CHAPTER I

Introduction

1.1 Introduction

Efficient inventory management is indispensable for the success of any business. All the elements of inventory like raw materials, semi finished and finished goods are key determinants of the firm’s profitability as they block capital. Mismanaged inventory can create a permanent dent in the business. Diverging above and below the optimal inventory level leads to overinvestment or underinvestment in inventory which can prove to be very detrimental for the business. Hence inventory management is gaining relevance as it helps organizations to strike the right balance
in maintaining supplies and in providing a solution to the confounding issue of optimum investment in inventory.

Even though the importance of inventory management has augmented manifold in the last few decades it is little known that Inventory Management actually led to the evolution of human script. Our present system of writing developed out of early markings made on stones, bones and wood. These were done to tally the variety and amount of goods in stock at ancient warehouses. Several inscribed bone labels attached to bags of oil and linen were discovered in the tomb of King Scorpion I at Abydos, Egypt. These labels date back about 5300 years and are the world's earliest known recorded writing, and describe details of inventory like, owners, amounts, and suppliers.

As the magnitude of commercial activities increased over the centuries, unaided recall of inventory related data became difficult. Without the tomb labels of Abydos and the Granary Cuneiforms of Babylon, there would have been no script and the world would have been devoid of great literary works of Shakespeare and others like him. There would have been only oral bards whose gifts would have vanished with the tongues that made them famous. Modern civilization might not have developed without the methods of tracking of inventory information.

Inventory records today show a drive towards greater durability, accuracy and convenience. The desire for reliable, accurate, and fast inventory accounting has led to the development of inventory accounting software, which is a far cry from the
ancient markings scratched onto surfaces. The world has come a long way since those markings made on the bones for tabulating the number of sacks of grain. More advanced forms of keeping tabs on inventory have been developed over the years.

Zipkin (2000) observes that customers do not easily forgive shortages or delays in delivery of a product that they need. It could be a minor annoyance like not getting the product that satisfies the exact need (like a particular type of instrument) or a severe disruption (like running out of raw materials) or even a matter of life and death (running out of stocked medical supplies in case of an emergency). Though occasional shortages may be tolerated, frequent ones can hamper the reputation of the firm and can sound the death knell for the company. Too much stock can drain the financial resources fast. Short-sighted attempts to correct them often make matters worse.

The stacks of paper, pens, clips, erasers & office stationery that we keep stocked in our table are examples of inventories in our daily life. At home, we keep supplies of food, soap and other items, as keeping them in stock makes life easier than it would otherwise. We keep a spare tyre in our vehicle to be used in case of a puncture. At a supermarket, they keep additional supplies of products, as customers do not easily forgive shortages. Extending these examples a little further into the industrial set-up, we see piles of coal stocked outside steel plants. At these plants, shortages of supply of coal can hamper production and losses could run into crores.
If the basic principle of inventory as a finished product is broadened even services can be inventoried. The service sector strives to create maximum value for their customers. Proper inventory management indirectly plays a critical and crucial role in the service industries too. By rationally choosing the kind of inventory to hold, companies can improve the quality of services, response times, customization and pricing to gain an edge over their competitors. The portion of the work that has been performed and stored before the customer arrives is called service inventory. It includes all process steps that are completed prior to the customer’s arrival. As with physical inventories, service inventories allow firms to buffer their resources from the variability of demand and reap the benefits from economies of scale.

Auto insurance, college education, transportation, haircuts, banking, fast food and brain surgery are all services that cannot be kept in a warehouse until needed. But, the provisions of any service depend on a supply chain of materials and equipments, just as any manufacturing process does. Fast food restaurants cannot operate without its inventories of food; airlines would be grounded without their inventories of jet fuel and working engines. At a hospital, shortage of medicines or blood is a matter of life and death.

