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A comparative study of Production Planning strategies in Sweden and India

*Harish U.C

**Hariharan Ganeshan

ABSTRACT

This paper is a review of production planning strategies in Volvo (CE) and Hyundai Motors. This study is to describe and understand the production planning strategies of Volvo (heavy trucks, Sweden) and Hyundai (light motor vehicles, India). Data were collected through telephonic interview and E- mail questionnaire from Volvo (CE) & Hyundai production planning engineers. Both companies follow an aggregate planning strategy where their production planning is done based on the demand. The production planning affects the production process in terms of inventory, production rate and work force. The study also tries to understand the challenges they face in production planning process. Both the firms try to balance their production plans with the fluctuating customer demand. The study also helps to understand how a manufacturing strategy aligns itself with the overall business mission and the business strategy.*

Keywords : Manufacturing strategy, Production Planning, JIT, Pull Production

Introduction

Manufacturing strategy is one of the functional strategies of the organization. In the current era of global sourcing, global supply, intense global competition, low cost manufacturing, short product life cycles and rapid technological developments, manufacturing strategy plays a crucial role in providing competitive advantage to a manufacturing firm. The manufacturing strategies are framed by organisations with an aim of achieving or sustaining the status of being a world class manufacturer. The strategies are formulated based on the overall objectives of the firm and are aligned or integrated with the overall business strategy of the firm. The production planning strategy for a firm is a map that describes the way to produce and distribute their product. this strategy is framed considering the firm's demand as well as the resources available with the firm so that the firm is competitive in terms of cost, quality and delivery. The production planning strategy can

be of short term, midterm and long term. The planning range differs from industry to industry.

Skinner. W. (1969) cited in Keong & Peter, (1994) stated that company's manufacturing polices and operation should be designed to fulfill the task demanded by strategic plans. Every manufacturing firm faces a number of challenges during the production. These challenges directly impact the operation and can be countered by well maintained production planning strategies. The major challenges in the manufacturing sectors are identified by Kippenberger T. (1997). Most of manufacturing firms' production capacity will not be in line with the demand and hence, the production planning will have to be carried out on a continuous basis. The major problems faced by the manufacturers are high inventory level, increased lead times, over and underestimated forecasting, need for flexible manufacturing, poor delivery and bad relationship with suppliers. All these drawbacks form the basis for this research and hence have been considered to be paramount while writing this paper.

This paper has paid attention to production planning

* Hyundai- Indian Subsidiary

*Assistant Professor, Guruvayurappan Institute of Management, Coimbatore.

**Student, MDH UNIVERSITY, Sweden

strategies such as pull production, inventory and lean methods in car manufacturing companies. The paper is focused on their production planning strategies and how these strategies help them to optimize their production operation. The primary purpose of this study is to understand the optimal production operation in automobile companies. Thus the research question can be formulated as follows: To understand how automobile companies' production planning strategies optimize their production operation?

In order to answer the research question the researcher formulates a set of objectives, aimed to increase the understanding of case and put the limelight on different perspectives of the issue. These objectives are:

1. To understand what production planning strategies are getting implemented?
2. To understand how the production planning strategies affect the production process?
3. To understand how the lean production system help to optimize their production operation?

The significance of this research is to describe and understand the production planning strategies of Volvo (heavy trucks) and Hyundai (light motor vehicles) in India and Sweden. The purpose of this paper is to understand the production planning strategies of Swedish and Indian companies and how lean production is helpful in optimizing their production operation. For the past several years, the market for heavy trucks and cars (Volvo and Hyundai) are increasing ceaselessly. The companies need to maximize their production operation to meet the demand in the market and a lot depends upon their production planning strategies. This paper also looks at the lean production systems of Volvo and Hyundai. The answers on the research questions will convince Volvo and Hyundai to enhance the lean production systems in order to eliminate the waste, control the inventory level to reduce production cost and increase the flexibility in production operation.

2 Research Methodology

In order to complete this research, a survey is conducted to collect data from automobile manufacturing companies in Sweden (Volvo) and India (Hyundai). Both these firms are among the leaders in the automobile industry and are global players. This research paper is a case study of production planning strategies of Volvo and Hyundai. Hyundai and Volvo have number of production operation around the world (Volvo has production facilities in 19 countries and Hyundai has in 6 countries). Based on the research questions case study is most appropriate for this paper because case study is a robust research strategy in conducting social science research, especially when a "how" or "why" question is to be answered (Yin 1994). The data used in the research can be classified as primary and secondary. The primary data is collected from production employees of Volvo and Hyundai companies. The primary data is collected through email interview. Semi structured interview is used to explore and explain themes that have risen from research questions. Secondary data is collected from secondary sources- like companies' home page, journals, magazines, and library online database. The email interview has been sent to the production employees in Volvo CE (Eskilstuna) and Hyundai (India).

