CHAPTER I

INTRODUCTION

Pharmaceutical Industry is driven by a global need to conquer diseases. Medicines are developed to treat new diseases or improve upon the existing treatment. An in depth understanding of human physiology and disease mechanism is a pre requisite to pharmaceutical R&D. To facilitate research, companies usually concentrate on select therapeutic areas such as antibiotics, quinolones, cough and cold preparations, ayurvedic products etc. Pharmaceuticals are medicinally effective chemicals, which are converted into dosage forms suitable for patients to imbibe. In its basic chemical form pharmaceuticals are called bulk drugs and final dosage forms are known as formulations. Bulk drugs are derived from four types of intermediaries, viz. 1) Plant derivatives 2) Animal derivatives 3) Synthetic chemicals 4) Biogenetic derivatives

Indian Pharmaceuticals Industry

Pharmaceutical Industry - Global Scenario

The developed countries like the United States, Western Europe and Japan are the biggest market. Higher purchasing power and a well developed health insurance and re-imbursement system implies that the value of drugs sold is much higher. Growth in these markets is also higher as new blockbuster drive growth. The following table shows the trends in the global pharmaceutical markets:
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mkt Size</td>
<td>US$bn</td>
<td>%</td>
<td>%</td>
<td>CAGR %</td>
<td>Forecast %</td>
<td>CAGR %</td>
</tr>
<tr>
<td>Total un-audited and audited Global Market</td>
<td>$ 712</td>
<td>6.4%</td>
<td>6.9%</td>
<td>7.7%</td>
<td>4 - 5%</td>
<td>4 - 7%</td>
</tr>
<tr>
<td>North America</td>
<td>307.0</td>
<td>4.4%</td>
<td>8.7%</td>
<td>7.9%</td>
<td>1 - 2%</td>
<td>2 - 5%</td>
</tr>
<tr>
<td>Europe</td>
<td>220.9</td>
<td>6.7%</td>
<td>5.4%</td>
<td>7.1%</td>
<td>5 - 6%</td>
<td>4 - 7%</td>
</tr>
<tr>
<td>Asia/Africa</td>
<td>78.6</td>
<td>13.3%</td>
<td>10.5%</td>
<td>12.0%</td>
<td>12-13%</td>
<td>11-14%</td>
</tr>
<tr>
<td>Japan</td>
<td>66.0</td>
<td>4.2%</td>
<td>-0.8%</td>
<td>3.0%</td>
<td>1 - 2%</td>
<td>2 - 5%</td>
</tr>
<tr>
<td>Latin America</td>
<td>40.2</td>
<td>11.6%</td>
<td>11.4%</td>
<td>12.8%</td>
<td>11-12%</td>
<td>11-14%</td>
</tr>
<tr>
<td>US</td>
<td>287.4</td>
<td>4.2%</td>
<td>8.6%</td>
<td>7.8%</td>
<td>1 - 2%</td>
<td>2 - 5%</td>
</tr>
<tr>
<td>Japan</td>
<td>66.0</td>
<td>4.2%</td>
<td>-0.8%</td>
<td>3.0%</td>
<td>1 - 2%</td>
<td>2 - 5%</td>
</tr>
<tr>
<td>France</td>
<td>39.3</td>
<td>6.2%</td>
<td>3.9%</td>
<td>6.3%</td>
<td>3 - 4%</td>
<td>2 - 5%</td>
</tr>
<tr>
<td>Germany</td>
<td>36.7</td>
<td>4.9%</td>
<td>2.0%</td>
<td>5.0%</td>
<td>5 - 6%</td>
<td>3 - 6%</td>
</tr>
<tr>
<td>UK</td>
<td>23.4</td>
<td>5.1%</td>
<td>4.2%</td>
<td>5.2%</td>
<td>2 - 3%</td>
<td>1 - 4%</td>
</tr>
<tr>
<td>Italy</td>
<td>23.1</td>
<td>1.3%</td>
<td>4.4%</td>
<td>3.6%</td>
<td>2 - 3%</td>
<td>1 - 4%</td>
</tr>
<tr>
<td>Spain</td>
<td>18.1</td>
<td>6.0%</td>
<td>9.7%</td>
<td>7.7%</td>
<td>6 - 7%</td>
<td>5 - 8%</td>
</tr>
<tr>
<td>China</td>
<td>17.7</td>
<td>25.3%</td>
<td>12.7%</td>
<td>21.7%</td>
<td>25-26%</td>
<td>19-22%</td>
</tr>
<tr>
<td>Canada</td>
<td>17.3</td>
<td>6.3%</td>
<td>8.0%</td>
<td>7.9%</td>
<td>5 - 6%</td>
<td>4 - 7%</td>
</tr>
<tr>
<td>Brazil</td>
<td>15.8</td>
<td>9.9%</td>
<td>11.5%</td>
<td>12.7%</td>
<td>10-11%</td>
<td>8 - 11%</td>
</tr>
</tbody>
</table>

Source: Compiled by the Researcher
Global Market Trends and Growth in select countries:

**United States of America**

The US market growth remains at low levels, at 1.2% for MAT Sept 2008, with MAT sales reaching $291 billion. The month-over-month sales growth is also low, with sales of 1.7% and prescriptions at -0.5% over Sept 2007. Significant factors driving this lower growth include an increased volume for less-expensive generic drugs and a reduction in the price of these generics, low volume for new patent protected products in the market, and weak economic conditions contributing to slower consumer demand. Value growth in the generic sector continues to decline, MAT Sept 2008, growth is -2.7%, fueled by fierce price competition in this sector. While the volume of generics continues to increase (TRx growth rate is 9.8% through MAT Sept). Recent expiries of major products include: Depakote (divalproex launched 9/08), Lamictal (lamotrigine launched 8/08), and Risperdal (risperidone launched 8/08). Specialist driven products remain the driver of higher growth in the market with YTD growth through Sept of 7.3%. Through November, they have had 20 NCEs approved by the FDA. These approvals have not provided substantial new growth to the US market. Notable products approved recently include Vimpat, an epilepsy therapy from Schwartz Biosciences/UCB, and Toviaz, an overactive bladder treatment from Pfizer. The US forecast for 2008 was just recently updated, and calls for expected full year growth in the US to come. Absconding

**Europe**

Top 5 Europe market reaches $158 billion, growing at 4.7% in value terms, up from 4.0% last year. Volume growth continues
at a flat rate of 1.3%. Germany and Spain have the highest growth rates with 5.9% (MAT Sep 2008) and 7.8% (MAT Aug 2008) respectively.

**Germany**

Germany remains the major source of regional value growth, accounting for 32% of regional growth. In addition, Italy's growth showing signs of recovery with 3.2% up from -0.2% last year, while UK Growth continues to slow down to 2.4% in year 2007 from 4.8%.

