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Study the Application of Project Planning Concepts to Reduce Late Delivery in Apparel Manufacturing Organization

V.S. Ratnayake, Kaumudi W.G.C., Dharshana R.K.D., Siriwardena M.M.G.T., Kumara K.A.C.M.
Department of Textile and Clothing Technology, University of Moratuwa, Katubedda, Moratuwa, SRI LANKA.

Abstract: Current international market demands on-time delivery as a key performance which provides significant advantage in competitive market condition. In most of the cases, apparel manufacturing organizations are vulnerable about on-time delivery and they tend to use expensive methods like air freights to achieve delivery performance. The research proposes a methodology which includes the application of project planning concepts which will provide alternate solutions for the problems that occur, thereby the apparel manufacturing organization can achieve an enhanced delivery performance. It includes problem identification and comprehensive literature surveys to verify the appropriate planning concepts. As a result of the literature review, contingency planning concept with failure mode effect analysis was used to develop the mechanism.

Keywords: Project planning; Apparel manufacturing; Contingency planning

I. Introduction

Time has emerged as a dominant and self-consistent feature of the competition (Bartezzaghi, et al., 1994). In a manufacturing organization time is classified as delivery time, resource related time and lead time. Although it is difficult to determine which is the most important, the Lanka Business Report (2014) mentions that lead time has become one of the important factors for achieving competitive advantage in today's global competition. It is an industry requirement to reduce the lead time, and it is observed that lead time is negatively influenced by several internal and external causes (Nijkamp, 2012). The classified times are interrelated with each other, where higher lead times will ultimately result in late delivery. Since late delivery leads to discontented customers (Lanka Business Report, 2014), on time delivery of orders will enable an organization to add and retain customers. Currently, most of the Sri Lankan Apparel Industry struggles with achieving on time delivery. Lead time is the total time required to manufacture an item, including order preparation time, queue time, setup time, run time, move time, inspection time, and put-away time. For make-to-order products, lead time is the time taken from release of an order to production and shipment while for make-to-stock products, it is the time taken from the release of an order to production and receipt into finished goods inventory (Nijkamp, 2012). As the lead time is a competitive advantage, lead time reduction is the main area which Apparel manufacturing industry will focus in order to achieve delivery date due to the shortage of lead time in fast changing fashion world (Lanka Business Report, 2014). It is required that the manufacturing process should flow without any obstacles to achieve the perfection in lead time. Thus apparel manufacturing process has been subjected to various process improvement techniques though the exact lead time is yet to accomplish. Due to the unavoidable or unplanned situations occurring in the process, it has been difficult to continue the smooth flow of it (Nijkamp, 2012).

It is identified that the delays in manufacturing process are caused by order intake, specifications and planning procedures (The Manage Mentor, 2003). Nijkamp (2012) convinces that 'Extreme higher delivery times due to unavoidable circumstances and low delivery reliability of suppliers prevent the organization achieving their actual lead time'. Late project completion generally has negative effects for the company such as penalty costs and customer dissatisfaction (Kuhl & Tolentino-Peña, 2008). Unexpected arrival of problematic situations cause delays along the entire manufacturing process, and currently it is observed that on time delivery is achieved through crashing techniques and air freights which costs highly to the factory. Hence, the need has arisen to plan an apparel manufacturing process provided with alternatives which will standardize the organizational process to face unplanned issues.

A major concern of organizations has always been that of dealing with uncertainty. Manufacturing firms are continually bombarded with unpredictable and uncertain events both from outside and from inside their organizations. The unplanned project arrival causes uncertainty to the process causing it difficult to maintain its smooth flow. Manufacturing flexibility is the most obvious response to this external uncertainty, because of its accommodating nature. This has been defined as "the ability of a manufacturing system to adapt successfully to changing environmental conditions and process requirements" (Camisón & López, 2010). Stadler & Kilger (2005) convince that 'Planning supports decision-making by identifying alternatives of future activities and selecting some good ones or even the best ones'. The 'Project' in apparel manufacturing process is recognized as the arrival of new styled apparel and its order completion. Application of project planning concept in apparel manufacturing organization therefore supports decision making to the problematic situations arising in the process occurred due to a new style arrival. A new styled apparel introduction causes complications in the process as a result of its deficiencies. Delivery performance is operationalized as the average of three reflective indicators:

conformance, timeliness, and lead time. For example, the timeliness aspect alone would not be a valid proxy for the entire construct because it can be inflated with extensively buffered delivery times. Similarly, it may be possible to always deliver exactly as promised if the delivery dates are confirmed much later than the customers had originally requested ((PMI), 2009). The standard definition for the on-time delivery is that it is a metric used to assess the ability of a business to fulfil shipping orders or other transactions within the period of time promised to a client or customer. Time delivery is generally expressed as the percentage of transactions that are achieved within the specified timeframe, and is often an area of focus for process improvement initiatives ((PMI, 2009).

