Delay Analysis & Lead Time Reduction for Timely Order Completion in a Buying-house

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Abstract:

The main target of the garment industry is to deliver a product within a given time by the consumer rather than a price reduction. To fulfil the target it is very much required to synchronise all the processes in the garment manufacturing unit. The process involves pre-production, production and post-production operations. In this research work, TNA and delay analysis is done to find out the causes turning towards delay. It is observed that the pre-production stages are dominating in terms of delaying the product to be delivered. Better control and synchronisation among the processes are found very much effective to minimise these delays.

Keywords: ***Lead Time, TNA Analysis, SOP, Delay analysis***

I. INTRODUCTION

In garment retailing, the merchandiser is the most significant person. The merchandiser is in charge of all of the work that takes place during the process. There will be far fewer issues if the merchandiser correctly handles the system's flow. Nine The most significant difficulty is the amount of time spent in the merchandising process [1-3]. Approvals and bulk fabric in-house take up around 75% of overall pre-production activity time, and it is by far the most time-consuming task. The entire supply chain requires a system. Lean is the most common tool used to solve the problems faced in the industry, the main goal of implementing lean technique is to help to achieve on-time work, avoid delay, and increase productivity. It helps to make proper communication between different departments [4]. The research work done by Iskandar *et al*. [5] focuses on incorporating lean techniques helps to manage the lead-time.

Abernathy *et al.* [6] stated that before beginning bulk manufacturing, suppliers must have buyer clearance on samples at various stages to confirm that everything is in order for bulk production. There are a few reasons for sample approval failure in the apparel supply chain such as poor workmanship, lack of understanding between the buyer and buying a house, non-availability of the actual trims and fabrics, and late comments from the buyer, there is no defined checklist from buyer's end [7]. Automation of the system increases the efficiency of a process and minimizes the risk of missing out on any activities. The objective of the project is to develop and implement an excel based system for auto-generation of dates for each process, that will notify possible delays at the pre-production stage [8-10]. The current system generates an order list; style creation and has sections for entries for finishing dates for each process but had no strict finishing schedules, which lay down standards for the sourcing of garments. [11]. According to the work of *Jana* [12], Pre-production activities

account for 73% of overall manufacturing lead time and have a strong positive connection (0.96) with total manufacturing lead time. A task tracking system (critical path management) allows businesses to establish key tasks, task dependencies, and milestones for pre-production and finished goods development [13]. The sample development and approval process of children's and women's garments in export-oriented knit garments factories for foreign buyers has been virtually observed to identify critical flaws in sample developers, factory merchandising departments, and various causes of buying house merchandising department approval delays [14]. The heart of any export order processing is sampling. Any style's destiny is solely dependent on the buyer and factory who add value to the samples. As a result, understanding the sample generation process is critical for controlling quality and costs throughout the first stage of sampling development [15]. As the sole person between the buyer and the factory who understands the buyer's specifications, technical specifics, and sample timeline, the merchandiser plays a critical role in the sampling process. In any export-oriented factory, sampling is the ideal strategy to place a large order. The advent of the fourth industrial revolution is associated with the development of global industrial networks, to which all production processes of a wide variety of enterprises will be connected [16-17]. As a result, the computer interaction environment is developed around the modern human. That means employees would work with cyber-physical systems in a smart factory environment.

As per the above literature, it is found that there is a lot of work done in the field of delay analysis but still the proper solution is not obtained. Therefore in this research, an attempt has been made to analyse, the overall merchandising process and the time delay process in the order execution and implementation of the time-and-action plan was compared with the existing process.

II. EXPERIMENTAL

A. Data collection

To find out how the employees felt about the difference between planned and actual dates in the Time and Action calendar, a questionnaire was created as shown in Table 1-7, by using Google Forms and distributed throughout the team.

