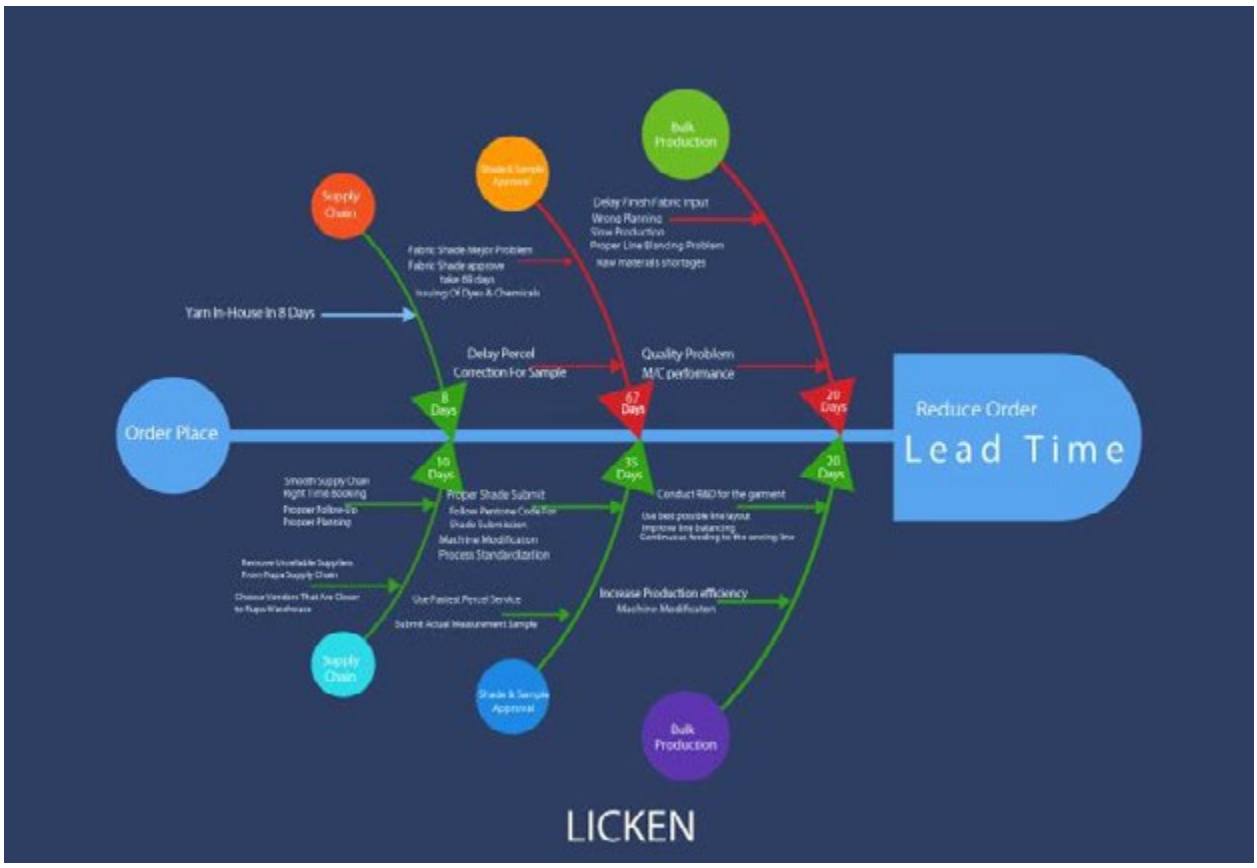


**Figure 2:** Reduce lead time by Fishbone Method for Licken color.

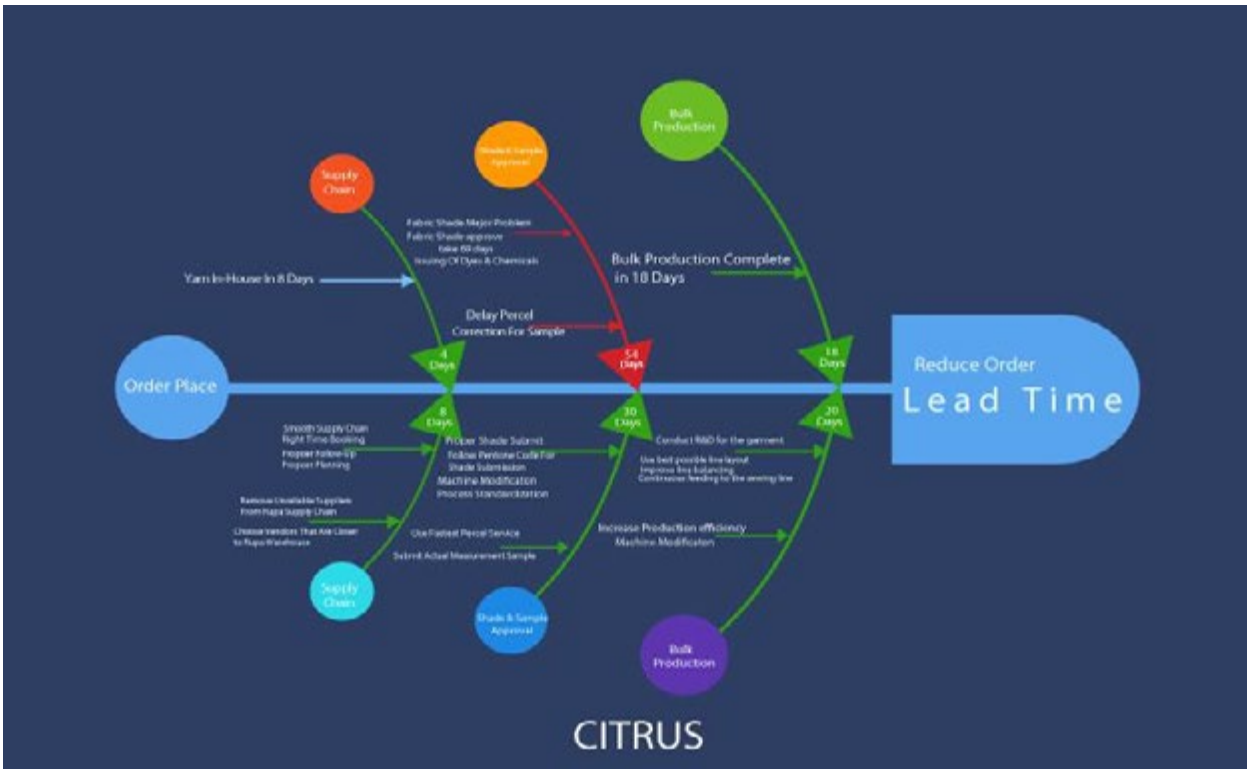


**Figure 3:** Reduce lead time by Fishbone Method for Citrus color.

In this figure 2 and 3, the research team has proposed a layout for Reduce lead time with the help of Fishbone method. In this method we display on the one side the total time taken for each section and explain the reason why lead time extend to its actual time. On the other side of the figure, we suggest improving some section to reduce lead time.