II. Project planning concepts

Project Planning

As stated by Gittinger (1982), projects provide an important means by which investment and other development expenditures foreseen in plans can be clarified and realized. Sound development plans require good projects, just as good projects require sound planning. The two are interdependent. Project planning provides a wide range of information about existing and potential investments effecting on the objectives of an organization. Mintzberg (1994) describes planning as the effort to formalizing decision making activities through decomposition, articulation and rationalization. The project planning can therefore be described as the effort in formalizing decision making activities through activity break down, communication and validation of something that brings the change in an organization (Salminen & Lanning, 1999). Project planning differs according to organization structure (Collyer et al., 2010). According to Birnberg (2012), following concepts are used for various purposes:

1. Strategic planning
 - Strategic planning is often called long term planning which helps to conceptualize future goals and needs for programs, facilities, systems, marketing, personnel, and other activities in design and construction organizations. It examines the specific businesses, disciplines, markets, regions and offices that will allow an organization to continue and thrive in to the future.
2. Action planning
 - Short term implementation plans are often called action plans requiring detailed and specific plans with time tables and accountability in support of strategic plans. It prepares near term targets in the areas of budgets, staffing, sales, deadlines, equipment, supplies or for other needs.
3. Contingency planning
 - Addresses how best to deal with opportunities, unexpected problems, surprises or other changes that may arise in an organization or for specific projects.

It is stated that through contingency planning, the organization can prepare for the challenges that cause plan to drift off course. Since the problematic situations observed in the apparel manufacturing organization tends to be unexpected, it is best to adopt the contingency planning concept to develop the solutions. Simpkins (2009) mentions that contingency planning has two versions: the first is framed to assure business continuity during either man made/natural disaster; second is uncertainty planning, which considers, in advance, various risks to a strategic plan prior to action. The apparel manufacturing organization consists of a strategic plan which delivers the goals and objectives of the organization. "The organizational leaders must make sure that there is a proactive contingency plan in place that incorporates impact controlling, alternative actions to ensure the success of the strategic plan's objectives and overall goal" (Simpkins, 2009).

Protecting the value of a project involves dealing with the uncertainty that will be associated with its delivery (Goldratt, 1997). When planning a project, the uncertainty factors have to be identified first before proceeding further in the process. Risk and uncertainty can both be identified with the use of past data. According to Simpkins (2009), when the area with the highest risk/ uncertainty is identified, these variables should be measured in order to provide a proactive plan. Here, risk is the "extent to which there is hesitation whether potentially desired or insignificant/unwanted outcomes of decision will be realised" (Sitkin and Pablo, 1992), and uncertainty is "the difference between the data required and the data already possessed" (Sanchez et al, 2009). It is also pointed out that risk management applied to project planning involves the analysis of the objective functions of the project in their interaction with the project variables. These variables (cost resources or other factors) have a dynamic behavior and they present different degrees of uncertainty through time.

Calculating uncertainty in project planning

Generally, the system risk or uncertainty is associated with reliability (Sellappan & Palanikumar, 2013). It is reported in the researches that reliability tools such as Fault tree diagram, Event tree diagram, Failure Modes and Effect Analysis (FMEA) and Cause and Effect diagrams are used in measuring the uncertainty/failure rate or the possible outcomes of a certain failure. Out of these tools, FMEA is proved to be the most convenient tool since it gives a numerical measure on risk of the causes. "FMEA is an inductive technique to systematically analyze all modes of failures of a system and identify the effects of these failures that may prevent fulfillment of its function" (Sant'Anna, 2012). The potential causes and effects are determined by this tool. The FMEA is a formalized but subjective analysis for the systematic identification of possible root causes and failure modes and the estimation of their relative risks. The main goal is to identify and then limit or avoid risk within a design. Hence, the FMEA drives towards higher reliability, higher quality and enhance safety. FMEA concentrates in identifying the severity and criticality of failures (Sellappan & Palanikumar, 2013). The FMEA depends on the three values of severity, frequency and undetectability. Here, risk of each failure is prioritized based on the risk priority number

(RPN) (Sant'Anna, 2012). It is noted that "the RPN is a product of the severity, occurrence and detection ranking value" (Sellappan & Palanikumar, 2013). These ratings are scaled with numbers between 1 and 10. The analysis starts from the basic structure of the system and particularly from those system elements for which accurate information about failure mode and its causes are available. By analyzing the functional relationships among these elements, it is possible to identify the possibility of propagation of each type of failure to predict its effects on the production performance of the entire system. The RPN must be calculated for each cause of failure. It shows the relative likelihood of a failure mode, in that the higher number, the higher the failure mode. From RPN, a critical summary can be drawn up to highlight the areas where action is mostly needed. The RPN is re-calculated after the failure has been addressed. The revised RPN confirms the effectiveness of the corrective action undertaken (Sant'Anna, 2012).

