Enhancement Of Supply Chain Efficiency By Extending Kanban System

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Abstract- *The manufacturing industries are getting more competitive and it is very important for them to have proper communication with the suppliers to supply the materials as per the requirement. Supply Chain Management aims at improving stability of the supply chain as a whole, by integrating organizational units along the supply chain and by coordinating material, information and financial flows in order to fulfill the customer demands .But conventional supply chain management practices alone cannot fulfill the requirements in the current competitive world. So this project aims to implement a system to enhance supply chain efficiency by integrating it with e-kanban. Advanced Shipment Notification(ASN) is the e-kanban tool used here for this system.*

Keywords- Supply Chain Management; Kanban; Purchase; Advanced Shipping Notice; Inventory; Inventory Balance Index

I. INTRODUCTION

Supply chain management (SCM) is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. Supply chain management involves coordinating and integrating these flows both within and among companies. It is the Design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally. SCM practice draws heavily from the areas of industrial engineering, system engineering , operations management, logistics , procurement , information technology, and marketing and strives for an integrated approach.

The field of purchasing and supply chain management continues to gain its importance as a part of the heightened focus on supply chain efficiency and effectiveness, inter-organizational collaboration for competitive advantage and to tackle society's 'wicked issues'. Upgrade of SCM can be done by integrating it with the e-kanban system. The best thing about an electronic kanban is that distributed teams can access it from anywhere with an Internet connection. Electronic kanban allows users to track the history of a project and make changes without losing any data. Online kanban also helps distributed teams see a project's details without having to take a photo of a physical (manual) kanban board.

The e-kanban tool used here is Advanvced Shipment Notification (ASN). It is a document that provides detailed information about a pending delivery. The purpose of an ASN is to notify the customer when shipping occurs and provide physical characteristics about the shipment so the customer can be prepared to accept delivery. An ASN, which is usually sent over the Internet in an electronic data information (EDI) or extensible markup language (XML) format, provides information about when an order will be shipped, which items are being shipped, how many of each item is being shipped and physical characteristics about the shipment such as the shipment's weight, the number of boxes and a description of how the shipment units are packaged. An ASN also tells the customer which mode of transportation is being used for shipping and provides carrier information.

Inventory or stock refers to the goods and materials that a business holds for the ultimate purpose of resale (or repair). Inventory management is a science primarily about specifying the shape and placement of stocked goods. It is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock. Inventories play a major role in deciding a company's profit. So it is as much is important to manage the inventory. The scope of inventory management concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space, quality management, replenishment, returns and defective goods, and demand forecasting. Balancing these competing requirements leads to optimal inventory levels, which is an ongoing process as the business needs shift and react to the wider environment.

CASE STUDY

Rane (Madras) Ltd., is one of the India's largest steering gear and linkage manufacturing company. It started in 1929 as a trading. But later in the year 1960, they completely dropped trading and started manufacturing and it all started with the manufacturer of Tie Rod ends at their plant in Velachery, Chennai. Later, as the automobile industries flourished in the country, the business spread to the manufacturing of other suspension and steering systems. The main components manufactured by the company include Manual Steering Gear Products (SGP) and Suspension & Steering Linkage Products (SSLP). RM SSLP, SC SSLP, BOF SSLP,CASTINGS, FORG SGP, BOF Master SSLP and BOF SGP are the various sections in SSLP and SGP.

Conducted a detailed study on Kanban and Inventory control from the company officials and journals. Come to know about the advantages of implementing e-kanban in the industry. And it comes to know that the best e-kanban tool that can be used is Advanced Shipping Notice(ASN). After that made a list of parts status in the different MMD sections for the month of November, 2016. Then made a list of the stocks and it found that 21% of parts are excess inventories and 34.5% of parts are in critical, i.e., less than the minimum quantity.

