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IMPLEMENTATION OF MODERN GARMENT PLANNING TOOLS & TECHNIQUES IN GARMENT INDUSTRY OF BANGLADESH

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ABSTRACT: *In this research I have tried to focus in Garment sewing plan, proper implementation of plan & its execution by various techniques with IT solution. The best way to cope up the present manufacturing challenges in RMG sewing are the implementation of lean manufacturing,5 S,6 Sigma with effective garment manufacturing software like Fast React & Real-time data tracking and production management systems. This will serve our purpose of flexibility and save a lot of money by reducing production lead time, reducing the inventory, increasing productivity, training operators for multiple works, and by reducing rework.*

KEYWORD: Fast React, Critical path of planning board, ERP, *RFID*, Lean, 5S, 6Sigma,

INTRODUCTION

Research Aim

To align floor production in a systematic way with accurate data, need to implement internationally recognized tools(Planning) in Garment Industry in Bangladesh.

Preface

Due to the increasing labor wage in developed countries, the apparel manufacturing has been migrating from the high wage developed world to low wage developing countries. Even though the labor cost is cheaper than in developed countries; due to the specific market nature of the garment industries for example:

The short production life cycle

High volatility

Low predictability

High level of impulse purchase

The quick market response

Garment industries are facing the greatest challenges these days.RMG Industries have been running in a traditional way for years and are rigid to change. They are happy as long as they are sustaining their business. They don't have much confidence and will towards innovation over old processes. Now the time has come to struggle with global market demand and niche market in garment industries if they want to run it further (Gao, Norton, Zhang and Kin-man To, 2009). This volatility of styles can be addressed only by flexibility in manufacturing. The major problem people faced in garment industry is stitching; most of time failure to meet delivery time is because of stitching. Stitching operations (with respect to cutting and finishing) needs high skill as well as quality work, because of difficulty associated with repairing of

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products sewed with wrong specifications. Thus we have to give more attention to stitching than to cutting and finishing of garments.

Key factors of a production plan

Availability of equipment and human resources

Also known as open time, this is the period of time allowed between processes so that all orders flow within your production line or service. Production planning helps you manage open time, ensuring it is well-utilized, while being careful not to create delays. Planning should maximize your operational capacity but not exceed it. It's also wise not to plan for full capacity and leave room for the unexpected priorities and changes that may arise.

Inventory control

Reliable inventory levels feeding the pipeline have to be established and a sound inventory system should be in place.

Risk factors

Evaluate these by collecting historical information on similar work experiences, detailing the actual time, materials and failures encountered. Where risks are significant, you should conduct a failure mode effect analysis method (FMEA) and ensure that controls are put in place to eliminate or minimize them. This method allows you to study and determine ways to diminish potential problems within your business operations. This type of analysis is more common in manufacturing and assembly businesses.

Forecast market expectations

To plan effectively, you will need to estimate potential sales with some reliability. Most businesses don't have firm numbers on future sales. However, you can forecast sales based on historical information, market trends and/or established orders.

Standardized steps and time

Typically, the most efficient means to determine your production steps is to map processes in the order that they happen and then incorporate the average time it took to complete the work. Remember that all steps don't happen in sequence and that many may occur at the same time. After completing a process map, you will understand how long it will take to complete the entire process. Where work is repeated or similar, it is best to standardize the work and time involved. Document similar activities for future use and use them as a base-line to establish future routings and times. This will speed up your planning process significantly. During the process map stage, you may identify waste. You can use operational efficiency/lean manufacturing principles to eliminate waste, shorten the process and improve deliveries and costs.

How to plan work

To maximize productivity, every company needs a sound production plan. However, effective planning is a complex process that covers a wide variety of activities to ensure that materials, equipment and human resources are available when and where they are needed. Production

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planning is like a roadmap: It helps you know where you are going and how long it will take you to get there.

All other activities are initiated from the production plan and each area is dependent on the interaction of the activities. Typically, a plan addresses materials, equipment, human resources, training, capacity and the routing or methods to complete the work in a standard time. In order to do a good sales forecast, you should base it on a history of firm orders.

The production plan initially needs to address specific key elements well in advance of production in order to ensure an uninterrupted flow of work as it unfolds. Here are some advantages of an effective production plan and scheduling.