RPN usage in project planning

The RPN is not a measure of risk, but of risk priority. Limited resources can be applied to the most important problems. The RPN gives a model to allocate these resources. Higher numbers are higher priority; therefore the resources should be given on the basis of priority. One interesting issue, not well understood, is that some numbers cannot be an RPN. It is noted that there are long stretches of numbers that can't be an RPN. (For example, no number from 901 to 999 is an RPN.). There are only 120 possible RPN values. Among these values, some values can never occur whereas some values may occur in multiple ways. It is also mentioned that the importance will be given to the failure mode with higher RPN values.

III. Methodology

Contingency planning steps

It is essential in an organization to identify the uncertain issues which would ultimately affect the late delivery in an organization. Simpkins (2009) mentions the following steps that should be taken in contingency planning process:

1. Identify the change event in a clear, to-the-point and measurable manner
2. Clarify how the occurrence of the scenario will be monitored and measured.
 - Changes of the scenarios should be able to measure since degrees of change are important.
3. Estimate its probability of occurring.
 - Due to the availability on limited resources, the greatest focus will be on those that have the highest probability since it cannot cover every aspect.
4. Develop a proactive plan to reduce its impact on the organization
 - Since many paths are available to a goal, impact reducing objectives and actions may take an alternative path while still pursuing the same goal.
5. Identify new or alternative resource requirements
6. Identify and inform key individuals who might manage or be accountable for new aspect of a possible revised plan
 - It is probable that when an alternative action path is chosen, new accountabilities will be involved.

The process steps guide to the factors which cause the late delivery in the organization and hence it is required to find the risk carried with these factors. After calculating the risk, the highest risk involved factor should be eliminated from the organization from its root cause. To measure the risk, the factors should be measured on 3 perspectives: Delivery performance, Quality and Quantity cause the highest impact to the organizational performance, thus, the RPN is achieved. The highest RPN will get the priority and definite measures should be taken to reduce it.

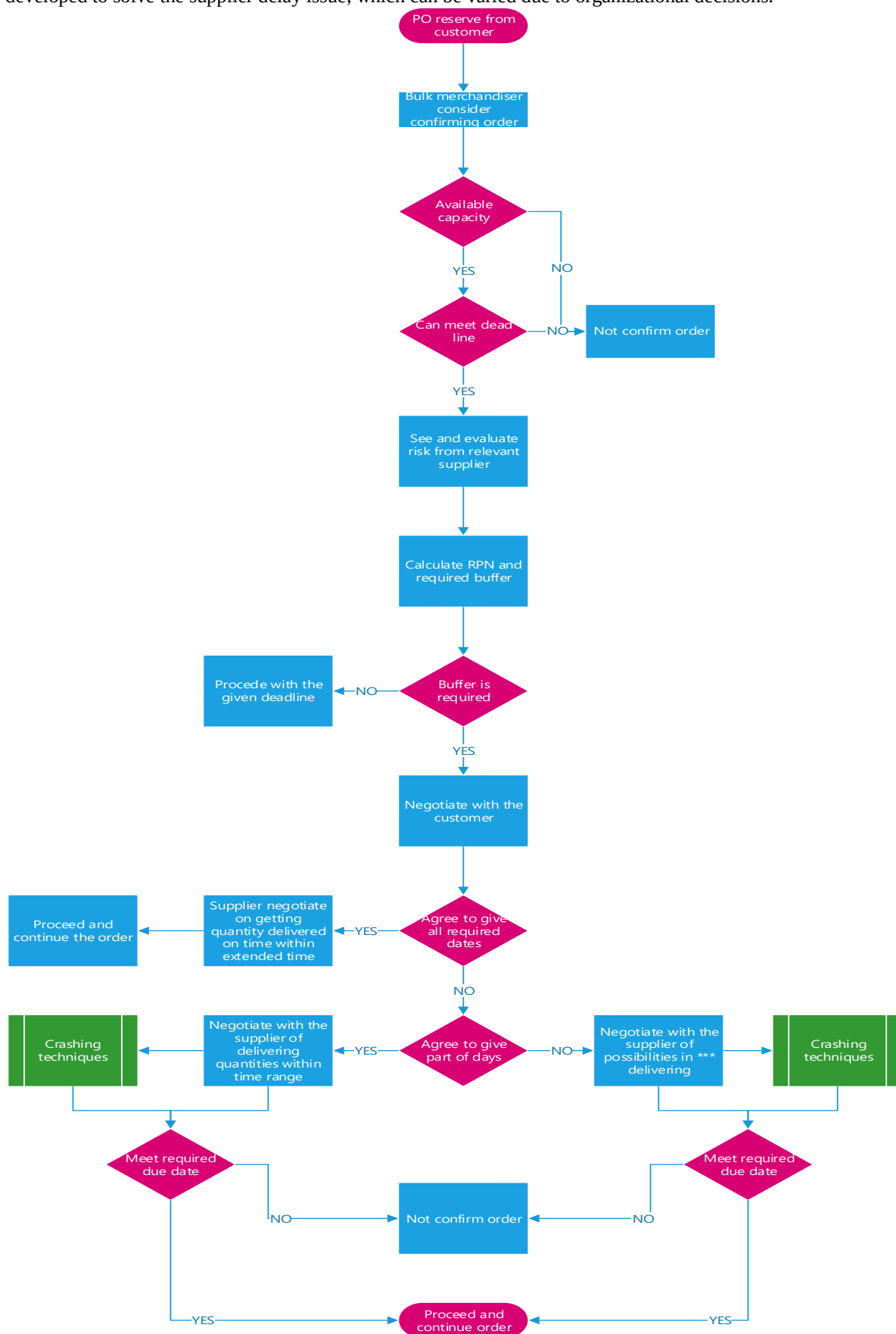
RPN = Severity ranking (S) x Occurrence ranking (O) x Detection ranking (D)