**France**

France volume growth continues to deteriorate growing at -1.9% down from -0.4% last year, while UK volume growth is on the increase at 3.2% up from 2.3% in the previous year. Specialist driven care represents over 90% of all value growth in Top 5 Europe, and is growing at a rate of 10%. Primary care growth shows slight recovery, with growth of 0.8%, up from 0.1% last year; this is also reflected in volume with growth rates of 1.6% up from 1% last year. Generics continue to penetrate unprotected market segment in the region. Generics now account for 57% of the unprotected market in volume terms, up from 53% 12 months ago. In addition, generics now account for 44% of unprotected regional value sales up from 39% last year.

**Japan**

The Japan market grew by 4.4% MAT Sept 2008 to reach $65 billion, this is up from 2.1% MAT Sept 2007. On the heels of the announced merger between major pharmaceutical wholesalers Mediceo and Alfresa which is completed in April 2009 and will form the largest wholesaler in Japan - the
current top 4 wholesalers, representing around 77.9% of drug distribution domestically, have announced midterm financial results. Combined operating income for these companies was $295.5 million, a -20.5% decline over the same period last year. The main reasons cited for this decline in performance were lower prices negotiated with pharmaceutical companies and increasing competition among wholesalers for higher share of distribution which is driving down wholesaler selling price to hospitals and pharmacies. Ethical pharmaceutical sales for the same period, on an actual NHI price base, grew +2.9% to $41.44 billion, while eliminating the impact of the April 2008 revision would have seen the market grow +8.3% to $43.53 billion.

Key Events

United States of America

1. Drug costs for seniors growing

Two new analyses show elderly and disabled people in Medicare prescription drug plans with the largest enrollments will pay 43% more on average in monthly premiums next year than when the drug program began in 2006, and some enrollees will see increases of as much as 329%, although overall, the Medicare drug program is costing taxpayers less than originally estimated.

The government's drug spending on the program fell by 12% to $44 billion in the fiscal year that ended Sept. 30, largely from the widespread use of low-cost generic drugs. The government pays part of the drugs' costs for seniors and helps subsidize premiums for low-income people.
2. FDA to open three offices
The US Department of Health and Human Services (HHS) announced that it opens FDA offices in the Chinese cities of Beijing, Guangzhou and Shangai this week. The government department stated that "establishing a permanent HHS/FDA presence in China will greatly enhance the speed and effectiveness of regulatory cooperation and efforts to protect consumers in both countries."

Europe
1. EU: Unique Decision By EMEA Regarding Orlistat
The European Medicine Agency (EMEA) has recommended switching a low-dose version of the anti-obesity drug Xenical (orlistat) from prescription only to non-prescription status. It will be the first centrally authorised drug to see its prescription status change. GSK which market Alli (low-dose orlistat) expect approval in all 27 EU member states by 2009.

2. Kidney cancer patients face delay in drugs decision
Kidney cancer patients will have to wait months for the NHS drugs rationing body to decide if they can have new drugs after guidance was delayed. NICE draft guidance said that patients with advanced kidney cancer should not receive new drugs that could extend their lives. During the consultation on the guidance new evidence was submitted and now NICE has delayed issuing another draft until well into 2009.

3. France: Proposed PLFSS amendments to promote generics
The national union of health insurers (UNCAM) for the first time will engage in individual contracts with physicians in 2009.
These will feature prescribing targets to rationalize behavior such as 70% of antibiotic prescriptions and 80% of antidepressant prescriptions must be generic. Physicians that meet their targets will receive a bonus of around €5,000 (approx. $6,800).

4. UK: Government announces new measures to improve patients' access to drugs
The government announced plans to improve patient access to medicines through a variety of measures. These include accelerating the NICE approval process, allowing patients to pay privately for medicines and treatment without losing NHS eligibility and increased flexibility in approaches to pricing and reimbursement with a focus on further risk-sharing schemes.

Asia Pacific
1. Lupin's Indian plant faces FDA GMP scrutiny
The US FDA has listed 15 observations in an inspection report following a Good Manufacturing Practices (GMP) audit at Lupin's facility in Madideep, India. Lupin said that it had addressed and presented its actions in response to eight of these observations right away and a complete response to all the observations would be submitted to the FDA expeditiously.

Indian Pharmaceutical Industry – An Overview
“The Indian pharmaceutical industry is a success story providing employment for millions and ensuring that essential drugs at affordable prices are available to the vast population of this sub-continent.” Richard Gerster
Indian Pharmaceutical Industry

The Indian Pharmaceutical Industry today is in the front rank of India's science-based industries with wide ranging capabilities in the complex field of drug manufacture and technology. A highly organized sector, the Indian Pharma Industry is estimated to be worth $4.5 billion, growing at about 8 to 9 percent annually. It ranks very high in the third world, in terms of technology, quality and range of medicines manufactured.

From simple headache pills to sophisticated antibiotics and complex cardiac compounds, almost every type of medicine is now made indigenously. Playing a key role in promoting and sustaining development in the vital field of medicines, Indian Pharma Industry boasts of quality producers and many units approved by regulatory authorities in USA and UK. International companies associated with this sector have stimulated, assisted and spearheaded this dynamic development in the past 53 years and helped to put India on the pharmaceutical map of the world. The Indian Pharmaceutical sector is highly fragmented with more than 20,000 registered units. It has expanded drastically in the last two decades. The leading 250 pharmaceutical companies control 70% of the market with market leader holding nearly 7% of the market share. It is an extremely fragmented market with severe price competition and government price control.

The pharmaceutical industry in India meets around 70% of the country's demand for bulk drugs, drug intermediates, pharmaceutical formulations, chemicals, tablets, capsules, orals and injectibles. There are about 250 large units and about 8000 Small Scale Units, which form the core of the pharmaceutical industry in India (including 5 Central Public
Sector Units). These units produce the complete range of pharmaceutical formulations, i.e., medicines ready for consumption by patients and about 350 bulk drugs, i.e., chemicals having therapeutic value and used for production of pharmaceutical formulations.

Following the de-licensing of the pharmaceutical industry, industrial licensing for most of the drugs and pharmaceutical products has been done away with. Manufacturers are free to produce any drug duly approved by the Drug Control Authority. Technologically strong and totally self-reliant, the pharmaceutical industry in India has low costs of production, low R&D costs, innovative scientific manpower, strength of national laboratories and an increasing balance of trade. The Pharmaceutical Industry, with its rich scientific talents and research capabilities, supported by Intellectual Property Protection regime is well set to take on the international market.

**Advantage India**

1. **Competent workforce**

India has a pool of personnel with high managerial and technical competence as also skilled workforce. It has an educated work force and English is commonly used. Professional services are easily available.

2. **Cost-effective chemical synthesis**

Its track record of development, particularly in the area of improved cost-beneficial chemical synthesis for various drug molecules is excellent. It provides a wide variety of bulk drugs and exports sophisticated bulk drugs.
3. Legal & Financial Framework
India has a 53 year old democracy and hence has a solid legal framework and strong financial markets. There is already an established international industry and business community.