- Reduced labor costs by eliminating wasted time and improving process flow.
- Reduced inventory costs by decreasing the need for safety stocks and excessive work-in-process inventories.
- Optimized equipment usage and increased capacity.
- Improved on time deliveries of products and services.
- Material ordering-Materials and services that require a long lead time or are at an extended shipping distance, also known as blanket orders, should be ordered in advance of production requirements. Suppliers should send you materials periodically to ensure an uninterrupted pipeline.
- Equipment procurement-Procuring specialized tools and equipment to initiate the production process may require a longer lead time. Keep in mind that the equipment may have to be custom made or simply difficult to set up. This type of equipment may also require special training.
- Bottlenecks-These are constraints or restrictions in the process flow and should be assessed in advance so you can plan around them or eliminate them before you begin production. When you assess possible bottlenecks, be aware that they may shift to another area of the process. Dealing with bottlenecks is a continual challenge for any business.
- Human resources acquisitions and training-Key or specialized positions may demand extensive training on specialized equipment, technical processes or regulatory requirements. These employees should be interviewed thoroughly about their skills. When hiring them, allow sufficient time for training and be sure that they are competent in their work before the job begins. This will ensure that your process or service flows smoothly.

Initiatives

- If the inventory is available at the point where work is to start? If not, then the work needs to be rescheduled when supplies become available. There is no point in scheduling work that you will not be able to complete.
- Are your resources available? Do you have the necessary staff to complete the task? Are the machines being used?

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- Does the standard time fit within the open time allowed? If not, then the work should be rescheduled.
- You should be careful to minimize risk factors; allowing too many what-ifs can delay delivery and be counterproductive.

How to make Production planning (Pp)

The production plan provides a foundation to schedule the actual work and plan the details of day-to-day activities. As sales orders come in, you will need to address them individually based on their priority. The importance of the sales order will determine the work flow and when it should be scheduled. After this, you should evaluate whether or not you are ready for production or to offer the service.

Line planning: It is scheduling and allocating of orders to production lines according to product setting (product is being made in the line) and due dates of production completion. A line plan defines when a style is going to be loaded to the line, how many pieces to be expected (target) from the line and when order to be completed. During booking orders or allocating orders to the production line, planners must check what is running on the line and how many days it will take to complete the running style.

Benefit of Line planning: It helps production manager as well as line supervisor with information such as what is the daily production target for line. They set their line (machines and manpower) accordingly. Line plan also provides information such as how many days style would run, what is the next style going to be loaded?

Planning tools: The primary planning tools used by a planner in a garment export house to do production plan are likely,

- A planning board (excel sheet or printed format).
- Time and action calendar (order wise). Time and Action calendar format for production merchant.
- Line plan sheet

Pre-requisites information: Following information must be available to make your planning faster and accurate.

- Process flow of an order or list of tasks
- Production capacity of each process - Cutting, sewing, washing and finishing, for sewing - line wise and product wise capacity (pieces per day per line)
- Pre-production status - Such as fabric and trims are sourced or not. If not yet sourced the expected sourcing date, PP sample approved or not or expected approval date
- Shipment date or planned ex-factory date

Here are some ways how planning tools are used to make planning task easier.

1. Time and Action calendar*:* Planned cutting date (PCD) and ex-factory date which are two

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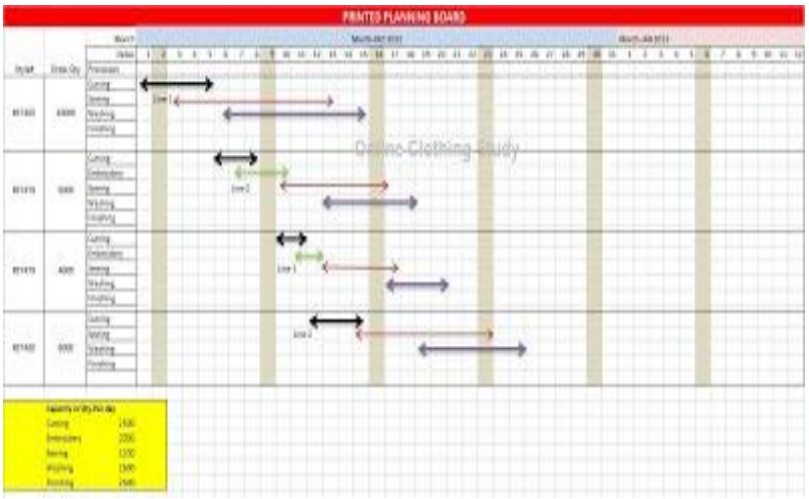
most critical dates for planning can be picked from TnA calendar. You will get total days available to you for all production processes. Even you will get rough distribution of start and finish date of each process. Order quantity is generally available in TnA calendar.