Table 1. Reasons for delays in FIT sample approval

Factors	Most frequent	Frequent	Often	Occasional	Rare
Delay in Submission by poor communication	○	○	○	○	○
FIT not as per spec.	○	○	○	○	○
Unfulfilled appearance	○	○	○	○	○
Inappropriate measurement	○	○	○	○	○

Table 2. Reasons for the delay in Lab dips

Factors	Most frequent	Frequent	Often	Occasional	Rare
Internal miscommunication	○	○	○	○	○

Material Unavailability	°	°	°	°	°
External miscommunication	°	°	°	°	°
Specsheet change by buyer	°	°	°	°	°
Missing Information	°	°	°	°	°

Table 3. Reasons for delays in proto sample approval

Factors	**Most frequent**	**Frequent**	**Often**	**Occasional**	**Rare**
Specsheet change by buyer	°	°	°	°	°
Construction defect	°	°	°	°	°
Imperfect Fit	°	°	°	°	°
Inappropriate Styling	°	°	°	°	°

Table 4. Reasons for delays in FPT submissions and approvals

Factors	**Most frequent**	**Frequent**	**Often**	**Occasional**	**Rare**
Incorrect Fabric Composition	°	°	°	°	°
Shrinkage test	°	°	°	°	°
Tensile strength	°	°	°	°	°
Flammability Test	°	°	°	°	°
Failing in Colorfastness test	°	°	°	°	°

Table 5. Reasons for delays in fabric/ trims in house

Factors	**Most frequent**	**Frequent**	**Often**	**Occasional**	**Rare**
Material unavailability	°	°	°	°	°
Order not on time	°	°	°	°	°
Delay in Fabric/ Trim approval	°	°	°	°	°
Quality rejection	°	°	°	°	°

Table 6. Reasons for PP sample approval delay

Factors	**Most frequent**	**Frequent**	**Often**	**Occasional**	**Rare**
Delay in Trims	°	°	°	°	°
Pending Approval	°	°	°	°	°
Failure in FPT/ GPT	°	°	°	°	°
FOB in-house delay of fabric	°	°	°	°	°

Table 7. Reasons for delays in GPT submissions and approvals

Factors	Most frequent	Frequent	Often	Occasional	Rare
Shrinkage	°	°	°	°	°
Hand feel after washing	°	°	°	°	°
Seam strength	°	°	°	°	°
Color bleeding	°	°	°	°	°

III. RESULTS AND DISCUSSION

After the successful completion of the survey, It was observed that fifty-two percent of styles running delays and surprisingly, the percentage of fifty-one of styles running delays in the preproduction stage

A. Pre-production delay analysis

It was noticed that several of the reasons for delays during the pre-production stage of garment manufacture were continuously repeated based on the aforementioned interpretation. The factors are thoroughly investigated and appropriate remedies are presented, to ensure that orders are delivered on time. In addition, the activities will have a better chance of sticking to the pre-planned time and activity calendar. The following broad categories can be used to outline the key causes of the delay as shown in Table 8.

Table 8. Delay analysis at the pre-production stage

S.No.	Reasons	Cases Observed	Percentage of Total Cases
1	Sample Approvals	30	27%
2	Material Procurement	24	21%
3	Changes in Specifications	12	11%
4	Quality Issues	28	25%
5	Fabric and trims Approval	5	4%
6	Lab Dip Approval	8	7%
7	Testing Failure	3	3%
8	Shade Variation	1	1%
9	presence of OAB	1	1%

The key pre-production activities were listed and the respondents were asked to select all the activities, according to them, which were the main delay-causing activities and took up the maximum time in the pre-production phase of any style as mentioned in Figure 1.

It is found that maximum respondents experienced that there is a delay in the FIT sample approval process (51.7 %), followed by Fabric-in-house (21.7 %) and PP approval (13.5%). These were further followed by GPT (Testing & Approval) (10 %) and Proto sample approval (8 %). According to the respondents, these were the top five activities which were the most delay-causing activities. According to the survey the frequent reasons listed

(decreasing order) for delays in the FIT sample approval process such as delays in submission by vendor, unfulfilled appearance, inappropriate measurement and fit not as per spec.