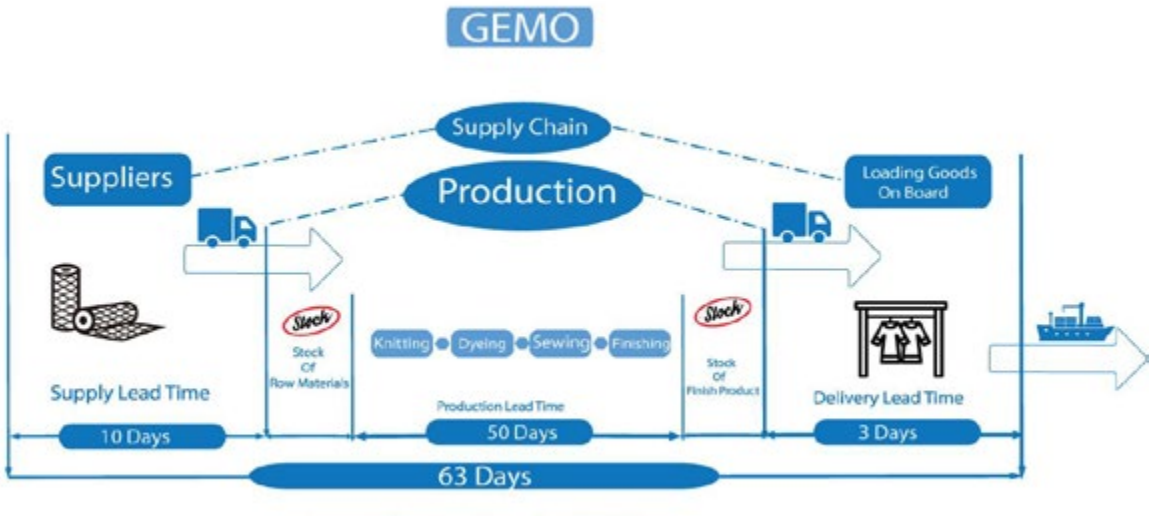


**Figure 4:** Proposed Section Wise Duration

Based on the proposed layout, if the industry follows the proposed layout, the overall time needed to produce garments will be slightly reduced, thereby reducing lead times as well as meeting buyer requirements. Currently, the industry has the capacity to dye 30 tons of fabrics, knit 3 tons, and sew 40000 kilograms of fabric per month. The industry can easily produce more than 10010 pieces of garments by the due date. As per the table sample, knitting, dyeing, approval, and bulk production will take a total of 53 days if the factory maintains the proposed new layout. Efforts should be made to update the dyeing lab's machinery and increase productivity in bulk production to reduce lead times.

### 4.1.3 Mathematical Analysis

If Yarn supply within time 10 days and for delivery it will take time 3 days for transportation. The total lead time by proposed new layout: sample knitting + sample dyeing + sample approval + bulk production + yarn supply time.

= (5 + 10 + 20 + 20 +10) = 65 days.
For Licken color,
So, Proposed new Lead Time = 65 days
Factory Lead Time=97 days
Now, Reduce Lead Time= (Factory Lead Time- new Lead Time)
= (97-65) days
= 32 days.
Reduce Lead Time 32 days from factory lead time and deliver the product within 63 days, if factory follow proposed new layout.

For Citrus color, If Yarn supply within time 10 days and for delivery it will take time 3 days for transportation. The total lead time by proposed new layout: sample knitting + sample dyeing + sample approval + bulk production + yarn supply time + delivery time.

= (5 + 10 + 15 + 20 + 5 +3) = 58 days.
So, Proposed new Lead Time = 58 days
Factory Lead Time=86 days
Now, Reduce Lead Time= (Factory Lead Time- new Lead Time)
= (86-58) days
= 28 days.

Reduce Lead Time = 28 days from factory lead time and deliver the product within 104 days if factory follow proposed new layout. So, it's possible to reduce lead time and deliver the order within due dates.

## 4.2 The workflow of Nani Buyer

| Item | Color | Order Quantity | Lead time | Ex-Factory Lead Time |
|---|---|---|---|---|
| POLO SHIRT | LICKEN | 5504 | 97 | 123 |
| POLO SHIRT | NOIR | 4710 | 97 | 123 |

**Table 4: Nani Buyer details**

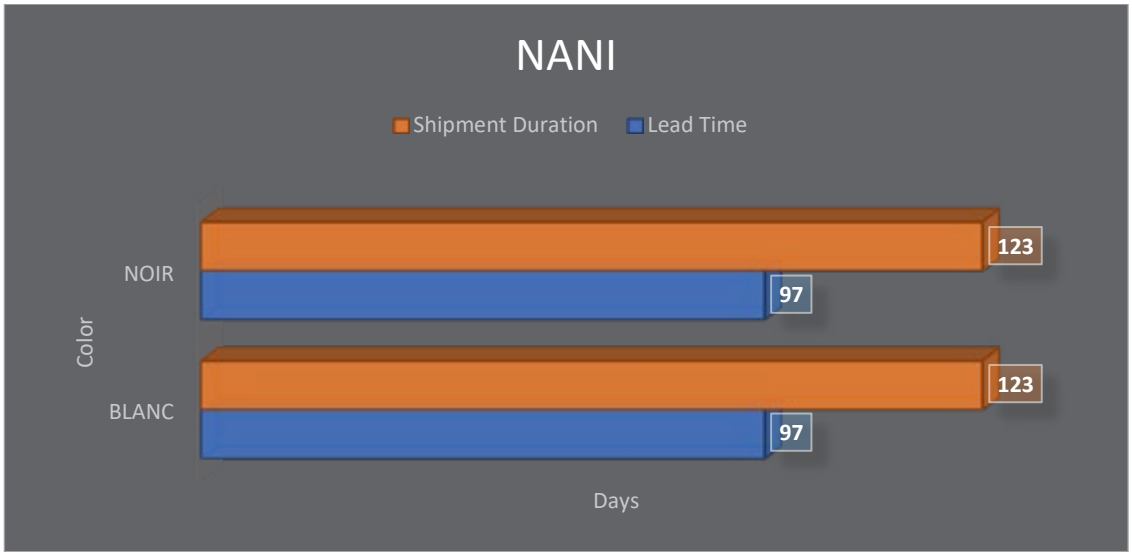


**Figure 5:** Compare Nani Buyer Lead Time & Factory Lead Time

From table 4 and figure 5, the research team has chosen the Nani buyer's knit Polo shirt, and it has a total of two colors: Noir and Licken. According to the buyer, the order to deliver the product is 123 days for Noir & Licken with 5504 and 4710 pieces within the lead time of 97 days. So, it's a 26-day delay from its actual lead time.