2.1. Sample

The primary data was collected from Volvo (CE) and Hyundai motors (India). Data were collected from five respondents (four Production Engineers and one Maintenance Engineer) from Volvo (CE) and one respondent (Production Planning Manager) from Hyundai motors.

3 Literature Review

3.1 Some Definitions of Manufacturing Strategy

Manufacturing strategy is one of the functional strategies of the organization. Hill T.J (1987) defines the manufacturing strategy as "a coordinated approach which strives to attain the uniformity between the functional capabilities and polices and the agreed current and future competitive

advantage necessary for success in the marketplace". Hayes and wheelwright (1984) noticed manufacturing strategy as a "regular pattern of decision making" in the production operation. It is directly correlated with the organization's business strategy.

Skinner(1986) explains that "a manufacturing strategy describes the competitive leverage required of – and made possible by – the production function". He lists out the structural decisions of manufacturing strategy as:

1. What to make and buy.
2. The capacity levels to produce.
3. The number and sizes of plants.
4. The location of plants.
5. Choice of equipment and process technology.
6. The production and inventory control systems.
7. The quality control system.
8. The cost and other information systems.
9. Workforce management policies.
10. Organisational structure.

Of late, several manufacturing firms formulate production planning strategies to enhance manufacturing operation and capabilities to increase their competitive strength in the global market.

3.2 Production Planning Strategies

Production planning aims at matching the capacity of production with the demand. As the demand increases production capacity also is to be increased and vice versa. The demand can be fluctuating in any period and this will affect the inventory level, working hours, production rate, external cooperation or any other demand influencing factors. The intent of production planning in a manufacturing organization is to reduce production time and cost, efficiently organize and utilize the resources and maximize efficiency in workplaces (Job et al. 2001).

Production planning strategies are segregated on time and decision basis i.e. facilities planning, aggregate planning and scheduling. In facilities planning, the top management makes decision about products that will be manufactured and identify the facilities required to produce them. The facilities' planning is for long term future. Nowadays, many manufacturing industries are using aggregate planning. It is medium range planning (3-18 months). It is about how many products are to be produced to meet the demand during a given period (Dumalo, University of the Philippines). Aggregate planning is a term used to indicate medium term capacity planning that aggregate the different products and services together in order to get a broad view of demand and capacity (Slack .N. et al. p. 323).

Aggregate production planning provides the primary link between the long term strategic plan and intermediate range planning activities. The main purpose of aggregate plan is to "specify that combination of production rate, work force level, and the resulting inventory on hand or backlog that both minimizes cost and satisfies the forecasted demand"(Reid & Nada R. Sanders, 2007). Buxey (2005) addressed aggregate planning concept along with three different types of strategies, namely, chase strategy, level strategy and mixed strategies. He noticed high level of fluctuations in demand increases the over stocking.

The researchers have noticed that chase strategy approach is used by firms to provide the optimal solution to production planning problems and ensures reduction in the inventory levels (Ankit et al. 2004). Most manufacturing firms which has adopted the Just in time production concept uses the chase strategy approach to aggregate planning. (R. Anthony Inman, Reference for business) In a chase strategy, the production capacity is increased or decreased depending on the changes in demand. Job et al. (2001) found that "Japanese system" is chase strategy. They addressed the production planning strategy showed to be the chase strategy, using "work force" issues.

Other kind of aggregate planning strategy is level strategy. It maintains an average production level and use the inventory as a "buffer" (Dumalo, University of the Philippines) to absorb the fluctuations in demand. The Level strategy will lead to overstocking of inventory during certain periods and will have back orders during certain other periods. The back order impacts the firm's quality of customer services and effectiveness of inventory management (R. Anthony Inman, Reference for business). So the investment in inventory is higher in level strategy compared to chase strategy (Job et al. 2001). Chase strategy is linked with the pull production system, whereas, level strategy is linked with push production system (Job et al. 2001).

Some manufacturing firms employs a combination of level and chase strategies. This combination strategy is called as a "hybrid" or "mixed" strategy. It can be used to meet organizational goals and policies at lower costs (R. Anthony Inman, Reference for business). The mixed strategy tries to optimize the cost of production by having some inventory and at the same time will have some fluctuations in production rate in line with the demand fluctuations.