4. Information & Technology
It has a good network of world-class educational institutions and established strengths in Information Technology.

5. Globalisation
The country is committed to a free market economy and globalization. Above all, it has a 70 million middle class market, which is continuously growing.

6. Consolidation
For the first time in many years, the international pharmaceutical industry is finding great opportunities in India. The process of consolidation, which has become a generalized phenomenon in the world pharmaceutical industry, has started taking place in India.

The Growth Scenario
India's US$ 3.1 billion pharmaceutical industry is growing at the rate of 14 percent per year. It is one of the largest and most advanced among the developing countries. Over 20,000 registered pharmaceutical manufacturers exist in the country.

The domestic pharmaceuticals industry output is expected to exceed Rs260 billion in the financial year 2002, which accounts for merely 1.3% of the global pharmaceutical sector. Of this, bulk drugs will account for Rs 54 billion (21%) and formulations, the remaining Rs 210 billion (79%). In financial year 2001, imports were Rs 20 billion while exports were Rs87 billion.
Steps To Strengthen the Industry

Indian companies need to attain the right product-mix for sustained future growth. Core competencies will play an important role in determining the future of many Indian pharmaceutical companies in the post product-patent regime after 2005.

Indian companies, in an effort to consolidate their position, will have to increasingly look at merger and acquisition options of either companies or products. This would help them to offset loss of new product options, improve their R&D efforts and improve distribution to penetrate markets. Research and development has always taken the back seat amongst Indian pharmaceutical companies. In order to stay competitive in the future, Indian companies will have to refocus and invest heavily in R&D. The Indian pharmaceutical industry also needs to take advantage of the recent advances in biotechnology and information technology.

The future of the industry will be determined by how well it markets its products to several regions and distributes risks, its forward and backward integration capabilities, its R&D, its consolidation through mergers and acquisitions, co-marketing and licensing agreements. Pharmaceutical industry is a continuous growth industry, immune to economic recession and commodity cycles. Rising population, new disease incidence or resurgence of certain spurs the growth. Therapeutic usage of pharmaceuticals varies across the globe. Hypertension and cardiac diseases are more prominent in developed countries while infectious diseases like typhoid, tuberculosis etc., are largely prevalent in developing nations.
## Table 1.2: Indian Pharmaceutical market

<table>
<thead>
<tr>
<th>Company</th>
<th>July '08 MAT (INR Crs)</th>
<th>Market Share %</th>
<th>MAT Rank July 08</th>
<th>MAT Rank July 07</th>
<th>Val. Gr</th>
<th>Vol. Gr</th>
<th>Price Growth</th>
<th>Net Gr</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPM</td>
<td>33,068</td>
<td></td>
<td></td>
<td></td>
<td>13.2%</td>
<td>5.0%</td>
<td>1.0%</td>
<td>7.3%</td>
</tr>
<tr>
<td>CIPLA</td>
<td>1,732</td>
<td>5.2%</td>
<td>1</td>
<td>1</td>
<td>17.2%</td>
<td>11.6%</td>
<td>-0.2%</td>
<td>5.7%</td>
</tr>
<tr>
<td>RANBAXY</td>
<td>1,688</td>
<td>5.1%</td>
<td>2</td>
<td>2</td>
<td>16.8%</td>
<td>7.3%</td>
<td>3.0%</td>
<td>6.5%</td>
</tr>
<tr>
<td>GLAXO</td>
<td>1,509</td>
<td>4.6%</td>
<td>3</td>
<td>3</td>
<td>5.1%</td>
<td>4.0%</td>
<td>0.4%</td>
<td>0.7%</td>
</tr>
<tr>
<td>NICHOLASP</td>
<td>1,225</td>
<td>3.7%</td>
<td>4</td>
<td>4</td>
<td>1.2%</td>
<td>-5.7%</td>
<td>0.8%</td>
<td>6.1%</td>
</tr>
<tr>
<td>ZYDUS CADILA</td>
<td>1,202</td>
<td>3.6%</td>
<td>5</td>
<td>5</td>
<td>11.6%</td>
<td>4.6%</td>
<td>1.0%</td>
<td>6.0%</td>
</tr>
<tr>
<td>SUN</td>
<td>1,125</td>
<td>3.4%</td>
<td>6</td>
<td>6</td>
<td>17.8%</td>
<td>10.6%</td>
<td>-0.1%</td>
<td>7.2%</td>
</tr>
<tr>
<td>ALKEM</td>
<td>1,029</td>
<td>3.1%</td>
<td>7</td>
<td>7</td>
<td>14.4%</td>
<td>6.4%</td>
<td>0.7%</td>
<td>7.3%</td>
</tr>
<tr>
<td>LUPIN LABS</td>
<td>892</td>
<td>2.7%</td>
<td>8</td>
<td>8</td>
<td>22.9%</td>
<td>9.8%</td>
<td>0.3%</td>
<td>12.8%</td>
</tr>
<tr>
<td>DRREDDYS</td>
<td>767</td>
<td>2.3%</td>
<td>9</td>
<td>10</td>
<td>10.9%</td>
<td>5.1%</td>
<td>2.6%</td>
<td>3.2%</td>
</tr>
<tr>
<td>ABBOT</td>
<td>756</td>
<td>2.3%</td>
<td>10</td>
<td>13</td>
<td>18.0%</td>
<td>8.9%</td>
<td>1.7%</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

**Source:** Compiled by the researcher

Most of the key players maintained their ranks compared to May 07 MAT. Abbot gained 3 ranks to move from 13th position to 10th position. GSK & Nocholas have seen a significant dip in their market shares compared to May 08 MAT by 40 bps & 60 bps respectively. DR REDDY'S gained a rank to reach 9 from its 10th in April 08. DR REDDY'S has lost its position from top 10 Ranks and is presently ranked at 11th position in August 2008 MAT.
Supply Chain Management in Pharmaceutical Industry

In today's economy the battlefield is shifting from individual company performance to what they call Supply Chain Performance.

Supply Chain Performance refers to the extended supply chain's activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner. Supply Chain Performance crosses company boundaries since it includes basic materials, components, subassemblies and finished products, and distribution through various channels to the end customer. It also crosses traditional functional organization lines such as procurement, manufacturing, distribution, marketing & sales, and research & development.

To win in the new environment, supply chains need continuous improvement. To achieve this we need performance measures, or "metrics", which support global Supply Chain Performance improvements rather than narrow company-specific or function-specific (silo) metrics which inhibit chain-wide improvements. We describe a number of supply chain performance measures that are expressly designed to support and monitor Supply Chain Performance improvements across the supply chain and illustrate the shortcomings of several common metrics.

Supply Chain Management

Why is it Top Management Concern?

Today's CEO can't simply focus on his or her company's performance in a vacuum; there is an emerging requirement to focus on the performance of the extended supply chain or
network in which the company is a partner. The battleground will be Supply Chain vs. Supply Chain, with emphasis on continuous improvement across the extended supply chain.

