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Exploring the insights of a consignment stock program implementation in a leagile supply chain

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Abstract. Supply chain performance, in terms of total cost, service level and delivery lead-time is an extremely important objective in an organization, being directly linked to inventory management. Therefore, well managed inventory is a main trigger to increasing profitability. In this regard, the present study attempts to explore the readiness of a leagile manufacturing company to embrace consignment stock model, in order to reduce inventory value for raw materials and packaging, as well as to avoid forecast accuracy problems and cash-flow issues. The methodology includes a brief analysis of different types of inventory models, focusing on consignment stock approach and proposes an exploratory case study, represented by a successful implementation of a consignment stock program in a multinational company, having already leagile prerequisites. Using as a basis the insights and learning from the real case, the aim of the study is to develop a business processes framework, accommodated with the IT support software, to serve as a guideline for future implementation of such programs.

1. Introduction

Tensions arising nowadays in most of the companies, regarding cost reductions, lead-times compression and enhanced responsiveness, created by the global competition, resulted in supply chains' efforts to adopt strategies or programs that reduce inventory cost and improve performance. When a company desires to be responsive, having a short lead-time and thereby the ability to rapidly react to market unpredictable requirements, it needs to maintain a high level of inventory [1]. In contrast, the same author argues that in order to operate effectively, inventory levels need to be continuously reduced [1]. Even though several authors agree about the view of a trade-off between responsiveness and efficiency in supply chains [1, 2, 3, 4 5], some of the researchers draw the attention on applying lean manufacturing on the parts of the supply chain that use forecasting to predict the demand and agile practices on the supply chain segments that deal with volatile demand or uncertainty. The use of leanness and agility in different areas of the supply chain is by Naylor et al. (1999) referred to as leagility [6].

The common goal of the lean and agile supply chain strategies is to meet the customers' demands at the lowest cost possible [7, 8]. Lean practices are mostly used to improve effectiveness, while agile tools enable the chain to become more flexible, increasing its adaptability, towards greater responsiveness. By these means, a company goes through a transformation process, being more suitable to further implementation of different programs or initiatives that address certain segments or processes of the value chain, improving overall performance.



Fisher (1997) lists some main supply chain priorities, regarding responsiveness and efficiency, which companies need to consider for continuous improvement. Among them, minimizing inventories throughout the chain, deploy buffer material stocks and adopt new approaches to reduce lead-time, are of the essence [9]. In manufacturing facilities, the levels of inventories at all stages indicate the company's competitive positioning, so, reducing inventory level and cost, especially for raw materials and packaging is an extremely targeted objective in business environments [10]. There are several options to be chosen in this view. Many firms adopted Just-in-Time (JIT) approach, or Vendor Managed Inventory (VMI) programs, while others implemented Consignment Stock (CS) policy. Among the above mentioned inventory management models, VMI has got the widest attention in the academic literature [11, 12], while quite little amount of literature was dedicated to CS [13, 14].

2. Research methodology

The present research methodology includes a brief analysis of different types of inventory models, focusing on consignment stock approach and proposes an exploratory case study, represented by a successful implementation of a consignment stock program in a multinational company, having already leagile prerequisites. Using as a basis the insights and learning from the real case, the aim of the study is to develop a business processes framework, accommodated with the IT support program, in order to help other companies to ease up the implementation of such models. The data collection in the field was carried out by the authors due to their involvement with the buying organization. The documentation consisted of material inventory levels and value, storage capacities evaluations, orders size and frequency, relationship with actual suppliers, employees' readiness, as well as process mapping procedures and the entire chain activities, in order to identify all the functions and processes that may be influenced by the implementation features of a CS program. Due to project's high complexity, this paper will only refer to the key business processes regarding the stock administration, that have to be conducted through an integrative software, namely the successive steps which are compulsory to follow and align with the supporting soft in case of such a program implementation.

3. Defining JIT, CS, VMI and comparing them with the traditional inventory model

JIT is an inventory management method whereby materials, goods, and labour are scheduled to arrive or be replenished exactly when needed in the production process [15]. Thus, in order to effectively employ JIT a company must accurately forecast demand. Operating in a JIT system stimulates suppliers to tighten inventory controls and ensure that demand is met on a timely basis [16].

