Impacts of Inventory Management Practices on SCM Performance in Auto Sector in India

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Abstract

Inventory is the heart and soul of every manufacturing company's supply chain. In order to reduce procedural waste, ensure error-proof warehouse operations, properly optimize transport & distribution with customized vehicles, always ensure damage-free deliveries & real-time visibility, and foster real-time information sharing among stakeholders, the automotive industry and related businesses are currently having difficulty integrating business processes through appropriate technology. The study's goal was to better understand the effects of Inventory management practices on SCM performance, and the findings indicate that inventory management practices have a strong correlation and a direct impact on SCM performance. Excess inventory might be a high risk to the company & low inventory may be end up in loss of opportunity and hence the study suggests that inventory must be at optimal level, and inventory norms must not be fixed for years but to review periodically based on the changing consumer need.

Keywords: Inventory, Inventory Management, SCM, Inventory Management Practices, Supply Chain Management, SCM Performance, ABC Classification, FSN Analysis, Just-in-Time (JIT), Vendor Managed Inventory (VMI)

Introduction

Concepts of Inventory Management

According to (Jenkins, What is Inventory Management? Benefits, Types, & Techniques, 2020), Inventory is made up of the components, completed commodities, and raw materials it sells or utilizes in manufacturing. Inventory is viewed as an asset in accounting. Accounting professionals utilize stock level information to accurately report values on the balance sheet. There are many definitions of inventory however a robust definition could be as follows:

"Inventory is the goods or products in physical forms (tangible state) or it is in the intangible form like software that someone (organization or individual) handles with the intention of selling. Inventory can be old or new, usable or non usable, raw materials or unfinished (work-in-progress) or finished goods."

Inventory should be treated as integrated part of logistics and supply chain management (Singh J. , Saruprıa, Kushwaha, & Kumari, 2019);(Singh, Singh, & Kumari, 2020);(Singh D. J., Singh, Kumari, & Vyas, 2022).

There are mainly three types of inventory as below (Singh, Singh, & Kumari, 2020);(Singh D. J., Singh, Kumari, & Vyas, 2022); (Singh, Singh, & Kumari, 2022);(Singh J. , 2021);(UNLEASHED, 2022):

i.) Raw Material Inventory: Raw material inventory is the stock that you employ to produce your finished goods.

ii.) Unfinished Inventory OR Work-In-Progress Inventory: Inventory of semi-finished products that have not yet been completed during production.

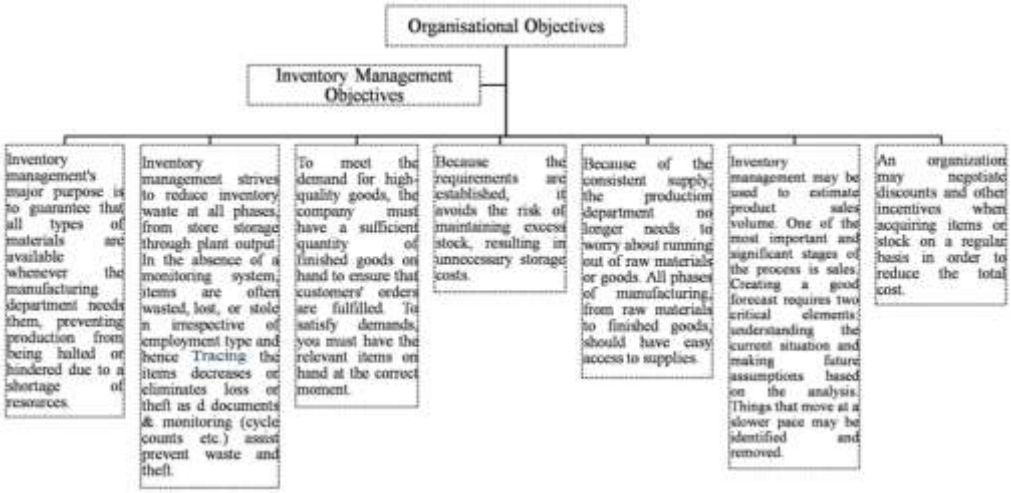
iii.) Finished Goods Inventory: The goods or products that have been finished and are ready for use or sale to the final consumer.

Although maintenance, repair, and operating goods (MRO Goods) and safety stock (extra inventory utilized during shortages or surges in demand) are components of the aforementioned types of inventory, many authors regard them as different types of inventory. Inventory management determines how well a firm runs its business, treats its customers, and boosts revenues. For businesses that sell products, from tiny craft breweries to major wholesalers and distributors, inventory management is crucial. Engaging suppliers, creating an inventory management system, taking a focused and goal-oriented approach to demands, using handheld (mobile) technology and devices, and using real-time data to analyze and make swift, wise business decisions can all help to improve inventory management (Singh, Singh, & Kumari, 2022);(Singh J. , 2021); (UNLEASHED, 2022); (Singh, Singh, & Kumari, 2020);(Singh D. J., Singh, Kumari, & Vyas, 2022).