To maintain and encourage supply chain improvement we need to go beyond traditional functional and business performance measures and develop new metrics with enough detail and richness to handle Supply Chain performance rather than individual business performance. Modern supply chains are highly complex and dynamic. They are characterized by constantly changing relationships and configurations, they support a proliferation of Stock Keeping Units (SKU'S), they use a mixture of manufacturing techniques (build-to-stock, make-to-order, Flow) to fulfill orders, and they involve multiple organizations.

Furthermore, the emergence of the Internet as a new technology enabler has increased the number of customer interactions and product configurations, thereby presenting greater demands on supply chain management and performance. The ultimate goal and measure is customer satisfaction: the ability to fulfill customer orders for personalized products and services faster and more efficiently than the competition. It is critical therefore to focus management attention on the performance of the supply chain as an integrated whole, rather than as a collection of separate processes or companies.

A team of Accenture, INSEAD, and Stanford University researchers has drawn a statistical correlation between companies' financial success and the depth and sophistication of their supply chains. Specifically, the supply chain leaders are showing market-capitalization growth rates significantly
higher than the industry average growth rate. In addition to that powerful supply chain-financial performance link, the team identified the best practices, challenges, metrics, and success factors that accompany a bottom-line-focused supply chain transformation.

The survey revealed that, from a financial perspective, "reducing cost" is still the pre-eminent driver of supply chain improvement initiatives. This is to be expected, as supply chain management always has been a linchpin of operational efficiency. More noteworthy, however, is that nearly 25 percent of respondents cited "enhancing revenue" as the most prominent driver of their supply chain improvement initiatives. Among North American respondents, those giving priority to revenue enhancement exceeded 30 percent. Of course, companies citing "enhancing revenue" as their initiatives' principal driver are still concerned about reducing costs. But they also are acknowledging supply chain management's growing potential as a front-office tool. Consider the numerous ways that demand manifests itself (via the Web, through online marketplaces, or in conjunction with partnerships) and how critical supply chain proficiency is to supporting each of these venues. It also is true that more and more margin potential is being derived after a product ships. In effect, service and support are becoming as important as the product itself. And supply chain management is the heart of profitable service and support.

Confirming the above observation, "service quality" was one of the most frequently cited drivers of operational performance improvements. Nearly 20 percent also identified "product innovation" as an important motivator. Clearly, these respondents appreciate the increasingly important role that
supply chain management plays in supporting collaborative design processes and maintaining tight control over the complete, end-to-end product lifecycle. The survey also revealed that "supply chain planning" and "linkages with customers and suppliers" are perceived to offer the greatest operational-improvement opportunities.

Planning and linkages also proved to be among the capabilities most frequently transformed by respondents' recent supply chain initiatives. Clearly, investments in these capabilities can help companies respond more effectively to changing market conditions, proactively control costs, and tighten relationships through greater information sharing and collaboration.

Statement of Problem
“Supply Chain Management and its impact on the financial performance in pharmaceutical company”

Need and Importance of the study
Supply chains in pharmaceuticals industry are experiencing a revolution. Threats such as parallel trading and counterfeit drugs and the requirements of organizations such as the FDA demand more rigorous controls and traceability on drugs; new technologies and new ways of working with wholesalers or alternative distributors offer a new flexibility in manufacturing and an ability to respond to immediate opportunities or crises in any given market. Rob Whewells cutting edge guide explains the nature of these threats and opportunities and provides the means to develop a strategic approach to supply chain that allows you to minimize risk and, at the same time, ensure flexibility and improved long-term profitability.
The pharmaceutical industry is growing in a big way. The business is more competitive. By implementing best SCM practices, the company can leverage on its costs thereby increase the profitability. The need for the study is important as it is CEO items and impacts on the costs. Best practices of SCM are important to implement. This study was not conducted before on Pharmaceutical industry hence it is important.

**Objectives of the Study**

The main objectives of the research are:

1. to study and understand the growth scenario of Global and Indian pharmaceutical industry and Supply Chain Management (SCM)

2. to review and examine the literature pertaining to Supply Chain Management in general and its relevance to pharmaceutical industry in particular

3. to study and understand the Supply Chain Management (SCM) processes and practices in Dr. Reddy's Laboratories Ltd (DRL) and assess the functioning and operations of the Global Distribution Centre (GDC) of DRL.

4. to analyze the performance metrics of SCM in light of demand and supply planning, logistics, warehousing and inventory.

5. to assess and understand the Supply Chain Management (SCM) Cost and its impact on financial performance of the company

6. to assess and understand the impact of Supply Chain Management on customer service and

7. to evolve suggestive measures to benchmark the performance metrics for the pharmaceutical industry on the basis of findings and conclusions.
Hypothesis
1. The firm that adopts Just in Time (JIT) has higher ROA than a controlled sample that does not adopt JIT
2. Better coordination in the Supply Chain reduces uncertainty throughout manufacturing networks which in turn leads to greater efficiency along with faster delivery of finished product.
3. Strategic logistic capabilities contribute significantly to superior company performance and sustainable competitive advantage.
4. There is a positive relationship between integrative information technologies and Supply Chain Management.

Research Methodology
The research design used for the study includes explorative, descriptive and analytical methods. The explorative research design has helped in determining the supplier / distributor satisfaction and also customer / user satisfaction. A conscious effort has been made to assess both of them. Descriptive study is related to personal discussions with the respective HODs and regular interaction with distributors.

Sources of data collection
Primary data was collected by preparing an administering three types of questionnaires through online (electronic media) and personal interviews with 1) top officials of the company, 2) distributors / suppliers and 3) customers. Secondary data was collected from various publications, research papers, reports and manuscripts and different websites. The secondary data on forecasting, sales, inventory, freight and profitability are collected from the S & OP forms and
annual reports and are analyzed in the light of exhaustive literature reviewed and subjected to statistical analysis which provided meaningful suggestions for proper actions and further investigations. A survey was conducted in the field in person and assessed the situation. For data source, survey means either paper electronic questionnaire which is sent to targeted groups to solicit relevant information and data base means objective data which is obtained from public and other sources. For analysis method, “Tabulation” refers to using simple analysis such as taking the statistical average and tabulating. “Multivariate” refers to using regression and other sophisticated statistical tools to test certain hypothesis or draw conclusions.

Universe of the study and sample selection

The study is undertaken in Dr. Reddy's Laboratories Ltd (DRL) Hyderabad. A sample size of four (4) distributors Viz., OOO“Avesta Farmatsevtika” 2) "Protek" Tsentr vnedreniya" Firma ZAO 3) NPK Katren CJSC and 4) Rosta who deliver 75% of revenue to the Russian region is selected as the researcher is located in Moscow (Russia for the last 7 years as Head of the SCM). The survey was conducted in the field in person and regular interactions with all the distributors and analyze the is of their reports.

