

LEAN MANUFACTURING CHALLENGES IN A SOUTH AFRICAN CLOTHING COMPANY

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ABSTRACT

This is a case study that investigates factors that affect the implementation of lean supply chain concepts in a South African clothing manufacturing company, hereafter referred to as Company A. The company's primary markets are public hospitals in Gauteng Province and it offers a wide range of hospital linen and apparel for hospital staff, patients and wards. The study was conducted at the premises of Company A and it analyses the extent to which production of defective parts, overproduction, excessive inventory, unnecessary production steps, unnecessary movement of people, workers waiting for material and unnecessary handling of material affect the attainment of lean supply chain. Areas covered by the study are segments of the production department; namely the storeroom, cutting room, garment construction, cleaning and despatch. The study also looks at the attempts made and challenges encountered by Company A in eliminating these wastes. The effects of these wastes are visible throughout the company from sourcing of raw materials to the delivery of finished products. They affect delivery lead times, product/service quality, cost and customer satisfaction. These findings have implications on the competitiveness of Company A. They help Company A to focus on establishing supply chain linkages that reduce the wastes. The study contributes by suggesting a model that a manufacturing entity should adopt to reduce the impact of the seven wastes.

Key words: South African clothing company, lean concepts, supply chain competitiveness, supply chain model.

INTRODUCTION

Company A was founded in February 2010 as a black owned and managed company. It established its factory at Ghandi Square in Johannesburg and uses dedicated technologies to design and manufacture clothing products. Company A has three production departments, namely cutting room, garment construction and cleaning/finishing. The general flow of material in the departments is given in Figure 1.

Its primary market is public hospitals in Gauteng and offers a wide range of products that include patient gowns, doctors' shirts and trousers, baby wrappers, sheets, theatre linen, and theatre wear for patients and staff.