Inventory management allows businesses to choose which products to order when and in what quantities. Inventory is kept track of from goods acquisition through product sale. The technique notices patterns and responds to them to ensure there is always enough inventories to satisfy client requests and proper notice of a lack. After being sold, inventory becomes a source of income. Inventory consumes cash before it is sold, while appearing as an asset on the balance sheet. As a result, holding too much stock results in expenses and decreased cash flow. Inventory turnover is one sign of effective inventory control. An accounting indicator called inventory turnover is used to track the frequency of stock sales over time. A business does not want to carry more inventory than it does sales. Lack of inventory turnover may lead to dead stock, or unsold product (Jenkins, What is Inventory Management? Benefits, Types, & Techniques, 2020). Inventory management is important as it saves costs, improves cash flow, and makes customer happy.

Inventory Management Objectives

It is important to note that inventory management objectives are closely integrated with organisational objectives as shown in figure-1.



Figire-1: Inventory Management Objectives' Integration with Organisational Objectives

The demand can be latent, dependent or independent and hence it is always challenging to forecast accurately at 100% however there are means to optimize the forecast to have optimal inventory level across the supply chain. In order to reduce logistical costs and fulfill consumer demand, inventory tracking is a continuous activity. According to (Lopienski, 2021);(Singh, Sarupria, & Kushwaha, 2019a);(Singh, Singh, & Kushwaha, 2020b) the optimum product amounts that should always keep in a fulfillment center or centers should indeed be recognized as optimal inventory levels. The probability of frequent inventory problems, such as excessive storage costs and out-of-stock products, is decreased by optimizing inventory levels. If there is excessive inventory, it may be expensive to buy, it can remain on the shelf for too long, and it can eventually go bad as bad inventory acts like a waste(Singh & Kumari, November 23, 2020);(Kumari & Singh, 2022). However, having insufficient inventory might result in stock-outs and backorders, which can lower consumer satisfaction.

Here are a few things to think about when it comes to optimizing inventory levels:

i.) Every person or organization will view inventory levels differently depending on their ultimate goals.

ii.) Optimal stock levels are subject to quick changes (monthly, seasonally, and annually as you grow).

iii.) Each SKU may require a different optimal inventory level depending on demand (Singh, Singh, & Kumari, 2020).

iv.) Eventually, as more things are added, volumes increase, or the organization expands its physical reach, inventory optimization becomes more and more difficult.

To estimate the appropriate inventory levels, one needs mathematical skills and the ability to work backwards using historical order and inventory data. In order for inventory to leave the supplier in time to fulfill orders as soon as they are placed, you should also consider when to place a fresh order for it. Here are three things to consider when establishing your company's appropriate inventory levels, along with some best practices(Singh, Singh, & Kumari, 2022);(Singh J. , 2021);(Lopienski, 2021).

Inventory Management Techniques

Using some of these standard inventory management strategies may be a wonderful way to take control of your supply, regardless of the size of your company. There are multiple techniques to manage inventory such as Just-in-Time (JIT), KANBAN, Vendor Managed Inventory (VMI), Cross-docking, Consignment Inventory, Back-ordering, Bulk Shipment, Economic Order Quantity (EOQ), First-in-First-out (FIFO) & Last-in-First-out (LIFO) and so on. In this study, only three inventory management techniques were discussed as below:

JIT (Just-In-Time) Inventory: By retaining as little stock as feasible, JIT avoids the expenses and dangers associated with maintaining a significant volume of stock on hand. Companies employ this technique in an effort to keep stock levels as low as possible before to replenishment. Using a just-in-time (JIT) inventory system (Banton & Boyle, 2022), suppliers may place orders for raw materials that are directly in line with production schedules. By only ordering the things they really need for the production process, businesses may cut down on inventory expenses while increasing efficiency and reducing waste. This technique requires precise demand forecasting in order to produce. Following are important considerations to keep in mind:

- The Toyota Production System (TPS), which was created by the automaker Toyota in the 1970s, is another name for just-in-time production. JIT is frequently used in conjunction with the Kanban scheduling method to avoid work-in-progress overflow.
- The just-in-time (JIT) inventory system boosts efficiency while lowering inventor and inventory wastes as a management tactic.
- The JIT production method depends on reliable suppliers, consistent output, superior craftsmanship, and trouble-free machinery.
- The JIT manufacturing method lowers warehouse holding costs, gives manufacturers more control over the production process, and also minimizes the need for working capital.

ABC Inventory Analysis: By grouping products into several levels, this strategy seeks to find the inventory that

is profitable for you. Based on their importance to the business, inventory items are valued using the inventory management method of ABC analysis. Inventory managers categorize items according on ABC's priorities for demand, cost, and risk. This enables business executives to comprehend which offerings are most essential to the financial performance of their company (Jenkins, 2020).

Class A products are the most important stock keeping units (SKUs) in terms of sales volume or profitability, followed by Class B and Class C goods. A categorization strategy that separates products into more than just those three groups may be preferred by some firms. Table-1 has shown the ABC classes & impacts.