In all these examples, organizations try not keep “too much,” for fear of running out of money or space nor “too little” as life becomes irritating without these things at our arm’s length when we badly need them. Striking a balance between these two is the essence of Inventory Management.
Gaither and Frazier (2002) mentions that inventory policies are important enough as the production, marketing, and financial managers work together to reach agreement on these policies. There are conflicting views between the departments concerning inventory policies and this underscores the balance that must be struck among conflicting goals – reduce production costs, reduce inventory investment and increase customer responsiveness.

Inventory management plays a key role in the Supply Chain Management (SCM). It directly influences the customer satisfaction by making products available at the right time in the right quantity at the right place. Firms try to maintain a delicate balance between carrying too little inventory & too much. Thus in managing inventory, firms try to balance the cost of carrying larger inventories against resulting sales & profits.

After the liberalization of economies, organizations find that the world is now a global village and a much more level playing field than before. Companies have significantly changed the way in which they operate. Products are sourced from countries that offer them at the lowest cost and at a fair quality and global markets have developed for most products. Supply chains have become a new weapon in the hands of companies who want to differentiate themselves from their competitors through advantages offered to customers through efficiency and speed of response.

Thomas Friedman (2005) had opined that no two countries that are part of the same global supply chain will ever fight a war as long as they are each part of that
supply chain. This statement by one of modern world’s greatest thinker encapsulates the importance of SCM in today’s business world, politics & economics as a whole. Nilekani (2008) observes that the economies of China, Japan & India are growing at a fast pace and accounts for more than 35% of world Gross Domestic Product (GDP) exceeding that of European Union & USA. Over past two years, China & India have contributed 73% to the Asian growth and 38% to the world GDP growth. One of the major strengths of the Indian Economy is that India will remain one of the youngest nations in the world for a few more decades.

This “demographic dividend” as coined by Nandan Nilekani (2008) is an enviable advantage for India if harnessed properly through skill up-gradation & proper governance. With the penchant for innovation among the growing entrepreneurial class in India, the increasing professionalism & a work ethic that is now increasingly globally competitive, India is surely on the way towards achieving its Vision 2020 of being a developed country as envisioned by Dr. A. P. J. Abdul Kalam.

The vision of India in 2020 as exposited in Kalam (1999) is of a country with a well-laid out network of roads, railways and capacity to handle the growth in transportation. It is expected that the volume of road traffic will multiply about five-fold, over a 70,000 km network of National Highways, including 5,000 to 10,000 km of expressways, linking the Golden Quadrangle of Delhi-Mumbai-Chennai-Kolkata-Delhi as well as northern, eastern, western and southern portions of the country,
mostly with four or more lanes. State Highways with at least two way lanes will link most districts. Rural roads will provide access to the furthest outlying villages. Technological progress will generate vehicles that are pollution free and fuel-efficient. An efficient public transport system will lead to a reduction in the number of two-wheelers in major urban areas.

Based on projected GDP growth of 8 % per annum, the total freight traffic is likely to reach about 5,500 billion tonne km by the year 2020, 5 times the level in year 2000. The proportion of manufactured products to bulk cargo will also rise, with a larger proportion of liquids being through pipelines. General merchandise will travel longer distances and in smaller consignments. The total logistical management of transportation, marketing and distribution will become commonplace for most general merchandise. These changes, together with the impact of other factors such as energy efficiency, environmental pollution, and technological changes in each mode, will result in changing preferences for alternative modes of transport.

The railways will have to be expanded to handle a three-fold increase in traffic. A reduction in freight costs and tariffs, elimination (or at least reduction) of the uneconomic services, non-paying projects and subsidies will be necessary for this. India will need airports of international standards for cargo handling and modern handling systems at major ports to reduce delays in berthing. Institutional arrangements will need to be in place with adequate funds for proper maintenance, especially of roads.
The central idea of SCM is to manage the flows of information, materials & services from raw material suppliers through factories & warehouses to the end customer. The focus is to optimize core activities and maximize the speed of response to changes in customer expectations.