LITERATURE SURVEY

Literature and contemporary studies on supply chain management and inventory management in purchase sector is in plenty as they are very important in the modern era of manufacturing. The major policies and operations had been in the area of developing adequate production capacity as a part of import substitution and to generate base level demand for products and improved manufacturing practices. An elaborate review of the literature has been made with a view to analyze the nature and scope of several studies pioneered so far in the fields of supply chain management and inventory management. The main objective of this review is to evaluate the current level of knowledge and to focus on the objectives of the present study i.e. a shift from known to unknown.

The supply chain, also known as value chain is a concept from business management that was first described and popularized by Michael Porter in his book, Competitive Advantage: Creating and Sustaining Superior Performance. Porter, M. E. in 1985 [1]. The definitions provided by various authors vary according to their area of focus and the industry they are trying to analyze. What can be seen from the bulk of the literature on supply chain management in the area of purchase sector?

A broader definition is given by Raphael Kaplinsky and Mike Morris in 2000 [2], which defines the supply chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. The definition recognizes the flow of services as well as products in supply chains.

Louise Knight , Wendy L. Tateb, Aristides Matopoulosa, Joanne Meehanc, Asta Salmid [3] proposed that, PSM (Purchasing and Supply Management) focus on supply chain efficiency and effectiveness. The Journal of Purchasing and Supply Management (JPSM) is always welcoming diversity in researchers perspectives, methodologies and data collection and analysis techniques. In PSM research novel methods help us in 2 ways; topics can be revealed in new ways, research focusing on new themes. Adoption of novel method is strong but there are factors which hinder research process innovation. In this section, these barriers and enablers are identified in order to consider what measures might be taken to encourage wider use of novel methods in PSM.

According to Kevin J Dooley [4], the study modern organization data may be textual and quantitative in nature. Researchers use content analysis method. This will reduce the complexity of qualitative, textual data so that it can be more easily and reliably understood, and identify patterns in such data. To perform Content analysis, there are 2 approaches; In Latent content analysis the researcher reads the text and responds in textual manner. In manifest content analysis, explicit mechanical rules are used. Latent content analysis have higher validity than manifest, because there is human in the loop. But it shows less reliability because of human error and fatigue in encoding. One main area where manifest content analysis method needed is called big data. Second area is behavioral operation management. Communication is the most important thing between two people or two organization so this will helps to understand behavior and also makes suggestions.

II. PROBLEMS FACING IN CONVENTIONAL SCM

2.1 Excess Inventory

Excess inventory exists when a company inaccurately orders inventory and is left with more than the market demands or market demand dramatically falls after inventory is ordered. Having excess inventory is generally regarded as bad for

business because of what it means for inventory turnover and the costs associated with managing it.

A. 2.1.1 Preservation Problems

One problem of having excess inventory is that it takes up floor space and prevents you from offering newer products that appeal to customers. Turnover-per-foot of shelf space is a common measurement used by retailers to determine how efficiently they sell products that are given space on the sales floor. When excess inventory lingers from an out-of-style or older product, it restricts better product opportunities.

B. 2.1.2 Reduced Profits

Excess inventory naturally leads to reduced profit margins in many instances. Companies usually wind up putting excess items on clearance to induce buyers to purchase them at lower costs. Some companies even wind up selling extra inventory at prices below what they paid for them. This significantly lowers profit margin, which is the difference between what you pay for products and what you sell them for. Similarly, selling at lower prices means you are not bringing in as much cash as you would selling products at regular prices.

C. 2.1.3 Waste

Related to the costs of inventory management is a worst-case scenario in which you end up throwing out excess inventory that perishes or expires. If a company carries fresh produce, for instance, it may have to throw out excess when it goes bad. Products like medicine, bread and other foods have expiration dates and must be tossed at some point. Reducing wasted inventory is critical for cost control and profitability.

2.2 High amount of out of stock parts

A stock out, or out-of-stock (OOS) event is an event that causes inventory to be exhausted. While out-of-stocks can occur along the entire supply chain, the most visible kind are retail out-of-stocks in the fast-moving consumer goods industry.