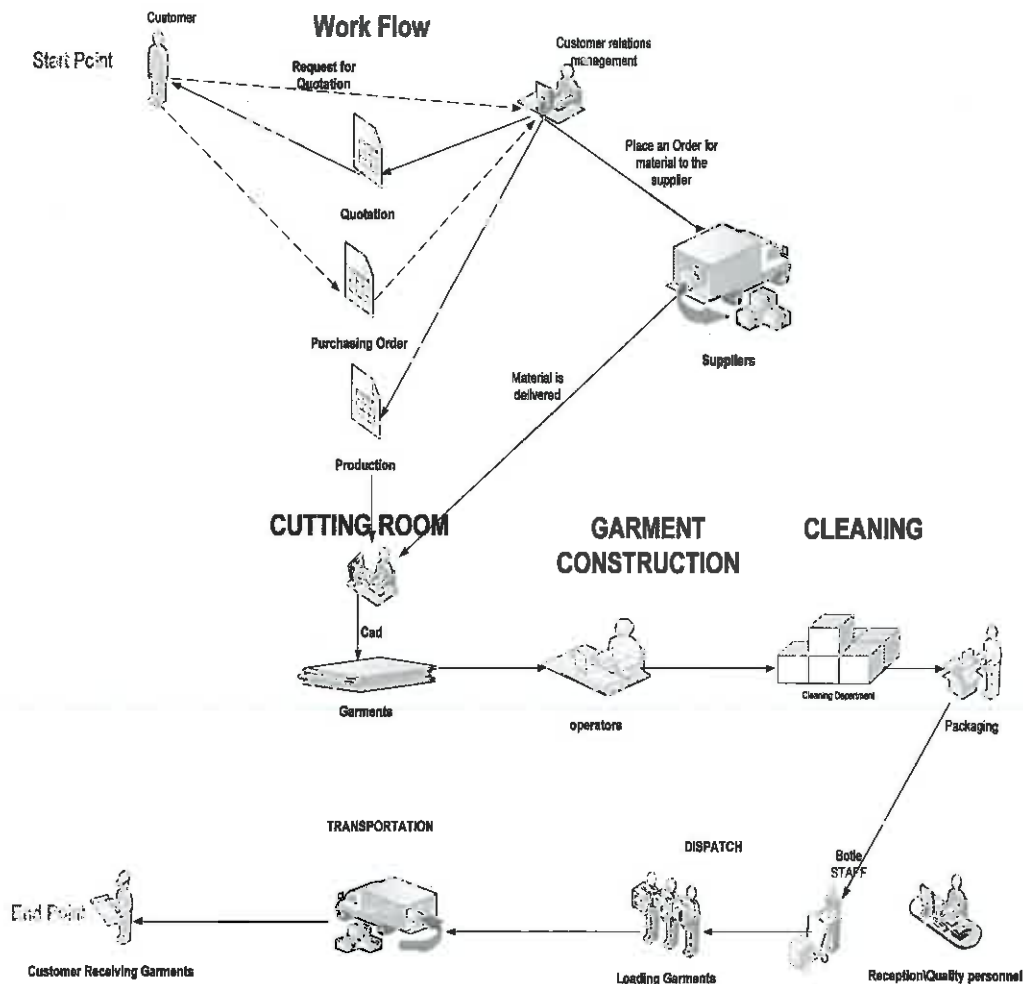


Figure 1: General flow of material in Company A

Company A produces products that are largely functional; products that rarely change in design and their demand is fairly predictable. After considering the demand of its products, Company A has adopted a lean supply chain strategy in order to create cost efficiencies in the supply chain by effectively managing inventory and focusing on improving the quality in the supply chain, thus eliminating waste. It has adopted a just in time philosophy and it endeavours to deliver the right material, at the right time, at the right place, and in the exact amount. It purchases material directly from suppliers that are approved by the Department of Trade and Industry (dti). The company supplies its customers on a make-to-order basis and tries as much as possible to keep the finished goods inventory to the minimum. The purpose of this research is to investigate the factors that affect the implementation of lean supply chain concepts at Company A.

Lean production is viewed as the production system of the 21st century, as mass production was recognized as production system of the 20th century (Pingyu and Yu, 2008). According to Demeter and Matyusz (2011), lean production permeates an entire organisation. It consists of lean development, lean procurement, lean manufacturing and lean distribution. It comprises a complex

cocktail of ideas that include continuous improvements, flattened organisation structures, team work, elimination of waste, efficient use of resources and cooperative supply chain management (Ferdousi and Ahmed, 2009). According to Ali Smadi (2012), lean production uses less of everything compared with traditional manufacturing methods. It uses less human effort in factory, less manufacturing space, less investment in tools and less engineering hours to develop new products. It also requires less inventory on site, fewer defects, and greater and ever growing variety of products (Ali Smadi, 2012). Lean production is supported by Just-in-time, which is a philosophy of continuous and forced problem solving. It supplies the customer with exactly what the customer wants, when the customer wants it, without waste, through continuous improvement (Ali Smadi, 2012). Lean production encompasses managerial practices in Table 2.

Table 2: Managerial Practices in the Lean Production Structure, source: Groover, 2008

| Just-in-Time Production | Worker Involvement |
|--|--|
| <ul style="list-style-type: none"> • Pull system of production • Control using kanbans • Setup time reduction for smaller batch sizes • Production levelling • On-time deliveries • Zero defects • Flexible workers | <ul style="list-style-type: none"> • Continuous improvement (kaizen) • Quality circles • Visual management • The 5S system • Standardized work procedures • Total productive maintenance |
| Autonomation | Waste |
| <ul style="list-style-type: none"> • Stop the process when something goes wrong (e.g. a defect is produced) • Prevention of overproduction • Error prevention and mistake proofing • Total productive maintenance for reliable equipment | <ul style="list-style-type: none"> • Production of defective parts • Overproduction • Excessive inventories • Unnecessary processing steps • Unnecessary movement of people • Unnecessary transport and handling of materials • Workers waiting |

Pingyu and Yu (2008) argue that for effective implementation of lean production, enterprises would require; the attention and involvement of senior managers, good communication platform, learning organization and the establishment of performance evaluation system.

METHODOLOGY

This study employs the methodology of a case study, and examines one structure of the apparel supply chain that is efficiency oriented. The research is cross-sectional and uses qualitative method to gather information on the factors affecting the implementation of lean supply chain concepts at Company A. The tools which were used for data collection are the questionnaire and interviews. Information was collected by a University of Johannesburg Industrial Engineering Student who had

been seconded to Company A on internship for a period of 6 months. The student was attending his final year of the diploma studies in Industrial Engineering and had completed 26 courses in the field of Industrial engineering. To gain access to the information required in the study, the student undertook the following:

- i. he arranged appointments with the four managers of Company A;
- ii. he verified the answers given by the interviewees through informative tours of the production floor and managerial offices of the plant;
- iii. during the six months he was at Company A, he assumed the role of a process improvement engineer. This allowed him to have a bird's eye view on all the functions of the company; and
- iv. a review of relevant literature from journals was also done.