CS is another approach in which the vendor removes his inventory and maintains a stock of materials at the buyer's plant. This model is being based on a close collaboration between the vendor and the buyer, aiming to create a win-win situation through revenue sharing [14]. The CS is legally owned by the vendor, but held by the buyer, meaning that the risk and rewards regarding the material stock remains with the first party. In accordance with a general CS policy, the vendor guarantees the buyer to continuously keep a stock between a minimum and a maximum level, which are agreed between the two parties [17]. The minimum stock level is termed as safety stock and the maximum level sets the limit the buyer can accept, concerning the storage space constraints. The entire process is governed by a consignment agreement, which represents the legal frame that enables both parties to perform the agreed activities. The buyer does not need to bare the financial cost associated with the inventory, as the materials are not bought until they are consumed in production [14].

VMI is a supply chain initiative where the vendor cooperates with its customers to reach a more efficient inventory management, the inventory being located to either the vendor or buyer, under the condition that the vendor manages the inventory [12]. This means that the vendor makes the inventory replenishment decisions on behalf of the buyer by monitoring inventory levels and product withdrawal, by deciding the appropriate inventory levels, as well as choosing the appropriate inventory policies to maintain the agreed inventory levels [12]. In VMI, the inventory could be owned by either the buyer, or by the vendor.

When referring to the similarities and differences between the inventory above management models, there are three main aspects to be taken into account: the inventory location, the ordering responsibility, and inventory ownership. Table 2 illustrates the differences and similarities of JIT, CS, VMI, and traditional inventory management models in regards to the three main points from the above description.

Table 1. Similarities and differences of JIT, CS, VMI, and traditional inventory model

	Inventory Models			
	JIT	CS	VMI	Traditional inventory Model
Inventory location	Vendor and Buyer	Buyer	Vendor or Buyer	Buyer
Ordering responsibility	Buyer	Buyer	Vendor	Buyer
Inventory ownership	Buyer	Vendor	Vendor or Buyer	Buyer

As shown in the table, whereas in traditional inventory management programs, the ordering, ownership, and physical control of the inventory stays with the buyer, in CS programs financial ownership of the material stock is with the vendor and shifts to the other party when the material is already consumed in production. Under VMI systems, the responsibility of ordering remains to the supplying company, while the ownership and the inventory location can be either at the buyer or the vendor. In the case of JIT delivery arrangement, the vendor holds the central part of the inventory at his facilities, but makes frequent deliveries to the buyers' location, based on pre-agreed schedules.

Based on the high specificity of each of the discussed inventory programs, it appears that the most suitable one to lower raw materials' inventory, as well as eliminating procurement lead-times is CS model. There are significant benefits for the focal firm, already mentioned in the industry reports or the research literature, as an outcome of CS implementation [17, 18]. Table 2 highlights the main benefits on the buyer's side.

Table 2. Buyer's benefits under CS

Buyer's Benefits under CS
- Reduced inventory costs; 'zero cost' for the consigned materials
- Improved cash flow; materials are invoiced and paid only after being consumed
- Procurement lead-times eliminated or drastically reduced; materials always on-hand
- Production continuity, with no disruptions from the perspective of the consigned materials
- Forecast accuracy problems and out-of stock instances are eliminated
- Extended payment terms, as the vendor is paid upon material consumption
- More flexible production mix and increased productivity
- Increased customer satisfaction, hence more responsiveness achieved

The next aspect of being investigated is at what extent is a company ready to adopt it, and how to proceed to achieve a successful implementation.

4. Case study insights and results

The focal company is an FMCG goods manufacturer, being since several years under leanness and agile strategies implementation, having already an integrated supply chain, with streamline processes, and clearly defined and allocated responsibilities. The software system that granted processes integration over the entire supply chain is represented by SAP (Systems, Applications, and Products), a German software product, which allows the business to track customers, suppliers and business functions interactions. SAP is especially well-known for its Enterprise Resource Planning (ERP) data management system and what is the most important, it is also designed to be adaptable for different business models, by specific input provided by the consultants, at request.