2.3 Increased lead time

A lead time is the latency between the initiation and execution of a process. For example, the lead time between the placement of an order and delivery of a new product from a manufacturer may be anywhere from 2 weeks to 6 months. In industry, lead time reduction is an important part of lean manufacturing.

2.4 Stoppage of production lines

Line Stoppage in the manufacturing industry are happened due to many causes: equipment failure, inventory mistake, shortages from suppliers, defectives products.

Uneven supply of parts by suppliers are the major cause for this problem. This is because the suppliers don't have a good knowledge about kanban system and still they are very much happy with the conventional methods.

OBJECTIVES

1. Completion of supply chain by including the suppliers into ASN
2. Implement a new system to measure quality of inventory

III. METHODOLOGY

1) Inclusion of ASN in Supply Chain

Advanced shipping notice (ASN) is a document that provides detailed information about a pending delivery. The purpose of an ASN is to notify the customer when shipping occurs and provide physical characteristics about the shipment so the customer can be prepared to accept delivery.

An ASN, which is usually sent over the Internet in an electronic data information (EDI) or extensible markup language (XML) format, provides information about when an order will be shipped, which items are being shipped, how many of each item is being shipped and physical characteristics about the shipment such as the shipment's weight, the number of boxes and a description of how the shipment units are packaged. An ASN also tells the customer which mode of transportation is being used for shipping and provides carrier information.

2) ASN implementation among the selected suppliers of 'Forg SGP'

Make a detailed study about ASN. Its come to know that that excess inventories are more in BOF SGP and the project is conducted there. There are a total of 120 suppliers and out of that 10% of suppliers are chosen according to the supplies of parts in hierarchy order. After that contacted each supplier and given information about ASN and told them about the importance of implementing ASN.

3) Implementation of Inventory Balance Index sheet

To measure the quality of inventory, new metric 'Inventory Balance Index' or IBI is introduced. IBI is a sheet

that is updated regularly with respect to the change in inventory. This metric is included for each buyer to measure the quality of inventory. It is calculated in points. The normal stocks are awarded with full points, the excess inventories are given half points and no points are awarded to parts with lower than the required stock. The calculation method for Inventory Balance Index is done as:

((0 * No. of parts with lower than the required stock) + (0.5 * No. of parts with higher than the required stock) + (1 * No. of parts meeting the stock requirement)) / (Total no. of parts)

IV. RESULTS

From the month of November onwards the selected suppliers were asked to implement ASN. By the month of March 2017, 9 suppliers out of 12 implemented ASN successfully.

Table 5.1 Suppliers who are doing ASN

S.No	Supplier Name	Whether supplier is using vendor portal	Supplier is doing ASN
1	AJP	YES	YES
2	AJ Precisions	YES	YES
3	Auto International	YES	YES
4	Brakes India	YES	YES
5	BSFL	YES	YES
6	Chamundi Heat Treaters	NO	NO
7	Endotherm Fluids	NO	NO
8	Ferro fusion fasteners	YES	YES
9	Kavia Engineering	YES	YES
10	KEMS forgings	YES	YES
11	JVR forgings	YES	YES
12	Mitter Fasteners	YES	YES
13	Prem Industries	YES	YES
14	RG Bronze	YES	YES
15	Sri Vidya Plastics	YES	YES
16	Swasthik Machine Tools	YES	YES
17	J K Fenner India Ltd	NO	NO
18	Sundaram Fasteners	YES	YES

Inventory Balance Sheet is implemented in the organization to measure the quality of the inventories. Table 6.2 shows the IBI sheet before the implementation of ASN among the suppliers. The excess inventory (burden) is much more in BOF SGP compared to others. And the IBI value is only 44.10 and it lies in 'Blue Zone'.