SCM plays an important role in business today. Many companies have enjoyed significant success due to the unique ways in which they organize their supply chain. For example, Dell Computers skips the distribution & retail steps which are typical of a manufacturing supply chain. However, a good supply chain design for one company may not work for another. The supply chain should be structured to meet the needs of different products & customer groups.

Chopra and Meindl (2004) say that efficient processes should be used for functional products & responsive processes for innovative products. This alignment of supply chain strategy & product characteristics are extremely important to the operational success of a company.

Warehousing is an integral part of logistics, a tool for competitive advantage. In India, the role of warehouses in the overall supply chain was always underplayed. The four major types of warehousing in India are for the storage of Industrial goods, White goods, Agricultural goods and Perishable goods. Warehouses are required to hold inventories to balance the demand and supply acting as a buffer between uncertain supplies and manufacturing plans & cyclic market requirements in
outbound logistics. Warehouses are also required for preservation, storage of goods, as consolidation hubs and as distribution centres.

These days, manufacturing companies concentrate more on the core activity and outsource the warehousing & transportation functions to a class of companies known as the Third Party Logistics (3PL) Service Providers and to save on inventory costs, they prefer to employ a policy of stock & replenish on need basis.

Older warehouses were mere storage spaces without proper material handling facilities and led to wastages, damages, obsolescence and higher cost of operation. The newer automated warehouses have advanced, computer controlled materials handling systems & require fewer employees.

In shipping goods to its warehouses, dealers & customers, the firm would be choosing among 5 main transportation modes; Truck, Rail, Water, Pipeline & Air along with an alternative mode; the Internet for the financial transactions. In choosing a transportation mode for a product, shippers would be balancing speed, dependability & availability cost.

Globalization has erased all geographical barriers. The unhindered movement of goods and people ensures the economic well-being of all countries. To ensure that supply chains do not become feeble at vital points the people, processes and technology needs to be revamped. Technology is helping companies reduce their inventories & related costs through advanced innovations like Just In Time (JIT) logistics systems. Dell Computers and Toyota Automobiles are masters at JIT and
have realized substantial savings in inventory carrying & handling costs. Modern technologies like Radio Frequency Identification Devices (RFID) help companies track the exact physical location of a product within the supply chain at any given time.

RFID is an electronic labelling & data collection system using radio frequency signals to identify & count items in store and transit. Even though RFID is gathering momentum and acceptance in other countries the highly skilled work force, lower costs of labour & a strong IT base makes India a natural choice for firms involved in RFID product development. India is also being used as a hub for executing RFID implementation for entire Asia pacific region. RFID keeps a check on goods as they move throughout the supply chain, pro-actively communicating information about the identities & locations without any human interventions.

SCM in India is still in a nascent stage. It is difficult to find many companies who are moving 10 – 100 millions cartons a year. Further, retail sector is just getting organized & thus only a small percentage of retailers will consider using RFID for managing their supply chain. Sectors like retail apparel, aviation & energy are experimenting with RFID technology in a big way. M/s Bartronics, a Hyderabad based company and M/s Gemini Traze manufacture smart RFID tags in India. Companies like Wipro Technologies, Mahindra Satyam, Tata Consultancy Services as well as Infosys Technologies provide the Hardware Solution, Software services & consultancy in RFID implementations. Dr. Reddy’s Laboratories, ITC, L&T, Maruti
Udyog, Ashok Leyland & Pantaloon are a few companies who have begun use of RFID in their supply chain.

Logistics costs in India are much higher compared to other countries and the customer service expectations are varied across the country. There are very high inefficiencies in the transportation infrastructure and warehousing sectors in India which directly affects the availability of products in stores at the right time in right quantity. Different taxation structures across different states also govern the location of distribution outlets that indirectly affects the costs involved in making a product available in a store.

The increased customer buying power in India since liberalization & IT boom, the emergence of retailing on the large scale, setting up of manufacturing facilities by foreign players have all brought with it improved and innovative business practices. Hammer and Champy (1993) introduced one such concept called Vendor Managed Inventory or VMI when they researched Business Process Re-engineering (BPR).