3.3 Push Vs Pull Production systems

The production system can be divided into two types i.e. pull and push production systems. Pull system starts from the customer order/demand and customer is the main driver of the production planning. The push production system is based on the estimated demand (Boyer & Verma, 2010, p. 455-456). The push production systems permit firms to produce more number of quantities. Ni and Lu (2009) noticed that advantage of the push production system is increase in the production and in effective utilization of resources, but, the main pitfall is increased inventory. The Just-in-Time (JIT) system developed by Toyota follows Pull Production System. In a Pull Production System the manufacturing of a product is carried out based on a customer demand. The Pull Production System helps the firm to control the inventory level. Ni and Lu (2009) has

found that the firms must identify their production strategy according with its "own production capacity", "operational goals", as well as its "position in supply chain" in order to reduce the production cost as well as the inventory level. Table 1 shows the differences between push and pull production systems.

Table 1. Differences between Push/Pull productions systems

Variables	Pull Production System	Push Production System
Main Sources	Customer order/demand	Estimated forecasted/ Production Plan
Production	Customer Order	More number of quantity
Inventory	Low Inventory Level	High Inventory Level
Resources	Based on the Demand	High Utilization

Inventory control is the process of managing the inventory level, so that the manufacturing firms are able to gain the overall benefit from the inventory. Manufacturing firms use inventory strategy which involves setting the size of the inventory level and at the same time to operate at maximum efficiency (Malcolm, 2003). The primary purpose of JIT inventory management is to monitor the inventory flow in order to reduce the cost associated with inventory (Malcolm, 2003). Inventory can be raw material, work in progress and finished goods. Toni et al. (1987) notes Crosby, L.B (1985) statement that "JIT is a philosophy of improvement in order to manufacture products of higher quality, within shorter lead times, at lower unitary costs". It is a collection of techniques for improving a production system. Toni et al. (1987) mentions that the low inventory level and low work-in-progress are based on the pull logic of a production system. JIT production system particularly is a line flow production systems. It produces many products in low to medium volumes (Miltenburg, 1995, pp. 308). The JIT philosophy helps to identify the production problem easily and provides an opportunity to improve inventory flow in the production system. Secondly,

JIT approach focuses on lot size reduction and increase process feedback leading to reduction in process variance. Flynn, B. B et al. (1995) addressed Finch (1986) statement "JIT encourages the reduction and simplification of setup procedures". The simplification of setup procedure is more favorable to be performed by a machine's operators rather than separate setup team. The setup procedure becomes more frequent, the feedback time is shortened leading to improved quality. Park (2009) noticed Swink et.al (2005) statement that JIT practices having the primary goal of eliminating waste in terms of material movement, work-in-process inventories and delays reduces lot sizes, helps setup time reduction, promote smooth flow of product, and follows pull production system.

3.4 Lean Concept

Many manufacturing industries are using lean production as a strategy to increase their competitive strength in the global market. The Lean concept derived from the JIT was implemented by Toyota (Peter et al. 2004). Jim Malloy (2009) noticed "Lean production is an assembly-line methodology developed originally for Toyota and the manufacturing of automobiles. It is also known as the Toyota Production System or just-in-time production." Vadim noticed that lean eliminates overproduction, minimize the inventory, and maximize the flow. Kivumbi (2010) noticed that JIT's role is to emphasis process problem and to eliminate the problems. Peter et al. (2004) has cited Womack et al. (1990) statement that "Lean production is 'lean' because it uses less of everything compared to mass production." Peter et al. (2004) noticed that the lean concept applies more widely throughout the firm to enable the activities beyond the shop floor (relationship with suppliers, customers, and partners). The International Motor Vehicle Program (IMVP) result noticed cited in (Michael A, 2000) that the lean production practices improved productivity through reduced lead times, cutting costs, increased quality etc. He found lean production system strengthen a firm's competitive advantage if the firm is able to appropriate the productivity savings it creates. Rachna & Peter (2007)

stated that the lean production is to eliminate waste by minimizing "variability". The variability is related to supply, processing time and demand. They noticed that the variability in setup time and delivery schedule by suppliers contribute to excess inventory which a firm need to have in order to prevent stock out operation. However, reducing setup time cannot eliminate the excess inventory from operation because firms keep the excess inventory to accommodate variability in supplier delivery. In order to reduce excess inventory of all types, firms will have to secure reliable suppliers in addition to developing a reliable process. The outcome of the lean methods are reduced inventory levels, optimized equipment, increased production velocity, enhanced production flexibility, reduced complexity and decreased material usage (Ross & Associates, 2003). Carlos (2006) noticed in manufacturing industries are the greatest of lean operations, one of the components of Lean Manufacturing success. Kippenberger, T (1997) notice that the implications of lean production are continuous improvement in product quality, control of production, reduction in lead time and shortening of product life cycle. The Lean operation helps to optimize production operation in manufacturing industries.