Statistical analysis

Statistical tools like correlation (multivariate) and regression analysis were applied to know the essential factors instrumental for the SCM and its impact on the financial performance of the pharmaceutical company.
Scope of the study
This study is attempted to observe the critical areas of SCM like logistics, procurement, inventory control, operations. SCM plays a significant role for improving organizational performance in the highly competitive environment. This study discusses on the performance metrics and proves how it impacts the financial performance.

Limitations of the study
The present study is confined to one company i.e. Dr Reddy's Laboratories Ltd. The findings of the study may not be generalized to all pharmaceutical companies. The perception of employees and distributors may have the limitations of biases, lacks of expression. Hence the limitation of bias is bound to creep into the study. However, all possible measures and necessary care is taken in order to present the findings as judicially as possible.

Profile of Dr. Reddy's Laboratories Ltd (DRL)
Dr. Reddy's Laboratories Ltd (DRL), sometimes referred as Dr Reddy's is an emerging global pharmaceutical company with proven research capabilities. The Company is focused on creating and delivering innovative and quality products to help people lead healthier lives. The technologies and expertise in the development and manufacture of quality organic intermediates, bulk actives and finished dosage forms have been critical to the success in delivering innovative and affordable life-saving medicines to customers world-wide, including Europe, Japan, Russia and the US.
Company Overview
Since its inception in 1984, Dr. Reddy's has chosen to walk the path of discovery and innovation in health sciences. It has been a quest to sustain and improve the quality of life, and it has had nearly two decades of creating safe pharmaceutical solutions with the ultimate purpose of making the world a healthier place. Competencies cover the entire pharmaceutical value chain – API and Intermediates, Finished Dosages (Branded and Generic) and NCE Research. Its research centre uses cutting-edge technology and has discovered breakthrough pharmaceutical solutions in select therapeutic areas. In a short span, it filed for 64 patents. They are the first Indian company to out-license an NCE molecule for clinical trials. To strengthen their research arm, they have set up a research subsidiary, Reddy US Therapeutics Inc., in Atlanta, USA. The company exports API, branded formulations and generic formulations to over 60 countries. Their inherent strength lies in identifying relevant API and formulations, and selling them at affordable prices across the world.

A few of its API such as Norfloxacin, Ciprofloxacin and Enrofloxacin enjoy a large customer base. Their finished dosages have an enviable track record. Some of them such as Nise, Omez, Enam, Stamlo, Stamlo Beta, Gaiety and Ciprolet are among the top brands in India, and many have become household names in near-regulated countries too. Their generic formulations have also become very popular in quality-conscious regulated markets such as the US and Europe. All this has been possible because of its innovative and sustained marketing efforts. The company is all set to spread its wings further and touch more lives across the globe.
Mission: Life Research Hope

The Core Purpose of the company is to help people lead healthier lives. This has been the driving force behind all its actions and investments since 1984. They are constantly searching for solutions to significantly improve the quality of life.

Vision

Vision of the company is to become a discovery-led, global pharmaceutical company. DRL will achieve this vision by building:

1. Workplaces that will attract, energise and help retain the finest talent available.

2. An organisational culture that is relentlessly focussed on the speedy translation of scientific discoveries into innovative products that make a significant difference in people's lives.

3. A global marketing organisation that understands and responds to the needs of the customer.

Its relentless focus on innovation, entrepreneurship and globalisation will transform into an illustrious discovery-based entity powered by innovative research. In this journey it will be guided by its core values. In its commitment to spreading health and happiness, playing a meaningful role in the society is a priority. It intends to see that its work with the underprivileged in the areas of education, health and poverty alleviation scales up into a major movement and achieves self-sustainability.
Core Values

1. **Excellence**: DRL strives for excellence in everything it thinks, say and do.
2. **Quality**: DRL is dedicated to achieve the highest levels of quality in everything it does to delight customers, internal & external, every time.
3. **Respect for the Individual**: DRL upholds the self esteem and dignity of each other by creating an open culture conducive for expression of views and ideas irrespective of hierarchy.
4. **Innovation & Continuous Learning**: DRL create an environment of innovation and learning that fosters, in each one of us, a desire to excel and willingness to experiment.
5. **Collaboration & Teamwork**: DRL seeks opportunities to build relationships and leverage knowledge, expertise and resources to create greater value across functions, businesses and locations.
6. **Harmony & Social Responsibility**: DRL takes utmost care to protect the natural environment and serve the communities in which we live and work.

Milestones

**2002**: The first overseas acquisition of BMS Laboratories Limited and Meridian Healthcare, UK.

**2001**: On April 11, Dr Reddy's becomes the first Asia Pacific pharmaceutical company, outside Japan, to list on the New York Stock Exchange.

Dr Reddy's out-licenses DRF 4158 to Novartis for up to US $55 million upfront. It is a milestone payment for specific clinical and regulatory endpoints.

Dr Reddy's is the first Indian pharmaceutical company to obtain 180-day exclusive marketing rights for a generic drug.
in the US market with the launch of Fluoxetine 40 mg capsules on August 3, 2001.

2000: Dr Reddy’s becomes India’s third largest pharmaceutical company with the merger of Cheminor Drugs Limited, and the acquisition of American Remedies Limited. Reddy US Therapeutics, a wholly-owned subsidiary, is launched in the US.

1999: Dr Reddy’s acquires Chennai-based American Remedies Limited.


1995: Sets up a JV in Russia.

1994: Makes GDR issue of US$ 48 million when the foundation stone was laid for a generic formulations facility to cater to highly regulated markets.

1993: Dr Reddy’s Research Foundation is established and becomes operational.

1991: Dr Reddy’s commences first exports of its formulations to Russia.

1990: Dr Reddy’s, for the first time in India, exports Norfloxacin and Ciprofloxacin to Europe and Far East.


1987: Dr Reddy’s obtained its first USFDA approval for Ibuprofen and started formulations operations.

1986: Dr Reddy’s goes public.

1986: Dr Reddy’s enters international market with exports of Methyldopa.

1984: Dr Reddy’s is established with an initial capital of Rs.25 lakhs
Safety Health and Environment (SHE)

Safety, Health and Environment are the three magic words that ensure hope, health and happiness. DRL believe that maintaining the ecological balance is as important as its business. Its motto is creating more with less and, in keeping with it, it has taken major steps to develop sustainable use of resources and conserve the environment.

In this quest, DRL has undertaken:
1) Effective waste management procedures
2) Minimising use of raw materials and solvents
3) Preventive maintenance and better monitoring
4) Careful process development and
5) Raw material evaluation for environmental hazard.

DRL committed to not just implementing but also building awareness on SHE regulations and management. "A well implemented and internalized SHE management system results in assurance to all our stakeholders that our actions truly reflect our stated commitment to Safety, Health and Environment. Implementing SHE - management system results in discovering many hidden sources of profit along with reduced pollution and a safe workplace" says Mr. G.V. Prasad, Chief Executive Officer and Vice-Chairman, Dr. Reddy's Laboratories Limited.