FINDINGS

Cao et al (2008) found out that in textile-apparel supply chains, there are three popular types of coordination practices, namely vertical integration chain, efficiency oriented chain and third-party hub chain. Company A's supply chain fits in well with the third-party hub supply chain structure. It sources its inputs from government certified suppliers. The Gauteng provincial government is the information centre and plays an oversight role on the supply chain, from raw material suppliers through Company A to the hospitals. The other three players in the chain have the autonomy to adopt supply chain strategies and practices that suit their objectives.

Figure 2 gives the supply chain model for Company A. When the provincial government receives an order from a hospital to produce say X garments, it communicates this request to Company A which then shops around for the required material from a list of government certified suppliers. Company A only gets paid by the provincial government after a satisfactory product is delivered to the hospitals.

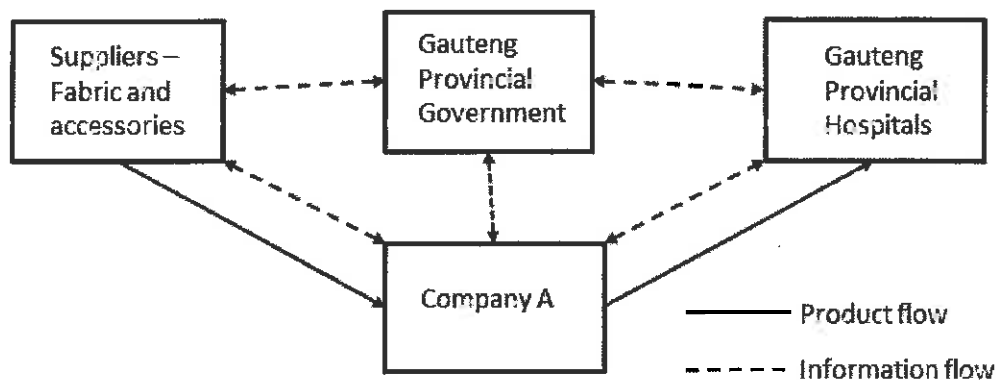


Figure 2: Supply Chain Model for Company A

Production of defective parts

Based on the nature of demand for its products, Company A has adopted a lean supply chain strategy. Workers inspect their own production, minimizing the delivery of defects to the

downstream production station. A weakness associated with its system is that it does not have a documented system to help reduce defects. Neither does it keep records of quality problems.

Overproduction and excessive Inventories

Overproduction and excessive inventories are correlated (Groover, 2008). Producing more parts than necessary means that there are leftover parts that must be stored (Groover, 2008). Company A has a challenge of synchronising flow of material within its departments. Accumulation of material at workstations is a common feature. Figure 3 gives a snapshot of this challenge in the garment construction department.



Figure 3: Result of asynchronous flow of material in the garment construction department-leading to accumulation of work in progress

From overproduction and excess inventories Company A incurs increased costs in; warehouse, storage equipment, additional workers to maintain and manage the extra inventory, additional workers to make the parts that were overproduced and production costs to make the parts that were overproduced. Accumulation of work-in-progress also hides problems and keeps problems from getting solved. Company A can reduce such waste through line balancing, set-up time reduction, preventive maintenance and improvement on plant layouts. Moreover, mechanisms such as the Kanban system to authorise production and transportation of materials would minimise the pile-up of inventory that is seen in Figure 3.

Company A is currently making use of a batch production system. An analysis of its products shows that it has several jobs that can be organised into families. Demeter and Matyusz (2011) advise that a company in Company A's situation can avoid the negative consequences of job shops by organising manufacturing cells for its different product portfolios. As the volume gets large, it would be worthwhile to build dedicated lines for products. This change in production system from batch to line (mass) increases work in progress inventory turnover, thereby minimising work in progress (Demeter and Matyusz, 2011).

One challenge Company A encounters in the make to order environment is the absence of suppliers who have the capacity to respond to its requirements in time. This forces it to stock a wide portfolio of raw material thereby satisfying incoming customer orders as soon as possible.