2. Planning Board: Line loading plan can be made for single process or multiple processes in a planning board. For reference I have attached below a planning board for multiple processes. Based on available time and production capacity of a line you may have plan for multiple lines a for order. Secondly, You may have postpone production start date if there no free space to load new order. Once you draw timeline for an order on the planning board you can see available capacity in a particular line and according to that you can make planning for following orders.



Planning Board (Fast React)

3. Calculations: First calculate capacity requirement for the order you are going to plan. Secondly, check capacity availability in all processes on the given time frame. Line capacity can be also calculated in minutes. For example, a garment SAM is 30 minutes and line performs at 50% efficiency. Calculate total capacity required (man hours) to complete sewing on time.

Fast React (FR)

Successful sourcing in a fast moving Apparel or Textile environment requires excellent planning and co-ordination, this is challenging even for a single-site business that sources products and materials locally. Operating globally magnifies these issues; to be successful, effective sourcing requires local knowledge, expert skills and specialist tools. Fast react Evolution Sourcing from Fast React Systems has been developed to provide effective support to sourcing companies that want to improve the visibility and control of their supply chain.

The Fast react Evolution Sourcing product offers extensive functionality for larger companies (typically over £15M GB turnover) or those with more complex requirements. The Fast react Evolution Sourcing product allows extensive critical path, including "new style development" critical path, "nested" events and bill of materials linked to the critical path. The Evolution Sourcing model also includes multi-level, multi-site planning, i.e. factory level allocation to plants or suppliers, plus optional detailed planning of selected sites at machine or line level

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(including distributed planning boards to remote sites if required). This detailed planning of some sites is typically used in situations where a business involves both own manufacture and sourced product or where a higher level of supplier collaboration/control is required.

Fast react Evolution also incorporates a very visual critical path planning board, which allows a powerful overview of critical path activities. The ability to visualize all orders on an easy to use planning board, with clear warnings of any potential problems, to provide coordinated, proactive schedules to suppliers, to manage critical path activities and to monitor the exact progress of all orders, including electronic updates from suppliers, offers huge business benefits.

FR has three specific software solutions to support your business improvement initiatives, providing visibility, improved operational efficiency and flexibility in the fashion supply chain.

Vision is invaluable for those involved in sourcing, providing a single, reliable point of reference for coordination and control to an otherwise hectic fashion environment. It offers visibility and clear information for all key processes from design to delivery.

Evolve is a vital planning tool for manufacturers to achieve effective capacity management and improve competitiveness. With lead times and margins being continually squeezed, the pressure to manage production well, without additional costs, such as air shipment or excessive overtime, has never been greater.

Align is critical for textile and other raw material producers who also need to plan quickly, accurately and effectively in order to respond to apparel manufacturer requirements for flexibility and shorter lead times. All of our solutions have been specifically developed for the fashion and textiles industry. Vision, Evolve and Align can each work as standalone solutions or integrate seamlessly.

Main reasons that companies invest in a Fast React solution

There are many reasons why companies buy Fast React solutions. Here are a few:

- The need to improve control of new style development
- Rising costs and lower margins creating a real pressure to improve efficiency and achieve cost savings
- Much reduced lead times and faster speed of response now demanded by customers
- Coping with significant business growth
- Issues with the delivery of materials, leading to bottlenecks and stoppages or excessive inventory levels
- Excessive fire-fighting to solve problems, including excessive use of overtime.
- Looking for an easier way to communicate and coordinate with suppliers
- A need to improve On Time Delivery Performance (OTDP %)
- Excessive air freight costs or delivery penalties
- Existing manual systems, such as spreadsheets are no longer able to cope
- A lack of management level visibility and reporting to support important decision making
- Customers are demanding much faster access to accurate latest status information
- Multi-level capacity planning at both factory and detailed line/machine level
- Management of supporting processes, specialist machines and work in progress