Commitment

Awareness building is dependent on a knowledge network created on Notes platform. The topics include Safety, health & environment (SHE) management in other companies, SHE regulations, chemical safety and plant performance.
Knowledge delivery ranges from competitions, contests, knowledge fairs & multimedia training with CD. LEAP-SHE is a Learn & Practice program on safety, health and environment management system (SHE-MS). With an inbuilt assessment program, this course has prepared all our employees for successful implementation of the SHE management system. This commitment comes from the faith that its operations are sustainable only if safety, health & environment management is integrated into production processes and manufacturing practices. We are collectively learning about safety, health and environment. Its knowledge and attitude is leading into an era of bulk drug manufacture where its product is no longer characterized only by its quality. Safety, health & environment performance is a focus too in determining the ultimate quality of the product.

**Investment**

The conversion of intent into action has come about with investment. DRL has a two-pronged investment strategy viz. one in pollution control devices & safety equipment and the other in the management system. Learning to do more with less, its focus has shifted to process improvements for yield improvement from a traditional "end-of-pipe" approach of waste treatment. The need for environment management is challenging our technological skills.

A team of process engineers work closely with production staff to beat these technology challenges. One such feat is the removal of dissolved solids from wastewater with a simple process change, thereby, conserving energy that would be required in traditional dissolved solids separation operation. DRL has also gone a long way in creating awareness among its employees. A success story is the 5S housekeeping initiative.
This initiative is founded on the strength of people's buy-in and involvement. What was earlier an unimportant task transformed into a housekeeping momentum due to the energy of all shop floor employees. Approximately, 650 personnel are inducted into the 5S process.

The factories are provided with the state-of-art pollution control devices. It uses biological treatment technology to handle liquid effluent. It has invested in facilities to carry out anaerobic and aerobic treatment of wastewater. These technologies are customized to treat the type of waste generated in manufacturing. New addition to the treatment techniques includes powdered activated carbon treatment. Organic waste is incinerated in Pyrolytic type incinerators. The incinerators are multifunctional treating liquid, solid, semi-solid and gaseous wastes.

Social Responsibility
Dr Reddy's is firm in its commitment to social responsibility. The Dr Reddy's Foundation for Human and Social Development (DRFHS) sees itself as a catalyst of change, which will foster, develop and promote initiatives at individual, group and organisation levels that attempt sustainable environmental development of individual groups and society at large.

Mission Statement of DRFHS
Dr Reddy's Foundation believes in the inherent motivation and capacity of the human being for progress, given the right environment.
The Genesis

Dr. Reddy's Foundation for Human and Social Development was founded on 19th October 1996 out of a sense of social responsibility of Dr. Reddy, a scientist and a successful entrepreneur. The core support for the Foundation's administrative support and core staff expenses are guaranteed by Dr. Reddy's Laboratories apart from a commitment for 30% of all the program support venture funding of projects that are to be scaled up. The approach is to identify programs that would make a significant difference to the quality of life of a large number of people in the community and assume responsibility for it until the program becomes self-sustaining.

Philosophy

The Foundation assumes the role of a catalyst in a chemical reaction. It promotes conditions that lead to desired results. It is the forum for pooling ideas from the best of minds in our society to better design the social experiments woven through appropriate networks and resources by foundation.

Social Catalyst

The Foundation has a unique role in the society in bringing together various stakeholders—the constituent beneficiary groups, other development players, corporate, bureaucracy, civil society etc. This position of the foundation characterizes a social catalyst and a patent on this concept, for the role it assumes is the first claim it staked.

Mentoring

The Foundation believes that the deprived and the poor are essentially people who are less equal than others. The inequality is a measure of the availability and the distribution
of the resources. Redistribution of the resources is an idealistic, utopian concept, unrealistic and unattainable. The solution lies in empowering the deprived to realise their latent potential in order to reduce the inequality. For this process, the Foundation is convinced of the need for a guide for every deprived constituent to climb the social ladder.

Strategic Business Units (SBU) of Dr. Reddy's Laboratories Ltd. (DRL)

Business Divisions
Dr Reddy's is a global pharmaceutical powerhouse committed to protecting and improving health and well-being. In order to have more focus on the customers and its deliverables, DRL business is divided into different strategic business divisions which are as follows:
1. Branded Finished Dosages
2. Generic Finished Dosages
3. Bulk Actives
4. Custom Chemicals
5. Biotechnology
6. Critical Care
7. Discovery Research

Operational Definitions and Conceptual Framework of Supply Chain Management

Supply Chain
A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in filling a customer request. These functions include, but are not limited to, new
product development, marketing, operations, distribution, finance, and customer service.

Consider a customer walking into a Wal-Mart store to purchase detergent. The supply chain begins with the customer and his or her need for detergent. The next stage of this supply chain is the Wal-Mart retail store that the customer visits. Wal-Mart stocks its shelves using inventory that may have been supplied from a finished-goods warehouse that Wal-Mart manages or from a distributor using trucks supplied by a third party. The distributor in turn is stocked by the manufacturer (say, Procter & Gamble [P&G] in this case).

The P&G manufacturing plant receives raw material from a variety of suppliers, who may themselves have been supplied by lower-tier suppliers. For example, packaging material may come from Tenneco, and Tenneco might receive raw material to manufacture the packaging from other suppliers. This supply chain is illustrated in Figure 1.1. A supply chain is dynamic and involves the constant flow of information, product, and funds between different stages. Each stage of the supply chain performs different processes and interacts with other stages of the supply chain. Wal-Mart provides the product, as well as pricing and availability information, to the customer. The customer transfers funds to Wal-Mart. Wal-Mart conveys point-of-sale data as well as replenishment orders to the distribution center (DC), which transfers the replenishment order via trucks back to the store. Wal-Mart transfers funds to the distributor after the replenishment.

The distributor also provides pricing information and sends delivery schedules to Wal-Mart. Similar information, material, and fund flows take place across the entire supply chain. These
examples illustrate that the customer is an integral part of the supply chain, the primary purpose for the existence of any supply chain is to satisfy customer needs, in the process generating profits for itself.

Chart 1.1 Stages of Supply Chain-A model for Detergent Industry

```
P&G or Other Manufacturer -> Wal-Mart or Third Party DC -> Wal-Mart Store -> Customer Wants Detergent and goes to Wal-Mart
|
| Plastic Producer
|
| Tenneco Packaging
|
| Chemical Manufacturer

Chemical Manufacturer -> Paper Manufacturer
| Timber Industry
```

Compiled by the Researcher

Supply chain activities begin with a customer order and end when a satisfied customer has paid for his or her purchase. The term supply chain conjures up images of product, or supply, moving from suppliers to manufacturers to distributors to retailers to customers along a chain. It is important to visualize information, funds, and product flows along both directions of this chain. The term may also imply that only one player is involved at each stage. In reality, a manufacturer may receive material from several suppliers and then supply several distributors. Therefore, most supply chains are actually networks. It may be more accurate to use the terms supply network or supply web to describe the structure of most supply chains. A typical supply chain may involve a variety of
stages. These supply chain stages are shown in Figure 1.2 and include the following: Customers, Retailers, Wholesalers/distributors, Manufacturers, Component / raw material suppliers. Each stage in Figure 1.2 need not be present in a supply chain. The appropriate design of the supply chain will depend on both the customer's needs and the roles of the stages involved in filling those needs.