Table-1: ABC Classes and Their Impacts

Types	Importance	Percentage of Total Inventory	Annual Consumption Value	Controls	Records
Class A	High Value	10% - 20%	70% - 80%	Tight	High Accuracy
Class B	Medium Value	30%	15% - 20%	Medium	Good
Class C	Low Value	50%	5%	Basic	Minimal

Source: (Jenkins, 2020)

It's possible that the Pareto Principle isn't always correct. Analysis, however, reveals that valued goods do lean toward an 80/20 distribution. ABC analysis quickly and easily pinpoints the "sweet spot" where the majority of a company's revenue originates.

ABC Inventory Analysis Formula is as below:

Annual No. of Items Sold * Cost Per Item = Annual Usage Value Per Product

Inventory ABC analysis improves working capital cost management. The knowledge gathered from the research lowers outdated inventory and can increase inventory turnover rate, or how frequently a company has to buy new inventory after selling out of old stock.

Advantages of ABC Analysis

Applying ABC analysis to inventory management can provide a wide range of advantages (Jenkins, 2020), including -

- Class-A products often represent for 70% to 80% of a company's sales, therefore it makes sense to negotiate with suppliers for better terms on these products. If the provider won't agree to lower pricing, try negotiating post-purchase services, down payment discounts, free delivery, or other cost savings.
- More precise forecasting of inventory: Monitoring and collecting data on products with high customer demand can help with accurate sales forecasts. Managers may use this data to decide on inventory levels and price to increase the company's overall revenue.
- Better inventory control: The study identifies the most well-liked products. Consequently, the company may keep lower stock levels for Class B or C commodities while still having enough of those products on hand by using its limited storage space.
- Better Pricing: An increase in sales for a certain product may indicate that consumer demand is rising, allowing prices to go up while still remaining profitable.
- ABC analysis is a technique for routinely evaluating resource allocation to ensure that Class A items are in accordance with customer demand. To make better use of personnel, resources, and facilities for the new Class A offers when demand drops, reclassify the product.
- Enhanced Customer support: A few of the variables that determine service levels are the volume of sales, the price of the goods, and profit margins. Superior service standards should be offered for the products you've determined to be the most profitable.
- Optimized Supply Chain Operations: To lower carrying costs and streamline operations, perform an ABC

analysis on inventory data to evaluate whether it's time to merge suppliers or convert to a single source.

- Appropriate Inventory Turnover ratio: Maintain a reasonable inventory turnover ratio by carefully tracking your inventory and obtaining statistics.
- Decreased Holding Costs: By carrying the appropriate percentage of stock based on A, B, or C classes, you can reduce the inventory carrying costs associated with maintaining extra inventory.
- Product Life Cycle Visibility and Management: Accurate demand projections and inventory control depend on knowing where a product is in its life cycle.
- Acquisition of Costly Items: The success of a corporation is directly related to its Class-A inventory. Keep an eye on demand and keep appropriate stock levels to guarantee that there is always a sufficient supply of the costly yet essential commodities available.

Vendor Managed Inventory (VMI): It is an inventory management technique where a product's supplier, often the manufacturer, is in charge of making the most of the inventory that a distributor has on hand. A tried-and-true inventory approach called vendor managed inventory (VMI) was created to simplify order fulfillment and inventory management. By coordinating corporate goals and streamlining processes for all parties, it enhances cooperation between distributors and suppliers. (Borade, Atul, & Bansod, 2010);(Kumar, Garg, & Agarwal, 2019);(Chakraborty, Chatterjee, & Mateen, 2014);(Khalid & Lim, 2018) informed that the reason why vendor managed inventory (VMI) became so popular was because the majority of businesses expected their suppliers to handle the inventory of raw materials, parts, and components and to provide what is needed as needed within a few hours or days. In addition to manufacturers, it also supports suppliers' expansion. It is divisive worldwide, even in emerging markets. "The report found that both large and small enterprises in India have begun utilizing VMI for enhancing their company performance, but the rates and the adoption determinants are different in large and small sectors, but there is a wide disparity on acceptance," the study stated. (Chandra, Srivastava, & Agarwal, 2013) Told that, in order to reduce supply chain costs and maximize additional revenue from optional cargoes using the same fleet of ships, it is advisable to integrate the maritime transportation planning of internally managed cargoes with the inventory management at the loading and discharging ports. Since replenishment frequencies are crucial to integrated inventory models' efforts to lower supply chains' overall costs, several research have failed to mathematically describe this cost. By altering the demand and supply gaps, a third-party logistics provider may also be used to guarantee that the buyer has the necessary amount of inventory (Sadeghi, Mousavi, & Niaki, 2016);(TrueCommerce, 2016).

Forecasts of customer and supplier demand are integrated with data from the point of sale by VMI systems. They also take into account previously set norms, such as service objectives, inventory turn goals, and min. & max. shelf presence. (TrueCommerce, 2016).

The following details describe how it operates:

- The data is analyzed by the VMI platform, which then suggests an inventory replenishment plan based on key parameters and predetermined goals.
- The VMI system receives data from a distribution partner in the form of the inventory information. This report contains details on goods movements, sales, and live inventory status across the supply pipeline.
- The recommendations are examined and approved by the provider.
- The supplier receives a purchase order in EDI format from the vendor controlled inventory platform, and the distribution partner receives an acknowledgement of the order.
- The order will be dispatched to the selected address as soon as the partner accepts the PO.