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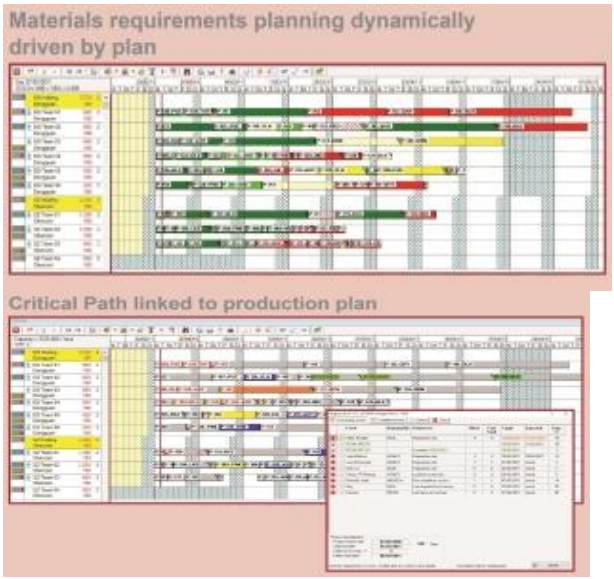
- Materials and pre-production critical path (T&A) priorities actively driven to support the latest plan
- The plan is updated and dynamic, so it reflects current situation including any slippage
- Flexible, management level reporting
- Multi-site collaboration capabilities for companies with several locations
- Data Interfacing to share data with business and other systems reducing data entry workload

Communicate the plan

After you have determined that you have met the criteria to start production, you will need to communicate the plan to the employees who will implement it. You can plan the production on spreadsheets, databases or software, which usually speeds the process up. However, a visual representation is preferred as a means to communicate operation schedules to floor employees. Some businesses post work orders on boards or use computer monitors to display the floor schedule. The schedule also needs to be available to employees ahead of time and kept up to date.



Consider change

One of the many challenges of production planning and scheduling is following up with changes to orders. Changes happen every day. You will need to adjust your plan in line with these changes and advise the plant. Dealing with change is not always easy and may take as much effort as creating the original production plan. You will need to follow up with the various departments involved in order to rectify any problems. As well, computer software can be helpful in tracking changes, inventory, employees and equipment.

ERP

Enterprise Resource Planning is Software for running a business. ERP was coined as an extension of the concept of manufacturing resource-planning (MRP) software, which automated the process of keeping a manufacturing line supplied with materials to meet incoming orders. ERP is a suite of applications including financials, manufacturing, human resources and other modules, that together automate the back-office business administration

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functions of an enterprise. Leading ERP vendors include SAP, Oracle, People soft and JD Edwards. Enterprise Resource Planning refers to the integration and extension of a business's operational IT systems, with the end goals of making information flow within (and beyond) a company more immediate and dynamic; increasing the usefulness and shelf life of information; eliminating redundancy and automating routine processes; and making information system components more flexible. Departmental boundaries generally become softer, accessibility of data is increased for partner companies and customers, and the company's ability to respond to the marketplace is generally enhanced. Enterprise Resource Planning is the latest high-end solution information technology has lent to business application. The ERP solutions seek to streamline and integrate operation processes and information flows in the company to synergies the resources of an organization namely men, material, money and machine through information. Initially implementation of an ERP package was possible only for very large Multi National Companies and Infrastructure Companies due to high cost involved.

Today many companies in Bangladesh have gone in for implementation of ERP and it is expected in the near future that 55% of the companies will be implementing one or the other ERP packages since this will become a must for gaining competitive advantage.

Real-time data tracking and production management systems

Real-time data tracking and production management systems such as Leadtec, iWorkPMS, Raptor are gaining popularity day by day in apparel manufacturing. All these systems use ***RFID (Radio Frequency Identification)*** technology for real time information capturing. Information tracked via RFID readers (terminals) in the apparel industry is processed through software and provides various reports that helps managing production.

Most essential reports such as line balancing, WIP, individual operator performance, line performance and employee earnings are available within a second.

1.Product Name: Leadtec
Solution Provider: CGS Inc. USA

The most comprehensive shop floor data collection and control solution available, Leadtec benefits manufacturers through improved profitability, reduced production costs, accelerated throughput time, and improved product quality.

Leadtec Terminal installed in workstation

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2.Product:iWorkPMS Solution Provider: iGarment Hong Kong

iWorkPMS system utilizes low frequency RFID technology to capture real-time data during the entire production work flow, thus the transmission, tracing, storage and retrieval of information will become much smoother, and the whole process more transparent. This system is also known as RFID bundle tracking system.