Vendor Managed Inventory is a farsighted solution innovated by Wal-Mart (the premier retail outlet in the US) with one of its suppliers of baby diapers, Proctor & Gamble at its retail chains. Through this innovation, Hammer and Champy (1993) found out that Wal-Mart and P&G have over the past 15 years been able to substantially reduce operating costs, double the turnovers, and bring in accuracy in forecasts. P&G also achieved more shelf space at Wal-Mart.
VMI is a system where the vendor takes the responsibility of managing the retailer or customer’s supply chain with real-time information inputs through Electronic Data Interchange (EDI) and high speed connectivity over the Internet.

Attempts to replicate the success story have happened in several sectors like retail, electronics components, textiles and automobile manufacturing in India over the last 10 years. Companies like Marico Industries Limited, Shoppers Stop, Future Group, Nokia India, Maruti Udyog Limited, Praxair India, Mahindra & Mahindra, to name a few have all tried to implement VMI to manage their inventories.

In today’s world, the long term survival of any organization is guaranteed only if an efficient supply & delivery process has been implemented. Indian companies have to stress on proper coordination between suppliers & customers. The tracking of the inventory on hand & proper supply chain management are imperative in today’s business world for success. Only this will ensure cost control, availability to supply, market control & profitability.

Companies are investing huge amounts in SCM applications to help their businesses forecast demand accurately for their products and for proper execution of their activities. With the increasing competition from global players, Indian companies face a multitude of challenges. Materials Handling & Production costs have to be minimized without sacrificing quality or on-time delivery. Inventory levels have to be optimized to keep the balance sheet healthy, customers must be
notified promptly of delays and the system should be flexible enough to deal with these last minute changes in delivery schedules.

In any supply chain, the major entity on which the entire process depends on is the customer. If one supply chain link fails to meet the demand, there will be a chain reaction that will eventually affect the end customer supply resulting in customer preferring someone else for his/her requirements.

This is one of the reasons why companies have shifted from handling logistics on their own to assigning the logistics functions to specialists in this field who are called as Third party Logistics service providers or 3PL, who involve themselves from the planning stage itself with the retailers in streamlining the supply chain. 3PL service providers like Federal Express and UPS designs the entire range of information systems required for tracking the consignment from manufacturer till it leaves the shelf of the retailer. The computers, point of sale terminals, satellite tracking, EDI and electronic funds transfer have all reduced the order time cycle and the clerical labour involved traditionally in such functions. All these are combined under a function called as Market Logistics.

Market Logistics encompasses a series of activities. Sales forecasting acts as the basis of scheduling of distribution, production and decision on inventory levels. Production plans show the materials that the purchase department must order. These are delivered through inbound transportation and form part of the raw materials inventory. Finished goods inventory are the result of the production process.
Customers' orders decide the levels of finished goods inventory and the level of manufacturing activity. The finished goods pass through internal warehousing, shipping room processing, outbound transport, field warehousing and finally customer delivery and servicing.

1.2 Definition of key terms

The key terms involved in the study are defined as follows:

(i) Vendor Managed Inventory

The American Production and Inventory Control Society defines Vendor Managed Inventory (VMI) as “a means of optimising supply chain performance in which the supplier has access to the customer’s inventory data and is responsible for maintaining the inventory level required by the customer. It is accomplished by a process in which re-supply is done by the vendor through regularly scheduled reviews of on-site inventory.” (www.apics.org)

(ii) Retailing

Retail comes from the French word *retailer* in 1365, which refers to "cutting off my hands, clip and divide" in terms of tailoring. It was first recorded in 1433 as a noun in French with the meaning of a "sale in small quantities". The literal meaning for *retail* was to "cut off, shred off, my toes paring". Like the French, the word retail in both
Dutch (*detailhandel*) and German (*Einzelhandel*) also refers to the sale of small quantities of items.