How SCM is Associated with Inventory Management & Other Logistical Activities?

The right data is made accessible for the right prediction, at the right resources, to manufacture the right product, in the right amount, in the right condition, and that it is delivered to the right place, at the right time, and at the right cost

thanks to efficient and effective supply chain management (Singh J. , Sarupria, Kushwaha, & Kumari, 2019). The goal of the research was to highlight the need of effective inventory management techniques for identifying and minimizing interruptions in the Indian car industry (Mentzer, et al., 2001); (Kottala & Herbert, 2019). (Singh, Singh, & Kumari, 2020);(Singh D. J., Singh, Kumari, & Vyas, 2022);(Singh, Singh, & Kumari, 2022);(Singh J. , 2021) described a supply chain as "a group of three or more entities (organizations or persons) intimately participating in the upstream and downstream flows of products, services, funds, and/or information from source to customer." contrasted with many other authors (Chopra, Meindl, & Kalra, 2016); (Christopher & Ryals, 1999);(Lee, 2002);(Gunasekaran, Patel, & Tittiroglu, 2001);(Lambert, Cooper, & Pagh, 1998);(McCormack & Lockamy, 2004) who described SCM as "the systematic and strategic coordination of traditional business processes and procedures amongst various business divisions inside a specific firm and across firms within a supply chain, with the purpose of improving the long-term performance of the supply chain" The performance of every organization may be improved by management methods, according to a survey of the literature on supply chain management. The SCM was created to unify and coordinate operations across the whole supply chain. The two knowledge bases of logistics and transportation management and supplier and procurement management were the main sources of the SCM concept. In terms of supplier and purchase management, SCM was equated with supply base optimization, supplier integration into new product design & development, and manufacturing processes (Krause, 1997). (Levary, 2000) Lowering inventory levels, reducing the bullwhip effect, cutting cycle times, boosting efficiency and effectiveness, and updating and enhancing quality on an acceptable level and beyond throughout supply chains are all advantages of supply chain integration. (Li, Rao, Ragu-Nathan, & Ragu-Nathan, 2005); (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006);(Thatte, 2007)SCM practices are outlined in terms of contacts with customers, working relationships with suppliers, and information sharing at all levels.

Literature Review

Many researchers have also supported and conferred the inventory management practices and their impacts on supply chain management performance. Accordingto (Atnafu, Balda, & Liu, 2018); (Khalid & Lim, 2018) Inventory management is critical to an organization's success in today's competitive and dynamic market (Mochama & Muturi, 2019). SCM has been largely focused on three major issues. First is the behavior of information sharing, second issue pacts with inventory management, and the third issue is sloping towards operations management (Meng, 2006). As Inventory is the integral part of supply chain and hence actual position of inventory on the ground must be proper & optimal level and optimal inventory control is one of the significant tasks in supply chain management (Singh & Kumar, 2011). Improper or excess inventory may lead to collapse the organization in no demand situation due to any unforeseen event. Hence, inventory management (Williams & Tokar, 2008) is critical to the supply chains and much more attention in SCM has been dedicated to inventory (Zemzam, Maataoui, Hlyal, Alami, & Alami, 2017). The logistics expenses of a supply chain, according to (Voordijk, 2010), include those associated with inventory management and storage, transportation, and physical distribution. Logistics are regarded as an important channel for customer satisfaction, cost-effectiveness, and optimal resource utilization in an organization (Mangla, Luthra, Jakhar, Tyagi, & Narkhede, 2017). Additionally, having a set of effective tools to decrease expenses and waste, deliver an effective service for client demand, and analyse system behavior is advantageous for businesses(Carvalho, Govindan, Azevedo, & Cruz-Machado, 2017);(Singh & Pandey, 2019). The cost of logistics is the result of a process that starts with the supply of raw materials and concludes with the delivery of the product(s) to the customer, and it includes the primary logistical operations of supply, physical conversion, and distribution (Rybakov, 2017). According to (Havenga, 2010), logistics costs only include transportation, storage management, and administration. Logistics costs are explicitly covered by acquisition, transportation, delivery, purchase, volume, and packaging

costs, according to (Weiyi & Luming, 2009), while implicit costs are covered by inventory maintenance, opportunity, interests, service goods, and the additional cost of logistics services for an incorrect logistics operation. (Jena & Seth, 2016) Divided costs into controllable (performance efficiency, transportation planning, demand prediction effectiveness, and intra-organizational information exchange) and non-controllable elements such as oil prices. It's crucial to realize that a company's process structure also defines its cost structure; this cost structure defines a collection of cost elements in an optimization model (Ilin & Anisiforov, 2014).