Lean

Lean manufacturing is an operational strategy oriented towards achieving the shortest possible cycle time by eliminating wastes. The term lean manufacturing is coined to represent half the human effort in the company, half the manufacturing space, half the investment in tools and half the engineering hours to develop a new product in half the time. These benefits can be achieved only if the concept is religiously followed in the 15 organization. In simple terms lean manufacturing is without waste. Thus the objective of this research is to find out how we can use lean manufacturing to achieve the following:

•To meet customer demand on time by eliminating non value added work from the process

•To minimize the work in process inventory

•To create flexibility of style changeover

•To reduce rework percentage

•To create a pool of multi-skilled operators who can respond quickly for changing style

Example-

The goal of the Toyota Production System is to provide products at world class quality levels to meet the expectations of customers, and to be a model of corporate responsibility within industry and the surrounding community. They implement lean manufacturing system & they succeed.

The Toyota Production System historically has had four basic aims that are consistent with these values and objectives: The four goals are as follows:

1. Provide world class quality and service to the customer.

2. Develop each employee's potential, based on mutual respect, trust and cooperation.

3. Reduce cost through the elimination of waste and maximize profit

4. Develop flexible production standards based on market demand.

The purpose of this document is to describe the major sub-systems that comprise TPS, as well as explain the key concepts and tools associated with the system of Toyota .The implementation of this concept in RMG sewing will bring good result.

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5S

5S is about sorting of things in your workplace and inventory stores. Keep workplace and floors clean and arrange things in right order for easy access. 5S can be considered a philosophy, a way of life, which can raise the morale and create a good impression to customers and enhance the efficiency. Any company that applied the 5S program will have quick and visible results, reducing different types of waste, in respect of lean manufacturing principles, removing all the forms of waste from the value stream (cycle time, labor, materials, and energy).

The benefits of applying this method in the company are the following:

- support the timely delivery;

- improve the products quality and reduce the number of defects;

- increase the productivity;

- reduce the loss of material, time and space (prevents waste);

- reduce the warehousing and inventory costs;

- reduce the downtime due to equipment malfunction;

- increase employment security. The employees will feel more comfortable at work and the continuous improvement actions will lead to less waste and better quality, affecting the company's profitability and competitiveness.

Now a day in Bangladesh starting implementation of 5S in various factories. And the outcomes are very positive.

Six Sigma

In many cases controlling the changes means trying to improve everything that has been measured. While computer software can calculate and monitor.

The parameters in order to know when a process has a problem, these limits loose most of their value in an environment where human operators are used. Manual calculations, charts and drawings will allow the implementation team to quickly recognize the changes in an average clothing factory. Taking into account what has been said above, I would like to propose a hypothetical case study on a clothing factory, where Six Sigma methodology and tools will be applied to it.

Six Sigma is a methodology that can help companies lower their costs or obtain higher profit margins by improving their processes.

Therefore, Six Sigma helps organizations achieve breakthrough improvement in value for themselves and their customers. Most of the companies accept between 3 or 4 sigma performance levels as being normal. In these cases, these processes create between 6,210 and 66,807 defects per million opportunities (DPMO), while the 6 sigma standard has only 3.4 DPMO which translates to less costs for fixing product defects.

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Example

General Electric profited between 7 to 10 billion dollars from using six sigma in about 5 years; DuPont added 1 billion dollars to its bottom line within 2 years of initiating its six sigma program, and that number increased to about 2.4 billion dollars within four years; Bank of America saved hundreds of millions of dollars within three years of launching Six Sigma, cut cycle times by more than half and reduced the number of processing errors by an order of magnitude; Honeywell achieved record operating margins and savings of more than 2 billion dollars in direct costs; and Motorola, the place where Six Sigma began, saved 2.2 billion dollars in 4 years.

At the beginning of 2015 an clothing company named A.C. X B.A. noticed a 8% annual customer complaints increase for 2014. We will try to eliminate this problem by making the company more efficient using the Six Sigma ***DMAIC*** methodology.

Define: Annual customer complaints increase by 8%

Measure: Major faults that occurred in the final product wore analyzed with the help of the histogram for prioritization.