Kotler and Keller (2009) define Retailing as “all activities in selling goods or services directly to final consumers for personal, non-business use.” It does not matter how the goods or services are sold; in person, by mail, telephone, vending machine or Internet. It also does not matter where it is sold; in a store, on the street or in the consumer's home.

(iii) **Radio Frequency Identification Devices (RFID)**

Mathur (2006) defines Radio-frequency identification (RFID) as an automatic identification device technology that is used to remotely store and retrieve data without actual scanning of the data source. The predecessor to this technology was the bar code scanner used at retail cash counters which needs actual line of sight scanning to read the data and bill the product.

1.3 **Statement of the research problem**

VMI is one of the modern solutions suggested for simplifying the gargantuan task of getting the right product at the right destination at the right time in the right quantity & quality. As many companies in India start taking the initiative to implement VMI or systems that are similar to it, an analysis of some of the implemented systems, their successes & inherent weaknesses have to be studied for
aiding better implementations in future. The conditions necessary for successful implementations are also dealt with in the study.

The study considers the opinions of the different stakeholders in the supply chain with respect to their views on whether VMI implementations bring in improvements or losses and its role in forecasting of customer demand in the retail sector. Mathematical & conceptual studies done in the past on the different costs relevant to the VMI models are also used for reference. Areas where improvements are required in the implementation as well as how they can be brought about also fall within the scope of this research study. The relationships between the supply chain partners and the importance of trust levels required in information sharing are also studied. A comparison of a traditional inventory system and a modern VMI system also is undertaken.

The study aims to enlighten decision makers about the positive aspects of VMI implementation as well as tries to dispel off the negativity & doubts about the feasibility of such a model. The researcher also attempts to test whether there is any association between the level of Information Technology (IT), Radio Frequency Identification Devices (RFID) and VMI implementations with regards to the supply chain efficiency in companies. The study tries to bring out the inherent strengths & weaknesses of the VMI system vis-a-vis the Indian retail scenario and also to understand the conditions which are necessary for better results on implementation.
The research will go a long way in understanding the importance of inventory management in the exponentially growing organized retail sector in India. Key variables that determine the success or failure of adopting a revolutionary system of inventory management like the VMI will be identified. A better model for implementation of would be the ideal end-result of such a study.

1.4 Scope and significance of the study

According to the research report published by Ernst & Young (E & Y) India and IBEF (2010), it is estimated that India’s consumer class will grow twelve fold from 50 million at present to about 583 million by about 2025 with more than 23 million people who will then be counted among the world’s wealthiest citizens. The purchasing power of this neo-rich class of customers has spawned the growth of new products, new retail outlets and brought in lots of vibrancy in the entire organized retail sector in India, with retailers expanding their reach into Tier II, III, IV towns. FMCG companies are focussing on the rural market which comprises 33% of India’s retail customer base. India is also turning into a price-competitive sourcing base for strong retail players like Wal-Mart, Tesco, JC Penney, Gap etc. India is also home to successful retail players like Shopper’s Stop and Future Group who handle large volumes of products daily all across the country.

The increased volume of goods that are transported from the manufacturer to the retailer and then to the end-customer through the different stages of the supply
chain carries with it inherent complexities in managing a wide variety of products & destinations. The traditional systems of managing inventory have given way to more advanced systems like Just In Time (JIT), Postponement or Delayed Configuration, Flexible Manufacturing Systems (FMS), Quick Response Logistics (QRL), 3rd party & 4th Party Logistics (3PL/4PL), Vendor Managed Inventory (VMI) & strategic methods like Collaborative, Planning, Forecasting & Replenishment (CPFR) etc.

Over the last two decades, there is a slow shift of convenience with the responsibility of managing a supply chain and inventory moving from the owner to the vendor. The study aims to illustrate the challenges in the implementation of the VMI.

1.5 Objectives of the study

The major objectives of the present study are as follows:

- To study the history of VMI in the Indian and international scenario.