In some cases, such as Dell, a manufacturer may fill customer orders directly. Dell builds to order, that is, a customer order initiates manufacturing at Dell. Dell does not have a retailer, wholesaler, or distributor in its supply chain. In other cases, such as the mail order company L.L. Bean, manufacturers do not respond to customer orders directly. L.L. Bean maintains an inventory of products from which it fills customer orders. Compared with the Dell supply chain, the L.L. Bean supply chain contains an extra stage (the retailer, L.L. Bean itself) between the customer and the manufacturer. In the case of a small retail store, the supply chain may also contain a wholesaler or distributor between the store and the manufacturer.

The Objective of a Supply Chain
The objective of every supply chain is to maximize the overall value generated. The value a supply chain generates is the difference between what the final product is worth to the customer and the effort the supply chain expends in filling the customer's request.

For most commercial supply chains, value will be strongly correlated with supply chain profitability, the difference between the revenue generated from the customer and the
overall cost across the supply chain. For example, a customer purchasing a computer from Dell pays $2,000, which represents the revenue the supply chain receives. Dell and other stages of the supply chain incur costs to convey information, produce components, store them, transport them, transfer funds, and so on.

The difference between the $2,000 that the customer paid and the sum of all costs incurred by supply chain to produce and distribute the computer represents the supply chain instability. Supply chain profitability is the total profit to be shared across all supply chain stages. The higher the supply chain profitability, the more successful the supply chain. Supply chain success should be measured in terms of supply chain profitability and not in terms of the profits at an individual stage.
Chart 1.2 Stages of Supply Chain - A model for Pharmaceutical Industry

Supplier → Manufacturer → Distributor → Retailer → Customer

Source: Composed by the Researcher

The success of a supply chain is defined in terms of supply chain profitability. The next logical step is to look for sources of revenue and cost. For any supply chain, there is only one source of revenue: the customer. The customer is the only real point of positive cash flow in a supply chain. In the Wal-Mart example, the customer purchase-detergent is the only one providing positive cash flow for the supply chain. All other cash flows are simply fund exchanges that occur within the supply chain, given that different stages have different owners.

When Wal-Mart pays its supplier, it is taking a portion of the funds the customer provides and passing that money on to the supplier. This cash transfer adds to the supply chain's costs. All flows of information, product, or funds generate costs within the supply chain. Therefore, the appropriate management of these flows is a key to supply chain success. Supply chain management involves the management of flows between and among stages in a supply chain to maximize total
profitability. In the next section, we categorize supply chain decision phases based on their duration.

Decisions in a Supply chain
Successful supply chain management requires several decisions relating to the flow of information, product, and funds. These decisions fall into three categories or phases, depending on the frequency of each decision and the time frame over which a decision has an impact:

1. Supply chain strategy or design
During this phase, a company decides how to structure the supply chain. It decides what the chain's configuration will be and what processes each stage will perform. Decisions made during this phase are also referred to as strategic supply chain decisions. Strategic decisions made by companies include location and capacities of production and warehousing facilities, products to be manufactured or stored at various locations, modes of transportation to be made available along different shipping legs, and type of information system to be utilized. A firm must ensure that the supply chain configuration supports its strategic objectives during this phase. Dell's decisions regarding the location and capacity of its manufacturing facilities, warehouses, and supply sources are all supply chain design or strategic decisions.

Supply chain design decisions are typically made for the long term and are very expensive to alter on short notice. Consequently, when companies make these decisions, they must take into account uncertainty in anticipated market conditions over the next few years.
2. Supply chain planning
As a result of the planning phase, companies define a set of operating policies that govern short-term operations. For decisions made during this phase, the supply chain's configuration determined in the strategic phase is fixed. This configuration establishes constraints within which planning must be done. Companies start the planning phase with a forecast for the coming year of demand in different markets.

Planning includes decisions regarding which markets will be supplied from which locations, the planned buildup of inventories, the subcontracting of manufacturing, the replenishment and inventory policies to be followed, the policies that will be enacted regarding backup locations in case of a stock-out, and the timing and size of marketing promotions. Dell's decisions regarding the markets a given production facility will supply and target production quantities at different locations are classified as planning decisions.

Planning establishes parameters within which a supply chain will function over a specified period of time. In the planning phase, companies must include uncertainty in demand, exchange rates, and competition over this time horizon in their decisions. Given a shorter time horizon and better forecasts than the design phase, companies in the planning phase try to incorporate whatever flexibility may have been built into the supply chain in the design phase and exploit it to optimize performance in the shorter term.

3. Supply chain operation
The time horizon here is weekly or daily, and during this phase companies make decisions regarding individual customer
orders. At the operational level, supply chain configuration is considered fixed and planning policies already defined. The goal of supply chain operations is to implement the operating policies in the best possible manner. During this phase, firms allocate individual orders to inventory or production, set a date that an order is to be filled, generate pick lists at a warehouse, allocate an order to a particular shipping mode and shipment, set delivery schedules of trucks, and place replenishment orders. Because operational decisions are being made in the short term (minutes, hours, or days), there is often less uncertainty about demand information.

The goal during the operation phase is to exploit the reduction of uncertainty and optimize performance within the constraints established by the configuration and planning policies. The design, planning, and operation of a supply chain have a strong impact on overall profitability and success. Consider Dell Computer. In 1993, Dell performed poorly, and its stock price dropped sharply. This led Dell management to focus on improving the design, planning, and operation of the supply chain, resulting in significantly improved performance. Both profitability and the stock price subsequently have soared due to this increase in performance.

**Key Point** Supply chain decision phases may be categorized as design, planning, or operational, depending on the timeframe over which the decisions made applies.

**Process view of supply chain:**
A supply chain is a sequence of processes and flows that take place within and between different supply chain stages and combine to fill a customer need for a product. There are two
different ways to view the processes performed in a supply chain:

1. **Cycle view**
   The processes in a supply chain are divided into a series of cycles, each performed at the interface between two successive stages of a supply chain.

2. **Push/pull view**
   The processes in a supply chain are divided into two categories depending on whether they are executed in response to a customer order or in anticipation of customer orders. Pull processes are initiated by a customer order, and push processes are initiated and performed in anticipation of customer orders.