A critical aspect of distribution systems is represented by the warehouse operations carried out at the various material-handling nodes (Faber, De, M.B.M., & Smidts, 2013); Warehouse operations are now increasingly regarded as a strategic component of supply chains (Hubner, Holzapfel, & Kuhn, 2016), and the topic of warehousing is attracting increased attention (Kembro, Danielsson, & Smajli, 2017). There are several authors (De Koster, Le-Duc, & Roodbergen, 2007) ; (Gu, Goetschalckx, & McGinnis, Research on warehouse operation: a comprehensive review, 2007); (Gu, Goetschalckx, & McGinnis, Research on warehouse design and performance evaluation: a comprehensive review, 2010) did literature reviews on the topic of warehouse operations and design. According to (Bartholdi & Hackman, 2016) Warehouses are "the places in the supply chain where inventory pauses, however fleetingly, and gets touched," according to one definition. One justification for having a warehouse is to balance supply and demand, consolidate a variety of items, and cut down on lead times and transportation expenses (Faber, De, M.B.M., & Smidts, 2013). According to (Berg & Zijm, 1999); (Petersen & Aase, 2004); (Kaur & Batra, 2020); (Sivakumar & Ruthramathi, 2019) warehouses have operations for receiving, put-away, storage, picking, sorting, packing and shipping. Along with increased e-commerce, many distribution warehouses also have extensive return operations (Bernon, Cullen, & Gorst, 2016). A company may have an edge over competitors if they can receive, store, do cycle counts, stock-takes, dispatch, rename racks accurately and in the proper position, utilize scanners quickly, and have a productive culture (Mabotja, Mulongo, & Kholopane, 2018).

Transportation is not only a means of travel but is also a means of business growth and transportation is being one of the attributes of inventory management practices impacts SCM performance (Mei, Messiah, & Afli, 2017). Transportation is integral part to economic growth & human settlement. Transportation optimization practice is used for the purpose of reducing transportation costs by defining the best route (Cigolini, Cozzi, & Perona, 2004). Transportation costs in India have risen in recent years as a result of increases in the price of diesel and gasoline. It has an impact on practically all vital products and services, hence it must be regulated. One of the key causes is the sharp increase in the price of gasoline and diesel.

Distribution management (Rexhausen, Pibernik, & Kaiser, 2012) activities of the supply chain that take place between production sites and end users. This is an ever-growing field of significant economic and scientific importance (Crainic & Laporte, 2016). Distribution management is a demand management tool which integrates supply to demand.

(Chen, Daugherty, & Landry, 2009); (Robertson, 2006) argued that a firm's strategic priorities are key factors of supply chain process integration. Process control is also one of the concerns in growing competitive needs such as cost, quality, flexibility& on-time delivery (Prajogo & Olhager, ANZAM-2009). (Bennett & Klug, 2012) Studied logistics supplier integration models in theory and practice in automobile industry and main conditions are geographical closeness, investment & asset type – shared or owned delivery contents, volume and sequence, information sharing and IT related integration, and transport system. Though all of the five conditions were measured relevant for the description of existing logistics process integration.(Gligor & Holcomb, 2014) Found that integration of logistics capabilities impacts operational performance which results as increased SCM performance and it has potential to lower the overall firm's cost. Multiple levels of supply chain integration have an impact on supply chain performance. Supply chain integration is important from a strategic and operational standpoint. (Mentzer, et al.,

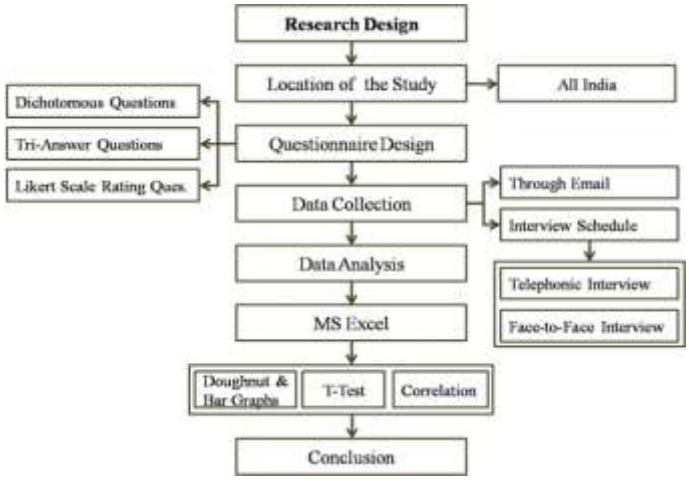
2001) Scholars have defined supply chain management in a variety of ways, with the majority of them involving integration (Pagell, 2004). Integration is essential to the concept of SCM (Munir, Jajja, Chatha, & Farooq, 2020). The performance of operations and SCM largely depends on collaboration and integration with inventory function as well (Yuen, Wang, Ma, Lee, & Li, 2019).