4 Empirical Findings

4.1. Production Planning Strategies

Volvo is a group of company that produce trucks, commercial vehicles, buses, construction equipments, aero engines and are also into financial services. The production planning strategies emanate from its mission statement and Volvo Mission statement says, "Using combined expertise to create transport related products and services of superior quality, safety and environmental care for demanding customers in selected segments" (Volvo, Annual Report, 2009, p.14). The findings of this study are based on the responses which the researcher received from the production employees of Volvo (CE). They mentioned that their aim is the component to customers, in the most efficient way. They follow "SQDEH" which

means Safety, Quality, Deliverance, Finance, Economics and HR. Moreover, they mentioned that in order to satisfy the customer demand; a level production environment is maintained with minimal lead time and inventory. Their production planning strategies are aimed at reducing the inventory cost. In 2009, one of their ambitions was to adjust the production capacity as per the market demand (Volvo, 2009, Annual Report p.45). This is achieved by employing 'Make to Stock' strategy where a part of the finished goods stock is used to level the demand. They also indicated constant movement of leveling production based on the demand/customer orders. The respondents pointed out that their planning depends on the complexity of the production flows. They use traditional order based planning for non complex flow and moderately complex flow and efforts are being made to maintain a pull production system here. However, for complex flows (Advanced Planning System) finite production capacity is maintained and the focus is on optimizing the flow around the bottlenecks. In autumn 2008, Volvo (CE) reduced the production rate in order to adjust production capacity to the lower demand and to reduce the inventories and was forced to lay off many employees (Volvo, 2009, Annual Report.) Volvo (CE) uses different planning horizons for production planning. They follow mid range plans 12 months (0- 2) years and short range planning (0-3 Months). Every month Volvo (CE) produces 2500 semi finished components. It is about 1500 axles, 1000 transmissions.

Hyundai is one of the leading automobile company in the world today. Hyundai's Headquarters is in Korea and they have manufacturing plants in Korea, China, India, US etc. The primary data for the current study was collected from the Indian manufacturing plant. The respondents of the Hyundai plant responded that their goal is to achieve the targets in production and also to produce the products by using zero defect concept. The company's vision statement mentions: "to build an efficient system of cooperation between worldwide production and sales, to strengthen company's key competitive strengths and establishing

localized sales strategies and green management" (Hyundai, Annual report, 2008, p24). Hyundai is implementing demand based production planning strategies. The respondent mentioned that their production is based on the demand in domestic and overseas markets. The Hyundai's Indian plants manufacture cars for domestic as well as International markets and the demand in the two markets vary significantly. The respondent also noticed that the foreign demand is based on the product specifications. If demand decreases, they will implement new products by using advanced technology. The respondent indicated that their production plan is divided into 3 months, and these 3 months are segregated into weekly and daily basis and they produce 2100 cars/day.

4.2 Pull Production System

Efforts are being made at the Volvo Plant to maintain a pull production system which will help them in reducing the inventory and thus reduce the cost of their operations. Currently they follow one-piece-flow of production to avoid batch production and to increase flexibility by minimizing change over times. By changing the production capacity in tune with the demand, they are able to reduce the inventory levels. In 2009, the capital tied up in inventory was reduced and by the end of 2009, the inventory of new products was in level with the existing demand. They were also able to reduce the inventory level of the unsold equipments. Overall, by the end of 2009, the inventory was reduced by 47% (Volvo Annual report, 2009).

From historical data perspective, as the demand remains at low level, they had to reduce cost in significant manner, by cutting back on inventories and reducing capital employees. During 2009, Volvo (CE) focus has directed efforts towards inventory reduction in order to improve cash flow. They have taken comprehensive program, including the shutdown of factories, modification of unsold machines to meet needs of new customers and relocation of products to markets with demand. The result was that at end of the year inventories were reduced by 47% (Volvo Annual report,

2009). One of the principles of Volvo production system also includes JIT which means producing and conveying what is needed, when it is needed, in the amount needed in the shortest lead time. The basic concepts of the principle are minimal inventory, customer demand and one-piece flow. The respondents divulged that Volvo (CE)'s production capacity meet the forecasted demand. It is based on the market condition. During 2008- 2009, production was low due to huge impact on economic crisis. Volvo (CE) sold 38,783 machines, a decrease of 39% compared to 2008 (Volvo, Annual report, 2009).