Severity is ranked based on the effect of failure, Occurrence is the frequency of the failure and Detection is the ability to detect the failure (Sellappan & Palanikumar, 2013). In comparison with the organizational factors, severity is the quantity late delivered, occurrence is the delivery performance of the organization regarding a particular factor, and detection is the quality rate of the organization with respect to the given factors. When allocating S, O and D rankings, the normal procedure is to decide ranks based on brain storming with the team. Since this procedure arouses many conflicts it was decided to assign a value range to determine the range. The value range was decided based on the following formula:

$$\begin{aligned} \text{Value difference} &= (\text{Maximum value} - \text{Minimum value})/10 \\ \text{Min. value} + \text{Value Difference} &= 1 \\ \text{Min. value} + \text{Value Difference} * 2 &= 2 \\ \text{Min. value} + \text{Value Difference} * 3 &= 3 \\ \text{Likely,} \\ \text{Min. value} + \text{Value Difference} * 10 &= 10 \end{aligned}$$

The practical usage of the contingency planning concept in an apparel manufacturing organization shows that the highest impact involved with the late delivery in the respected organization is with the supplier raw material delivery delays. In this situation, suppliers are the risk factors, and the risk priority should be calculated in terms of their performance in late delivered quantity, late delayed frequency, and quality of the delivered materials. Based on that, the RPN is calculated and assigned for every supplier, where higher the RPN, higher the risk involved with the supplier. After determining the risk involved, the preventive measures should be taken to

minimize the risk after discussing with the respected parties. The following process flow chart shows a method developed to solve the supplier delay issue, which can be varied due to organizational decisions.



IV. Discussion

The consideration on issues arising in the apparel manufacturing organization has led to the direction of the impacts which are caused by the uncertainty issues. Since there are number of uncertain and unplanned issues arising as a constraint to every organizational process, an organization should be able to maintain a smooth process when the uncertain issues occur. Contingency planning concept was applied in this scenario. The contingency planning concept provides a good alternative plan for the organization in case of an uncertainty. While studying the contingency concept, the planning process steps were applied to identify and solve the problems in the apparel manufacturing organization with the help of RPN. Based on the RPN, the highest priority risk factor can be found and reactive measures can be discussed with the management.

It was studied that the planning concept can be allocated in a preventive manner to solve the problems in an organization. The problem was observed, root cause was analyzed and a solution was proposed with the aid of planning concepts, and the application of the solution displays several measures that should be taken to prevent chance of issue taking place. Although contingency planning and other tools have been used in the manufacturing industry, there are no records in its usage in apparel manufacturing industry, especially of RPN.

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