| 10/25/2020 | Order Place | Duration |
|---|---|---|
| 11/2/2020 | Sample Knitting Dyeing Program | 8 |
| 11/6/2020 | Grey Fabric Deliver to Dyeing | 4 |
| 11/10/2020 | 1st time Shade submission | 4 |
| 11/14/2020 | Shade Not approved due to Uneven Dyeing | 4 |
| 11/20/2020 | Shade approved | 6 |
| 12/7/2020 | Collar Shade not approved | 17 |
| 12/14/2020 | Collar Shade approved | 7 |
| 12/25/2020 | PP Sample submission for final approval | 11 |
| 1/14/2021 | Pre-production sample Receive & Approve for Bulk Production | 20 |
| 1/28/2021 | Yarn In-house & Bulk Production Program | 14 |
| 2/25/2021 | Bulk Production | 28 |
| | Total Time | 123 |

| Section Wise Duration | |
|---|---|
| Sample Knitting | 4 |
| Sample Dyeing | 38 |
| PP Approval | 31 |
| Bulk Production | 42 |
| Yarn In-house | 8 |
| Total Time | 123 |

**Table 6: TNA of Noir and Blanc color**

Table 6 displays the total time needed to produce garments in the five sections: sample knitting, sample dyeing, PP approval, bulk production, and yarn made in Nani's house in different colors (Licken and Noir). Overall, in Table 6, most of the time was spent on bulk production, sample dyeing, and PP approval, which together accounted for about 85% of the total time. Even though sample knitting and yarning were done in-house, the buyer's total lead time requirement for all colors was 97 days. The highest time spent on bulk production is about 42 days for both colors. There is no proper production planning in bulk production; as a result, production takes a considerable amount of time. The dyeing lab, however, takes 38 days to dye samples. Because there are no standard-quality machines in the dyeing lab, it takes more time to meet the requirement. Pp approval

placed 3rd highest number of times is 31 days. For some reason, it doesn't match the buyer's requirements. Likewise, sample knitting and yarning in-house take 4 and 8 days, respectively for both colors. POLO SHIRT Sewing Capacity of Rupa Fabrics Ltd.: 40,000 pieces per day, and Dyeing Capacity of the Factory: 30 tons per month.