They also indicated forecasting based on the mid range planning (0-12 months). They divide the months into weeks in order to simplify the forecasting to balance the production capacity. The respondents mention pull production system to reduce the production cost as well as minimize the inventory level. It mainly depends upon the prerequisites of the production flow, variations in demand, product characteristics, product value and process stability. If these prerequisites are met, then a pull production system will generate less cost and lower inventory levels. Volvo production system mainly covers the three major dimensions such as vision statement, modules with tool techniques, and five principles. The practical tool and techniques applied in each specific area drive to create operational excellence. The company forces to optimize the cost efficiency and productivity in all areas of its operations. The company is to make cost advantage over the production and increase the productivity in order to improve the profitability. They have an important task for the future taking advantage of economies of scale and increasing productivity in all parts of the group. The Volvo production system is one of the key to attain strategic goals of operational excellence, but also way to create an attractive workplace.

On other hand, Hyundai motors' manufacturing products are based on Domestic as well as Overseas demand. Their workforce, production and inventory are based on demand. They keep 25% of inventory for Domestic operation. The domestic demand is based on the new model cars and

product life cycle. The respondent addressed that the production capacity balance the demand. They are leveling the production into monthly/weekly/daily basis. Hyundai CEO stated that in order to respond to rapid changing market situation, our company should continue to increase the competitiveness in R&D and quality management, and moreover, to improve the efficiency and flexible production operation (Hyundai Annual report, p.25). The respondent agreed that the pull production system helps to make the cost advantage over the production and inventory level.

4.3 Lean Production

Volvo's process stability notices to reduce all kinds of variability and waste to make the production process in a more efficient way. The organization has the responsibility for reducing the environmental impact from production process. They are conducting research to develop new product by using new technology that will pay attention to environmental friendly production process and products. Furthermore, the respondents also addressed lean production practices improve the productivity and quality through reduced lead times. Volvo (CE)'s one of the 2010 ambitions is to optimize the industrial footprint to become more efficient in production and development. Volvo (CE)'s semi finished goods meet the expected quality. They have formulated the Built in quality principle in VPS. It defines "doing things right the first time, detecting and correcting problems at the point of origin". The production system focus on zero defects by having the mindset of not accepting bad quality, being proactive, and eliminating root causes. The production flows are continuously examined to identify potential improvement measures to reduce environmental impact. Volvo (CE) encounters major challenges while planning the production. The major challenges are changing customer demand, process stability, production capacity, new products, and phasing out old products, unsecure markets and wrong forecasting. The respondents mentioned that these challenges are being solved by continuous improvement.

Table 2: Summary of the findings

	Volvo (Sweden)	Hyundai (India)
1. Mission	Using combined expertise to create transport related production and services of superior quality safety & environmental care for demanding customers in selected segments.	Build an efficient cooperation between worldwide production and sales, strengthen company's key strengths, establish localized sales strategies and employ green management.
2. Strategy	'Make to stock' 'Level strategy'	Demand based production planning
3. Planning Horizon	Mid range (0-2 Years) Short range (0-3 Months)	3 months
4. Focus areas	Reduce variability and waste, reduce environmental impact	Combine high quality with price competitiveness, continuous improvement
5. Quality principle	Doing things right the first time, detecting and correcting problems at the point of origin	Develop and produce zero defect vehicles
6. Pull production	Currently implementing through 'one-piece-flow' of production	Following demand based pull production
7. Major challenges for production planning	Changing customer demand Ensuring process stability Balancing production capacity New products Phasing out of old products Unsecure markets Wrong forecasts	Material delay Unsuspecting delay Market condition

Hyundai's respondent noticed Lean production system makes the production process an efficient one. They use FIFO concept. This lean practice reduces lead time, minimize the inventory level and simultaneously increase the productivity. Their strength is in its ability to combine high quality with competitive pricing. Their production system follows zero defect concepts. The Company's "Quality Way" policy seeks to develop and produce zero defect vehicles (Hyundai, Annual report, 2008, p.25). The respondent noticed major challenges during planning the production are material delay (foreign supplier), unsuspecting delay and market condition. These gaps are filled by continuous improvement.

5 Analysis

The summary of these findings help to understand the production planning process and the strategies followed

in the two firms considered for the study and is shown in the table 2.

6 Conclusion

This study looks at the production planning strategies of Volvo (CE) and Hyundai motors. It shows their production planning strategies and how it affects their production process and explains about the lean production to optimize their production operation in successful manner. The research has followed case study method to carry out the study. The paper lists out the various strategies and planning methods used at the two plants by interviewing the employees at the two companies' manufacturing facilities. The study also helps to understand the challenges followed in the production planning phase and how they try to cope with these challenges through continuous improvement and through the use of improved technology.

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“Success is not final, failure is not fatal: it is the courage to continue that counts.” - Winston Churchill