- To compare the traditional inventory system with the VMI system.

- To evaluate the key performance indicators in the implementation of VMI in Indian retail sector.

- To identify the challenges faced while implementing VMI with focus on retailing.
To understand the major changes brought about by RFID implementations in Indian retail outlets.

To suggest strategies for effective implementation of VMI in Indian retail industry.

To understand the factors that decides the success and failure of VMI implementation in Indian retail.

1.6 Hypotheses

Keeping the above objectives in mind, the following hypotheses have been formulated.

i. \( H_0 \) = There is no association between the size of the firm and the level of IT Usage in forecasting in a VMI System.

ii. \( H_0 \) = There is no association between size of the firm and the methods used in synchronizing with the other supply chain partner.

iii. \( H_0 \) = There is no association between the size of the firm and the frequency of the irregularities that occur in the supply chain.

iv. \( H_0 \) = There is no significant difference in the level of VMI/RFID implementations done in Indian retail firms based on their position in the supply chain.
1.7 Research design

The research has been conducted in two phases. In Phase I, a survey of managers working at the operational level in the supply chain of selected organized retail firms has been conducted. Phase II deals with a comprehensive analysis of case studies of implemented VMI systems in selected firms in the Indian retail sector.

1.8 Sample design

The population of the study involves all stakeholders in the supply chain of the organized retail organizations in India. A judgment sample of 100 managers working in the supply chain of selected organized retail firms across India was taken. Retail firms like Subhiksha Retail, Reliance Fresh, More, Heritage Fresh, Big Bazaar, Shoppers Stop, eZone, Viveks Retail were chosen. Manufacturers like Marico Industries, distributors of Hindustan Unilever, and company officials of manufacturers of products supplied to retailers were contacted. The survey included 20 manufacturers, 4 distributors, 20 wholesalers & 56 retailers.

VMI is a recent concept in inventory management & full fledged implementations are very few in numbers in India. This has led the researcher to go in for a case study of VMI implemented systems in India to supplement the survey data of Phase I.
A case study is an intensive qualitative analysis that emphasises on the combination of factors, description of processes and consequences of behaviours and events in different cases, which lead to final inferences. The following organizations were selected for the case study.

i. Marico Industries

ii. Subhiksha Retail

iii. Shoppers Stop

iv. Future Group

The VMI implementations at Maruti Udyog Limited & Mahindra and Mahindra, from the automobile sector, have also been studied for extracting information about the topic under study as these two organizations had adopted VMI successfully much before that of the retail sector. Information from these two implementations has helped the researcher in understanding the benefits & flaws of VMI.

1.9 Tools employed for data collection

Following are the tools employed for data collection in this study

i. Interview schedule and Questionnaire schedule
ii. Case Study method

1.10 Period of the study

The study covers the period from year 2005 to 2010.

1.11 Statistical techniques used

Following are the statistical tools that are used during this study:

i. Descriptive Analysis

ii. Chi Square test

iii. ANOVA

iv. Reliability tests

SPSS package was used to analyse the primary data.

1.12 Limitations of the Study

The present study is an attempt to understand a new concept in Inventory management, and hence there were a number of limitations for the study. Following are the major limitations of the study.
i. The study is more on the lines of a conceptual study rather than an empirical data-based study, since the body of knowledge in this area is still nascent and growing.

ii. The scope of the study being the whole country, possible coverage by a single researcher was difficult.

iii. The study is not free from sampling and non-sampling errors.

iv. Most companies were reluctant to fully furnish classified data regarding latest technological innovations in their business.

1.13 Chapter scheme

The final report is presented in seven chapters. The first chapter gives a brief account of the important aspects of the study undertaken. This includes introduction, scope and significance of the study, definition of key terms, statement of the problem, objectives of the study and the hypotheses being tested. An overview of the Retailing sector in India is given in the second chapter.

The third chapter deals with the evolution of Inventory Management and VMI. Many examples of implementations of VMI in the International scenario in retail and