Unnecessary Movement of People and Materials

One cause of unnecessary movement of people and materials in Company A is attributed to the layout that the company adopted. The current layout is a job shop setup (Figure 4). Since Company A's product range is small and can be grouped into distinct families, locating machinery into cellular structures will minimise travel, waiting and inventory requirements. This will reduce unnecessary movement of people and material (Ali Smadi, 2012).



Figure 4: Inappropriate plant layout

Unnecessary processing Step

Company A has challenges associated with product design. Energy is expended designing products with features that serve no useful function, and yet time and cost are consumed to create those features. An improvement in this regard will help Company A make savings.



Figure 5: Workstations waiting for material

Workers waiting

Waiting at different workstations will be avoided if the flow of processes is adjusted to the rate of customer demand takt time (Allen and Thomerson, 2008). Work is redistributed so that each process is completed within this rate. Work is rebalanced and each task within the process is documented into a standard (Allen and Thomerson, 2008). In Company A, workloads are not properly balanced and this induces accumulation of inventory at some workstations and waiting for jobs at others as in Figure 5.

Machine breakdowns and long set-up times are also rampant in Company A. This inevitably forces workers to wait.

Standardising set-up, loading, unloading and sewing processes facilitates just-in-time deliveries, thereby eliminating waiting in the system (Ali Smadi, 2012). Company A is yet to determine the standard times for these activities in the plant.

Worker Involvement

Company A needs to involve its workers in continuous improvement, provision of visual workplace and standardising work procedures. This will enable and give its workers the skills to analyse and eliminate wastes.

CONCLUSION

Although Company A shares information with its trading partners, there is no physical flow integration. Cao et al (2008) argues that it is necessary to have full information sharing and physical flow integration if effective supply chain coordination is to be realised. Vendor managed inventory (VMI) is a typical practice of this level of inter-enterprise coordination (Cao et al, 2008). In short, there is need for Company A to achieve integration with customers and suppliers. This would be

realised if the model in Figure 5 is adopted. In the proposed setup, the Gauteng provincial government would be the hub the coordinates both information and material. Moreover material suppliers, Company A and hospitals will be aligned to accomplish global system objectives, i.e. attain a global lean system.

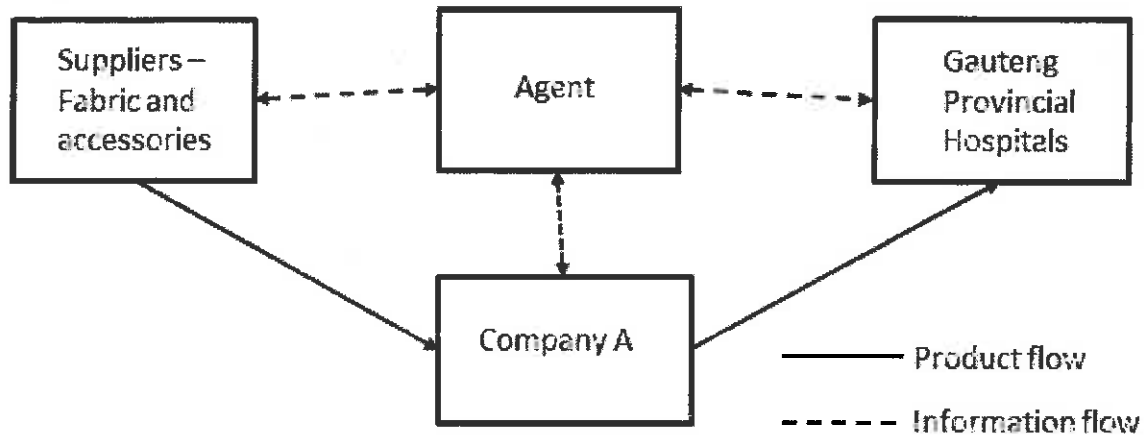


Figure 5: The Agent Coordinating the whole supply chain to provide finished goods to the hospitals-brand owners.

Company A tried to implement lean production without understanding the true means of it. There is need for the company to invest in quality management system, preventive maintenance, and synchronising flow of material within the plant. Moreover the company needs to train and involve its workers in line balancing, plant maintenance, provision of visual workplace, continuous improvement, standardising of work procedures.

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