A supply chain is gradually integrated, with the highest returns on investment being prioritized. Different priorities and methodologies may be ascribed to the supply chains of different divisions of an organization based on plans, demands, and possible returns. Internal integration, for example, has been found in certain studies to have a greater impact on operational success than external integration (Flynn, Huo, & Zhao, The impact of supply chain integration on performance: A contingency and configuration approach, 2010);(Li N. , 2015). Supply chain integration (SCI) has become increasingly important for long-term organisational success. Supply chain members communicate and work together to improve performance, resulting in increased profitability while satisfying customer demand (Kumar, Chibuzo, Garza-Reyes, Kumari, Rocha-Lona, & Lopez-Torres, 2017). SCI stands for strategic collaboration between manufacturers and their supply chain partners to maximize the use of internal and external resources and capabilities throughout the supply chain (Flynn, Huo, & Zhao, The impact of supply chain integration on performance: A contingency and configuration approach, 2010). It has had a major positive influence on the operational and financial performance of the company (Mohammadi, Darzian-Azizi, Fakher, & Kafi-Kang, 2014). SCI can have a direct and indirect impact on a company's performance. Directly, higher performance is a result of close coordination between enterprises in the supply chain (Kim, 2009);(Flynn, Koufteros, & Lu, 2016); (Kumar, Chibuzo, Garza-Reyes, Kumari, Rocha-Lona, & Lopez-Torres, 2017). (Childerhouse, Hermiz, mason-jones, Popp, & Towill, 2013) Explained that Information sharing & IT management helps in improving the supply chain performance. One of the key strategies to improve the performance of the supply chain has been identified as information exchange. It enables businesses to more effectively coordinate their efforts with their supply chain partners, which improves performance. Many authors such as (Baihaqi & Sohal, 2013); (Charan, 2012); (Hall & Saygin, 2011); (Kumar & Pugazhendhi, 2012) have explained about supply chain performance.

Research Methodology

Research Design: The brief research design is shown in the Figure-2 as below:

In this research, inventory management practices in auto sector in India were a descriptive cum analytical research. It needs a comprehensible specification of who (auto companies in India), what (inventory management practices), when (2016-2020), why (found gaps) and way (survey- questionnaire, F2F Interview, through email) of the research.



Location of the Study

Based on an analysis of Wikipedia data, the study's location was chosen. The study was carried out for the Indian auto sector companies.

Data Collection

Data Collection Methods

The data was gathered using a well-designed, closed-ended questionnaire that asked about adoption and agreement continuum using a likert scale from 1 to 5, with 5 being the strongest agreement and 1 being the strongest disagreement, respectively. In addition, information about

the attitudes of experts in the automotive sector regarding third party logistics (3PL) service providers was gathered using dichotomous questions.

Sampling Technique

For this investigation, random convenience sampling was used.

Data Collection

Wikipedia stated that there were four main clusters of the car industry, with a total of 137 manufacturing units throughout all clusters. Out of 137 responders, 103 were persuaded after much work and the use of interpersonal connections, and they shared the knowledge privately. Out of 103 replies, 90 were usable responses as shown in Table-1. Response rates are also calculated which is also very good as shown in Table-2.

Table-1

Companies	Numbers
Targeted Companies	137
Obtained Responses	103
Usable Responses	90

Table-2

Responses	Rate in %
Target vs. Obtained Response Rate	75.18
Target vs. Usable Response Rate	65.69
Target vs. Usable Response Rate	87.38

The primary data were collected through telephone & in-person interviews and through email communications via a well-designed questionnaire. The scope of the investigation included automobile plants that produce two-wheeled vehicles, three-wheeled vehicles, four-wheeled vehicles including heavy passenger and commercial & construction vehicles.

Data Analysis of Responses:

The data were analyzed using MS Excel 2010. The analysis was done to check the inventory management practices on SCM performance.

Results Discussion

Any decision-making process absolutely requires the analysis portion of any data collection, and the analysis's ultimate purpose is to arrive at the conclusion. The technical report's main section is the results discussion. This chapter's goal is to compile the data that has been gathered using statistical techniques. In addition, present the study results graphically, in a table, or in any other appropriate manner. The present study was carried out to analyze the gaps in expectations (agreement) and perception (adoption) in inventory management practices and how does this impact the SCM performance. Inventory management practices have taken six variables namely Application of VMI, Application of JIT, Application of FSN Analysis, Application of ABC Classification, and Proper Planning & Inventory Control. These all variables are directly related to supply chain management performance. The findings are presented under the following headings:

Analysis

Dichotomous Questions With Respect To Inventory Management Practices

Do you agree that 3rd Party Logistics Service Providers (LSPs) are more flexible in comparison to 10Years back?

Figure-3

According to Figure-3, Professionals, who make up 81% of the population, think that 3PL-LSP is more flexible now than it was 10 years ago. The maturation of 3PL-LSPs and the altering viewpoint of manufacturing and trading businesses, who want to concentrate on their core capabilities, are the causes of this (Singh, Singh, & Kumari, 2022).