Defects per unit (DPU) =total defects/total units Defects per million opportunities

(DPMO)= DPU X 1,000,000 Defects%

= DPU X 100 Yield%

= 100 -Defects% Process Sigma (or Sigma Level)

= NORMSINV (1 -DPU) +1.5

Where NORMSINV is the Excel function for calculating the Sigma Level and 1.5 represents the Sigma shift.

Analyze: The Process Failure Mode Effects Analysis (PFMEA) was used to determine the Risk Priority Number (RPN) value and action was taken accordingly. It is a systemic analysis of potential failure modes aimed at preventing failures or errors.

Using PFMEA implies firstly identifying the potential failure modes, and that determining the actions needed to be taken in order to correct them. After these actions are implemented, the process is evaluated once more in order to see if the new result is acceptable or not.

Improve: The Six Sigma implementation team came up with various improvement suggestions. Some of the most notable ones were:

1. The quality inspector had to participate in a series of training courses regarding quality.

2. A Quality Awareness Program was implemented for checkers and operators.

3. A well defined quality manual was developed for the company.

4. Work instructions wore developed and issued to each department.

5. Quality defects solving teams were created in each department.

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As a result to these measures:

1. There has been a significant decrease in defects per million opportunities (DPMO) in all of the company's manufacturing lines.

2. The Process Sigma level increased overall by 31.17%.

3. There has been a 13% increase in sales as opposed to the same period the year before.

4. Thanks to a newly implemented quality checking system and the constant monitoring by the trained quality inspector, a drastic reduction in quality defects level was registered.

5. It can be said for certain that this kind of change can only be noticed

After foolproof measures have been adopted to check quality and make

Workers, checkers and middle management aware of them.

Control: Control chart and plan were CREATED

Reasons that fail production plan and cause shipment delay

1. Product development and Sampling: Product development and sampling stage fall under pre-production processes. Other pre-production processes include sample approvals, finalizing vendors and cost negotiation with raw material suppliers. Most of the factories do not consider including development stage schedule under plan. It results no control on pre-production processes. It goes long and long. When sample approval gets detailed, consequentially ordering of trims and fabric get delayed. A complete plan is done when you include sampling plan under your planning. Out of total lead time most part is consumed by pre-production functions. As a result planned cut date (PCD) gets postponed.

2. Delay in sourcing of raw material: Normally factory planner discuss with supplier about their lead time for sourcing goods such as fabric and trims prior to making the final production scheduling. Suppliers fail to send good on time due to too many uncertainties. Sourcing delays also consumed extra time and make it difficult to start in-house processes on time. Few export houses experienced that yet after loading of cutting and stitching, trims such as care label, laces or main label are yet to be sourced. Partly stitched garments start piling up in the line and line supervisor load another style keeping running style aside from the line until they receive trims. How many factories can manage delay in such situation?

3. Inferior quality in sourced goods: Fabrics, trims and accessories get in-housed at last. Goods are passed through quality checks before using in product or cutting. Unorganized factories mostly source fabric from power loom and face quality related problem. It may be shade variation/matching, wrong GSM quality, low quality print etc. If an inferior quality of raw material found, fabrics are send for re-processing or resourcing. It causes further day in PCD.

4. Production urgency: Pressure and urgency increases when factory starts production processes (such as cutting, preparatory and sewing), as order has already eaten up bigger part of total time scheduled for the production processes (production to finishing). Not having much time on hand, managers push everything on fast pace. They even push their whole team on quantity production. In this stage they forget to care of quality of the product. Once they start

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ignoring standard procedures they get stuck on stitching quality or related problem rises. Repair and re-inspection become a main process. These process increases production time.

5. Delay from Sub-contracting Jobs: For high fashion product, few value added processes such as panel printing, embroidery, bead work or dyeing are needed. For these value added processes factory normally send fabric or half stitch garment to sub-contractors for job-works. Sub-contractors also come with their big commitments on delivery and quality. But when factory receives goods, they had to count some more days on their delays. This happen due to absence of planning at subcontractor factory.

6. Unresponsive and inflexible production systems.

CONCLUSION

This scenario of Bangladeshi garment has to be changed. Garment owner Have to know exactly what customers want in terms of actual merchandise. Increase Productivity & maintain garment quality to use various world class techniques. Non compliance activities are totally prohibited. They dictate price according to consumer pressure and expectations (designers must work to price points - costing is done on a price minus basis, squeezing the manufacturer's margins).

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