Pressures like unpredictable demands in the market, forecast accuracy issues, stock-outs, and cash flow, made the management team decide the adoption of CS policy. The proposal was to target the most suitable materials sourced by reliable suppliers, already engaged in a collaborative relationship with the company. All the involved suppliers have been assessed based on specific criteria [19]. An in-depth analysis has been performed on all the processes and resources involved in the transition to CS model, and the project team reached a final consensus regarding the actions to be followed to support the business case. The implementation was a success, being executed under the consistent guidance of the project team, even though it concerned only two types of materials, as a pilot start. An excellent communication among all the implied parties and stakeholders support helped to overcome the challenges arisen from the complexity of the process in certain areas, like increased reporting frequency and separate monitoring of the physical stock per each vendor.

Based on the insights of the case study, the action steps have been isolated by the research authors, structured and ordered in a process framework, along with the corresponding transactions' codes, roles and simulation outputs. The business process framework for CS implementation, accommodated with SAP software is presented in table 3.

Table 3. Business process framework for CS implementation accommodated with SAP

	Business Process Steps	Transaction Code	Role (execute this step)	Output Data / Results / Additional Information	Document Number out of the Simulation Program
1	Create consignment Purchasing Info Record (PIR) with "zero" price	ME1N	Master Data	Select consignment	PIR created under the number 5300274504
2	Create yearly /monthly Purchase Order (PO) with item category, "K"-consignment assigned	ME1N	Material Planner	Delivery date far away in the future in order not to interfere the APO planning	Standard PO created under the number 4500948441
3	Create standard (real) PO against the vendor for the materials in scope	ME21N	Material Planner	Communicate PO to vendor	Standard PO created under no. 4500948442
4	Post Goods Receiving Note (GRN) against Consignment PO (in special stock "K") upon material receipt in the warehouse	MIGO	Material Clerk	Movement type 101	Material document posted 5000003205
5	Create physical inventory document for special stock "K" = consignment	MIK1	Material Clerk		Physical inventory document created 100001221
6	Transfer material to Manufacturing function (SL 2200)				
6.1	Reverse quantity from initial GRN post against consignment PO	MIGO	Material Clerk	Movement type 102 (special stock "K")	Material document posted 5000003206
6.2	Perform GRN for the same quantity against the real PO	MIGO	Material Clerk	Movement type 101	Material document posted 5000003207
6.3	Stock transfer from SL 2000 to SL 2200	MB1B	Material Clerk	Movement type 311	Material document posted 4900019158
7	Send to vendor weekly report with materials in scope, transferred to production, to be further invoiced	MB51	Material Supervisor	Total quantity should be equal to weekly GRN posted in step 6.2	

5. Conclusions

Consignment stock program is an excellent option towards reducing inventory cost, as well as eliminating out-of-stock instances, forecast accuracy issues and bringing procurement lead-times to zero levels, all of these being targeted objectives in supply chain's management to achieve enhanced efficiency and responsiveness. Though, it is important for the focal company to be ready to adopt such initiatives to avoid implementation failure.

The case study demonstrates that a agile company, already having in place streamlines processes, clearly defined and allocated responsibilities, along with a robust ERP software solution, represented by SAP software in the present case, is more prepared to adapt to this kind of changes and has a higher rate of a successful implementation than a typical firm. Furthermore, trust and commitment between supply chain members, as well as information sharing, are crucial for a positive outcome.

Based on the insights obtained through this case study, the key activities of the stock administration part of the project have been isolated by the authors and structured in a process framework, being accommodated with the SAP software program in terms of operating transactions and roles allocation. This framework could be used by other businesses in scope, who decide to adopt a CS program.

Both, theoretical and empirical research, contribute to the existing literature concerning inventory business solutions and represent a useful example for companies that aim to improve their overall supply chain performance by lowering inventory and shorten procurement lead-times, thereby building a competitive advance.

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