Table 5.2 IBI values of different sections in the month of November,2016

SECTION	NOV~16 DANGER (%)	BURDEN (%)	NORMAL (%)	IBI VALUE
RM SSLP	49.48	24.38	26.14	38.33
BOF SGP	36.95	37.91	25.14	44.10
SC SSLP	51.32	22.34	26.34	37.51
BOF SSLP	39.06	8.99	51.95	56.45
CASTING	25.00	25.00	50.00	62.50
BOF MASTER SSLP	19.75	-	80.25	80.25
FORG SGP	19.73	28.16	52.11	66.19

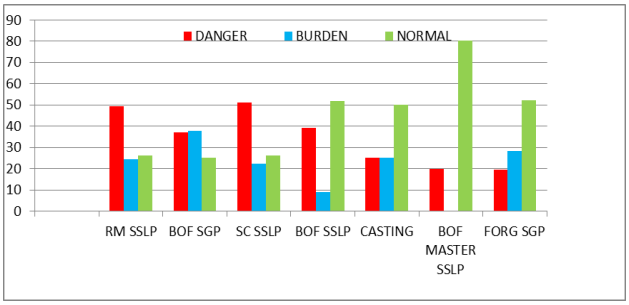

Fig 5.1 IBI chart

But after the successful implementation of ASN, the IBI value of the BOF SGP is increased from 44.10(Nov,2016) to 58.72 (Mar,2017).The critical inventories were reduced from 36.95% to 26.74% and the burdens were reduced from 37.91% to 29.07%. So as a result there is an increase of 14.62% in total IBI value and BOF SGP moved from Blue zone to Green zone(Normal).

SECTION	Mar~17 DANGER (%)	BURDEN (%)	NORMAL (%)	IBI VALUE
RM SSLP	51.03	17.85	31.12	40.05
BOF SGP	26.74	29.07	44.19	58.72
SC SSLP	52.56	14.13	33.31	40.38
BOF SSLP	36.05	7.75	56.20	60.08
CASTING	17.65	25.00	57.35	69.85
BOF MASTER SSLP	14.91	-	85.09	85.09
FORG SGP	20.39	29.05	50.56	65.09

Table 5.3 IBI sheet as on March,2017

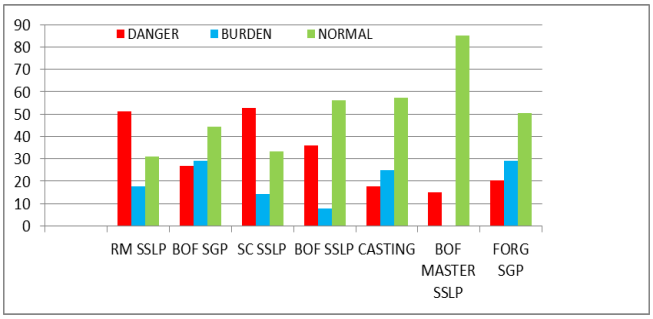

Fig 5.2 IBI chart as on March 2017

V. CONCLUSION

The findings of this study shed light on the linkages between SCM and kanban. We have considered intertwine paths to manage the inventories and have derived quantitative estimates of effects. The results are complementary with the large body of case study evidence on the implementation of ASN in Supply Chain in purchasing departments.

Our findings suggest that, the amalgamation of kanban with SCM can reduce the excess inventories and can also save critical items to recover from the danger zone. This helps to reduce the extra charges for excess inventory maintenance and also diminishes the line stoppages due to the unavailability of parts.

While broadly consistent with prior research, these findings offer new and quantitative insights regarding the effects of SCM and lean implementation. The findings presented here are aggregate estimates, far removed from the details of shop floor where lean implementation actually takes place. Advanced combinations of established methods can help scholars get more traction on complex issues through working at the edges of the field to make sense of changing the landscape of SCM. The practice community is facing ever greater risk in supply chains-we should be willing to take some risks in how we go about to understand the field and addressing challenging research agenda.

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