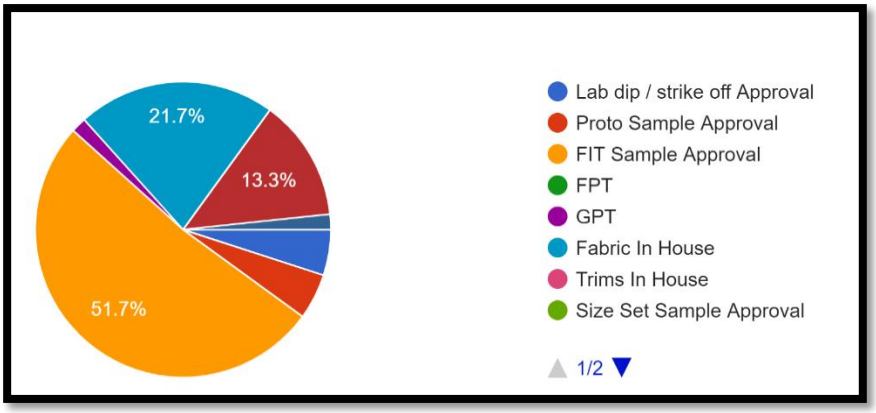

Fig1. The activities in pre-production are the causes of maximum delay

The reasons for the delay in getting fabric in-house were shortlisted to four reasons and among these resources, unavailability was rated as a frequent reason for the delay in fabric/ trims in-house. Resource unavailability can also have many reasons, such as delay in placing an order by the vendor due to which the mill is not prepared, ordering raw materials more than the capacity of the mill, Improper inventory management, improper planning or any kind of mishap, Delay from the mill's side. Out of the above five shortlisted reasons for the delay in proto sample approval, the reason "Construction defect" was rated as frequent. The reasons of which can be, inappropriate Styling, Artwork/embroidery/ print incorrect, or improper understanding of the style by the buyer The survey included a question to find out why the PP sample approval is delayed and it was found that frequently it is caused due to pending of any other approval or due to improper communication, between the departments of the buying house, or due to lapse of communication among the buyer, buying house and vendor. From further questions, it was found that GPT delay was caused mainly due to two factors, the garment fails in one or more tests and there is Fabric in-house delay.

B. Implementation of a few corrections

After the TNA analysis, a checklist was prepared to improve the process in order to the reduction in the delay. Primarily the checklist was implemented for five different styles which were poorly performing. Interestingly after the implementation of the checklist, a reduction of 47% in the delay was Observed as presented in Figure 2.

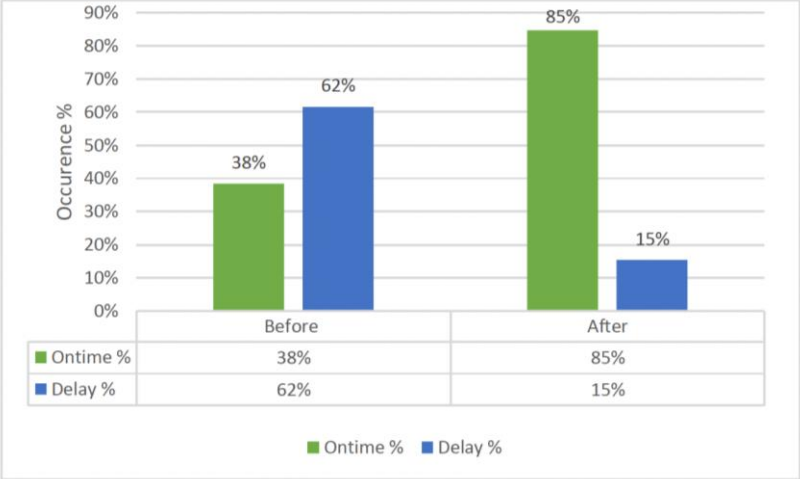

Fig.2. Comparison of delay percentage after implementation of the checklist

IV. CONCLUSIONS

After the above discussions, it can be concluded that the research helped in the understanding of the merchandising process and some of the critical aspects of merchandising that can affect the process's smooth operation. The pre-production processes such as 'Sample Approvals', 'Material Procurement', 'Changes in Specifications' and 'Quality Issues' are found to be major contributors to the delay in buying-house. The research also claimed that synchronisation of the process by following a proper checklist is found very much effective in reducing the time delay.

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