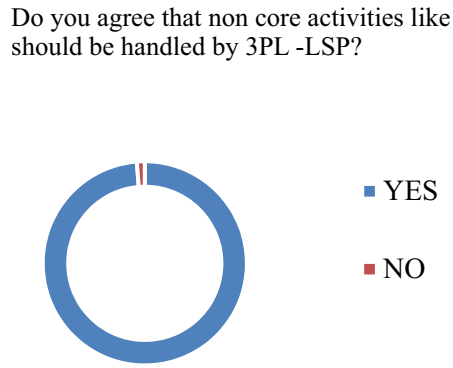


Figure-4

As per Figure-4, In a study, (Singh, Singh, & Kumari, 2022) highlighted that majority of specialists in the automotive business concur that experts (3PL-LSP) should handle their logistics activities. Furthermore, (Arif & Jawab, 2018) mentioned that outsourcing logistics functions plays a crucial part in enhancing their effectiveness and efficiency and has a positive influence on the delivery of services linked to logistics. Outsourcing was once thought of as a tool for cost-cutting, but it has now evolved into a strategic tool for value creation. (Kakabadse & Kakabadse, 2003). Additionally, outsourcing adds flexibility to the system and safeguards against unanticipated changes in demand (Ahimbisibwe, Nangoli, & Tusiime, 2012).

Analysis of Try Answer Questions with respect to Inventory Management Practices

Please refer Figure-5, Most of the respondents (83%) agreed that inventory is the key assets and it should be managed through 3rd party experts as 64% respondents said. Majority (94%) respondents from automobile industry told that JIT is good inventory management practice. As per review of literature, ABC classification is one of the good tools in inventory management & controls however about 34% respondent uses some other techniques instead of ABC classification.

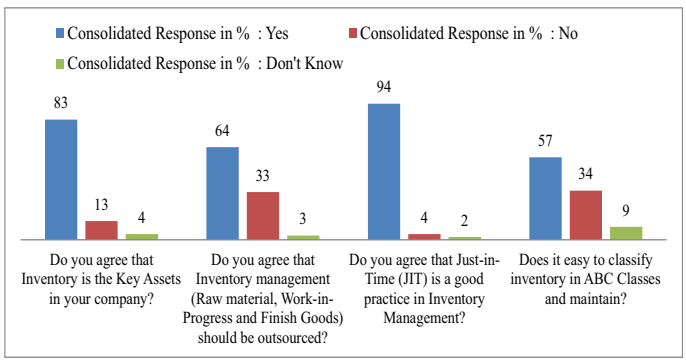


Figure-5: Responses to Try Answer Questions

Please consult Figure-6, proper planning and collaboration with suppliers could reduce the bullwhip effect and improper inventory as agreed by 63% respondents however, most of the industry professionals (92%) use inventory management practices. Shocking news is that majority (73%) of the inventory management professional did not impart proper education on the subject and also most of the professional in automobile industry do not use FSN analysis in inventory management. Vendor managed inventory (VMI) technique is popular among the automakers as per the analysed data.

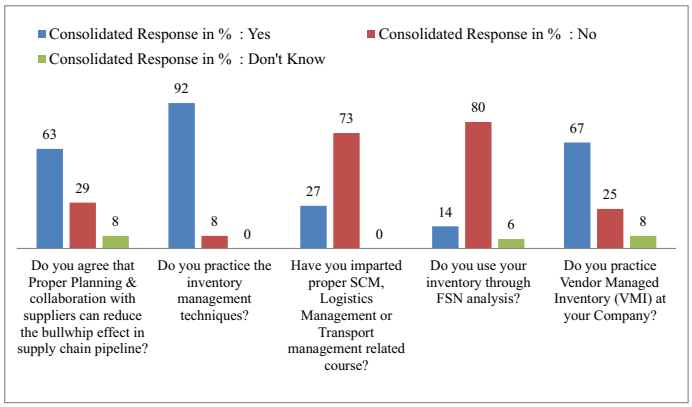


Figure-6: Responses to Try Answer Questions

Research Model

The research model in the Figure-7 shows the relationship of inventory management Practices and Supply Chain Management performance. This model was statistically test

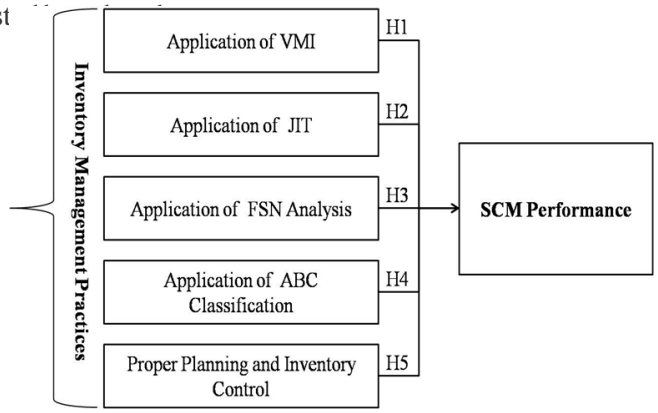


Figure-7: Model of Inventory management practices on SCM Performance

correlation.The variables taken as inventory management practices are applications of VMI, applications of jit, applications of FSN Analysis, applications of ABC Classification, and proper planning and inventory control as it was found that these practices directly impacts SCM performance.

Testing of Hypothesis

Proposed Research Hypotheses of the research is shown in Table-3 as below. The alternate hypothesis would be just opposite of the null hypothesis.