### 4.2.1 Proposed a new Layout for NANI Buyer

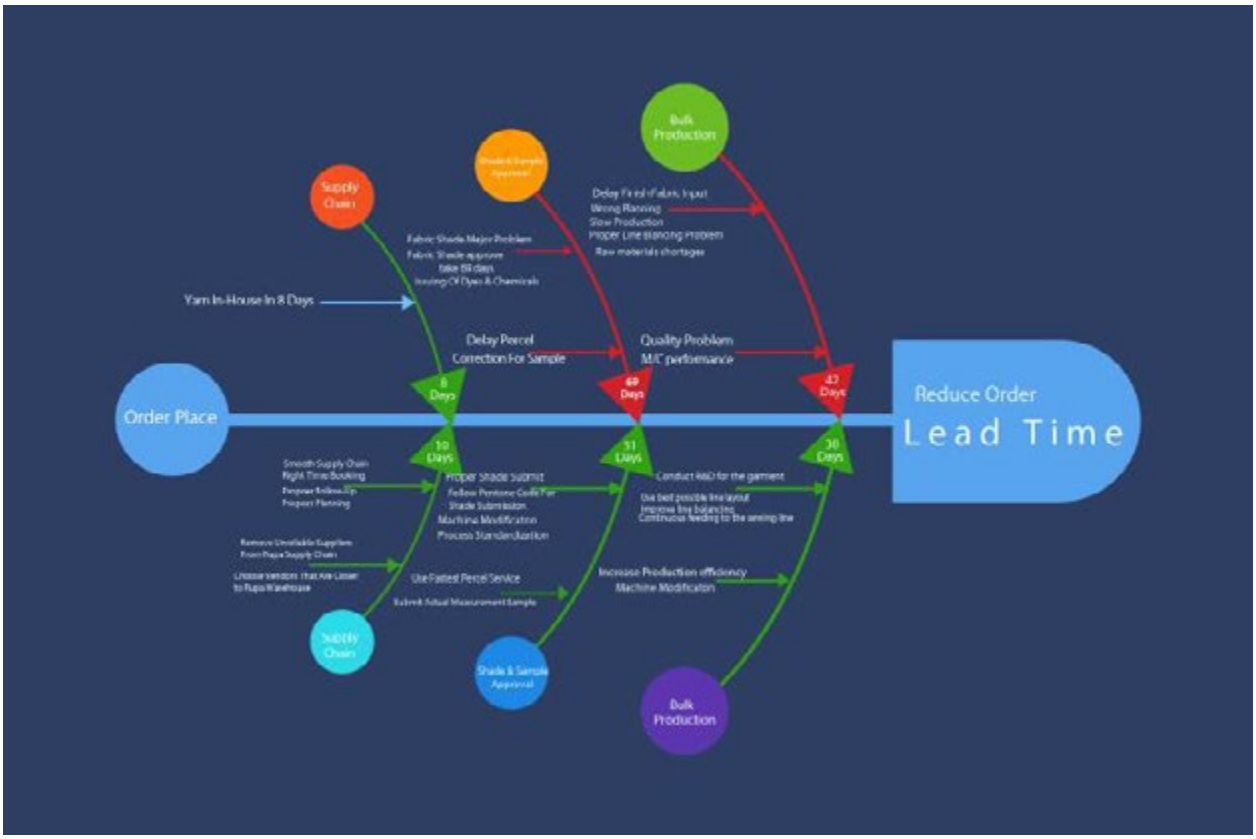


**Figure 6:** Reduce lead time by Fishbone Method of Noir & Blanc color.

In Figure 6, we propose a layout to reduce lead time with the help of the Fishbone method. In this method, we display on one side the total time taken for each section and explain the reason why the lead time extends to its actual time. On the other side of the figure, we suggest improving some sections to reduce lead time.


**Figure 7:** Propose Section Wise Duration

### 4.2.3 Mathematical Analysis

If Yarn supply within time 10 days, then total lead time by proposed new layout: sample knitting + sample dyeing + sample approval + bulk production + yarn supply time + delivery time.

= (4 + 16 + 31+ 30 + 10) =91 days.

So, Proposed new Lead Time =91 days

Factory Lead Time=123 days

Now, Reduce Lead Time= (Factory Lead Time- new Lead Time)

= (123-91) days

= 32 days.

Reduce Lead Time = 32 days, if factory follow proposed new layout. So, it's possible to reduce lead time and deliver the order within due dates.

## 5. Conclusions and Comparative Statement

| Buyer | Color | Item | Buyer Lead Time (Day) | Factory Shipment Duration (Day) | Propose Shipment Duration (Day) | Reduce Lead Time (Day) |
|---|---|---|---|---|---|---|
| NANI | BLANC | POLO SHIRT | 97 | 123 | 91 | 32 |
| | NOIR | | 97 | 123 | 91 | 32 |
| Gemo | BLANC | SHORT PANT | 63 | 97 | 65 | 32 |
| | CITRUS | | 63 | 86 | 58 | 28 |
| Total Reduce Lead Time | | | | | | 124 |

**Table 7: Comparative Statement between Factory layout and proposed new layout**

Extended lead time is one of the major problems the apparel sourcing world faces when exporting ready-made apparel from Bangladesh. Bangladesh entered the quota-free market in 2005. After entering the free market, the Bangladesh apparel industry faces competition from other competitors [18,19]. Analysis has found that import dependency on the backward-linked industry is the main factor in lead time. More than 80% were imported [10,11,12]. The lack of a sufficient backward linking sector means that the import process of manufactured goods from the RMG sector in Bangladesh takes 55–75 days [13,14]. As a result, this sector faces a long lead time, which is 90 to 130 days on average. The analysis shows that the impact on the total lead time for information is negligible [15,16,17]. Therefore, based on this analysis, it has been found that import dependencies account for 50% or more of the problem of long lead times in the RMG industry and that the standard lead time to compete with other manufacturers and exporters in the world is the primary factor contributing to long lead times. It becomes possible to avoid the import of fabrics only when the garments sector ensures the availability of fabric from the local market by developing backward links in industries, particularly in the oven sector and establishing textile mills by the buyer for their consumption [18,19].

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