Table- 3: Proposed Research Hypotheses of the Study

Null Hypothesis (H_0a): There is no impact of Application of VMI on SCM performance.
Null Hypothesis (H_0b): There is no impact of Application of JIT on SCM performance.
Null Hypothesis (H_0c): There is no impact of Application of FSN Analysis on SCM performance.
Null Hypothesis (H_0d): There is no impact of Application of ABC Classification on SCM performance.
Null Hypothesis (H_0e): There is no impact of Proper Planning and Inventory Control on SCM performance.

Data Analysis – Reliability, T-Test, Correlation and Regression

Reliability Test

The final calculated value of Cronbach's alpha (α) is 0.962, which is more than 0.9, i.e., the reliability or internal consistency of data is excellent as per table-2. Hence, the data collected was consistent for further analysis.

T-Test

The P value is as low as it goes beyond 4 decimal points and hence it has shown 0.0000 in all cases in the table-4 as below.

Table-4:Results of t-test: This table shows the final results of t-test based on hypothesis

Predictor (Ind. Variable)	p - Value	Significance Level (0.01)	Null Hypothesis (Accepted or Rejected)	Final Results and conclusion of Hypothesis
Application of VMI	0.0000	0.01	Rejected H_0a	Alternate Hypothesis (H_1a) accepted which says that there is impact of Application of VMI on SCM performance.
Application of JIT	0.0000	0.01	Rejected H_0b	Alternate Hypothesis (H_1b) accepted which says that there is impact of Application of JIT on SCM performance.
Application of FSN Analysis	0.0008	0.01	Rejected H_0c	Alternate Hypothesis (H_1c) accepted which says that there is impact of Application of FSN Analysis on SCM performance.
Application of ABC Classification	0.0002	0.01	Rejected H_0d	Alternate Hypothesis (H_1d) accepted which says that there is impact of Application of ABC Classification on SCM performance.
Proper Planning and Inventory Control	0.0000	0.01	Rejected H_0e	Alternate Hypothesis (H_1e) accepted which says that there is impact of Proper Planning and Inventory Control on SCM performance.
Decision at 95% and 99% - level of significance, p value < 0.05, and/or p value < 0.01, then, Reject the null hypothesis (H0) and accept the alternate hypothesis (H1)				

As per the final results shown in table-4, the alternate hypotheses (H1a, H1b, H1c, H1d, H1e) were accepted in all cases of inventory management methods while the null hypotheses (H0a, H0b, H0c, H0d, H0e) were rejected, demonstrating the close relationship between the population and the sample. In other words, there is a positive association between the effectiveness of supply chain management and inventory management practices.

Table-5: Correlation Results as per Research Model

CORRELATION OF VARIOUS INVENTORY MANAGEMENT PRACTICES ON SCM PERFORMANCE	
Correlation of Application of VMI on SCM Performance	0.77
Correlation of Application of JIT on SCM Performance	0.83
Correlation of Application of FSN Analysis on SCM Performance	0.54
Correlation of Distribution Management (DM) on SCM Performance	0.73
Correlation of Process Integration (PI) on SCM Performance	0.91

Table-5 shows that there is a high (strong) correlation between inventory management practices and supply chain management Performance.

According to the outcome, any changes to the input variables will result in a change in the output. The performance of the supply chain would be excellent if all inventory management techniques were applied correctly and optimized. Now that the connection is highly positive, the model concludes that utilizing inventory management practices improves SCM performance.

Conclusion

There is a huge potential and scope of inventory and its management in supply chain management. An inventory management practices help to reduce inventory holding cost, ensures perfect order fulfillment, improves inventory accuracy, improves logistics specially warehouse productivity, improve the profitability, advances the planning, and improves customer satisfaction of any company. It also ensures the optimal material/products availability, minimized losses, reduces space required which results in reduced inventory storage cost, and optimized sales. The following conclusions may be drawn from t-test, and correlation analysis:

- The final t-test results show that all five variables of inventory management practices accepted the alternative hypothesis, showing that inventory management practices were closely related to SCM performance. If any input variable changes, the result is probably going to change.
- The correlation between supply chain management performance and inventory management practices is quite strong across all five variables. Thus, it can be stated that changes in the input parameters would have an impact on the outcomes and that the methods employed for inventory management determine how effective SCM is. The SCM would function properly if all inventory management techniques were applied and correctly optimized.

According to the research, inventory management techniques are directly related to SCM performance and have a significant and positive link with it. The results have demonstrated the model's accuracy. Additionally, it means that inventory control is crucial to the efficiency of the supply chain in the automotive industry. The same results can be applied to other manufacturing industries because inventory management practices are essentially the same as those of other manufacturing organizations. The research amply demonstrated that inventory management solutions have a major impact on supply chain management effectiveness. Whether it be inventory of raw materials, works-in-progress, or finished goods, it should be at a desirable level. Any warehouse operations must be closely monitored, and all waste—both material and procedural—must be eliminated. It is necessary to have the best possible distribution and conveyance. Real-time system and process integrations must be ensured. Information sharing is essential for supply chain operations. Improved inventory management practices, per a study, result in greater SCM performance, which is essential for any company's success because it increases overall customer satisfaction and profitability.

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