**Cycle View of Supply Chain Processes**
Given the five stages of a supply chain shown in Figure 1.2, all supply chain processes can be broken down into the following four process cycles, as shown in Figure 1.3: Customer order cycle, Replenishment cycle, Manufacturing cycle, Procurement cycle. Each cycle occurs at the interface between two successive stages of the supply chain. The five supply chain stages thus result in four supply chain process cycles. Not every supply chain will have all four cycles clearly separated. For example, a grocery supply chain in which a retailer stocks finished-goods inventories and places replenishment orders either with the manufacturer or the distributor is likely to have all four less separated. Dell, in contrast, sells directly to customers, thus bypassing the retailer and distributor. A cycle view of the supply chain is very useful when considering operational decisions, because it clearly specifies the roles and responsibilities of each member.
of the supply chain. The cycle view provides clarity, for example, when setting up informal systems to support supply chain operations, as process ownership and objectives clearly defined.

In the following pages, various supply chains are described in detail:

**Chart 1.3 Supply Chain Process Cycle**

<table>
<thead>
<tr>
<th>Cycles</th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Order Cycle</td>
<td>Customer</td>
</tr>
<tr>
<td>Replenishment Cycle</td>
<td>Retailer</td>
</tr>
<tr>
<td>Manufacturing Cycle</td>
<td>Distributor</td>
</tr>
<tr>
<td>Procurement Cycle</td>
<td>Manufacturer</td>
</tr>
<tr>
<td></td>
<td>Supplier</td>
</tr>
</tbody>
</table>

*Source: Composed by the Researcher*

**Customer Order Cycle**

The customer order cycle occurs at the customer/retailer interface and includes all processes directly involved in receiving and filling the customer's order. Typically, the customer initiates this cycle at a retailer site, and the cycle primarily involves filling customer demand. The retailer's
interaction with the customer starts when the customer arrives or contact is initiated and ends when the customer receives the order. The processes involved in the customer order cycle are shown in Figure 1.4 and include the following: Customer arrival, Customer order entry, Customer order fulfillment, Customer order receiving.

**Customer Arrival**

The term customer arrival refers to the customer's arrival at the location where he or she has access to his or her choices and makes a decision regarding a purchase. The starting point for any supply chain is the arrival of a customer. Customer arrival can occur when

1. the customer walks into a supermarket to make a purchase,
2. the customer calls a mail order telemarketing center, or
3. the customer uses the Web or an electronic link to a mail order firm.

From the supply chain perspective, a key goal is to facilitate the contact between the customer and the appropriate product so that the customer's arrival turns into a customer order. At a supermarket, facilitating a customer order may involve managing customer flows and product displays. At a telemarketing center, it may mean ensuring that customers do not have to wait on hold for too long. It may also mean having systems in place so that sales representatives can answer customer queries in a way that turns calls into orders. At a Web site, a key system may be search capabilities with tools such as personalization that allow customers to quickly locate and view products that may interest them. The objective of the
customer arrival process is to maximize the conversion of customer arrivals to customer orders.

Customer Order Entry
The term customer order entry refers to customers telling the retailer what products they want to purchase and the retailer allocating products to customers. At a supermarket, order entry may take the form of customers loading all items that they intend to purchase onto their carts. At a mail order firm’s telemarketing center or Web site, order entry will involve customers informing the retailer of items and quantities they selected. The retailer then allocates the product to the order and may also provide a delivery date to the customer. The objective of customer order entry process is to ensure that the order entry is quick and accurate and is communicated to all other supply chain processes that are affected by it.

Chart 1.4 Customer Order Cycle

Source: Composed by the Researcher
**Customer Order Fulfillment**
During the customer order fulfillment process, the customer's order is filled and sent to the customer. At a supermarket, the customer performs this process. At a mail order firm this process generally includes picking the order from inventory, packaging it, and shipping it to the customer. All inventories will need to be updated, which may result in the initiation of the replenishment cycle. In general, customer order fulfillment takes place from retailer inventory. In a build to order scenario, in contrast, order fulfillment takes place directly from the manufacturer's production line. The objective of the customer order fulfillment process is to get the correct and complete orders to customers by the promised due dates and at best possible cost.

**Customer Order Receiving**
During the customer order receiving process, the customer receives the order and takes ownership. Records of this receipt may be updated and cash payment initiated. At a supermarket, receiving occurs at the checkout counter. For a mail order firm, receiving occurs when the product is delivered to the customer.

**Replenishment Cycle**
The replenishment cycle occurs at the retailer/distributor interface and includes processes involved in replenishing retailer inventory. It is initiated when a retailer places an order to replenish inventories to meet future demand. Replenishment may be triggered at a supermarket that is running out of stock of detergent or at order firm that is low on stock of a particular shirt. In some cases replenishment
takes place from a distributor that is holding finished-goods inventory. In other cases shipment may occur directly from a manufacturer's production line.

The replenishment cycle is similar to the customer order cycle except that the retailer is now the customer. The objective of the replenishment cycle is to replenish inventories at the retailer at minimum cost while providing the necessary product availability to the customer. The processes involved in the replenishment cycle are shown Figure 1.5 and include: Retail order trigger, Retail order entry, Retail order fulfillment, Retail order receiving

**Chart 1.5 Replenishment Cycle**

![Diagram](source: Composed by the Researcher)

**Retail Order Trigger**
As the retailer fills customer demand; inventory is depleted and must be replenished to meet future demand. A key activity the retailer performs during the replenishment cycle is to devise replenishment or ordering policy that triggers an order from the previous stage (possibly the distributor or the manufacturer). The objective when setting replenishment order
triggers is to maximize profitability by balancing product availability and cost. The outcome of the retail order trigger process is that a replenishment order is generated.

**Retail Order Entry**
The retail order entry process is similar to customer order entry at the retailer. The only difference is that the retailer is now the customer placing the order with the distributor or manufacturer. The objective of the retail order entry process is that an order be entered accurately and conveyed quickly to all supply chain processes affected by the order.

**Retail Order Fulfillment**
The retail order fulfillment process is very similar to customer order fulfillment except that it takes place either at the distributor or manufacturer. A key difference is the size of each order. Customer orders tend to be much smaller than replenishment orders. The objective of the retail order fulfillment is to get the replenishment order to the retailer on time while minimizing costs.

**Retail Order Receiving**
Once the replenishment order arrives at a retailer, there retailer must receive it physically, update all inventory records, and settle all payable accounts. This process involves product flow from the distributor to the retailer as well as information and financial flows. The objective of the retail order receiving process is to update inventories and displays quickly and accurately at the lowest possible cost.

**Manufacturing Cycle**
The manufacturing cycle typically occurs at the distributor/manufacturer (or retailer/manufacturer) interface
and includes all processes involved in replenishing distributor (or retailer) inventory. The manufacturing cycle is triggered by customer orders (as is the case with Dell), replenishment orders from a retailer or distributor (e.g., Wal-Mart ordering from P&G), or by the forecast of customer demand and current product availability in the manufacturer's finished-product warehouse.

In general, a manufacturer produces several products and fills demand from several sources. One extreme in a manufacturing cycle is an integrated steel mill that collects orders that are similar enough to enable the manufacturer to produce in large quantities. In this case, the manufacturing cycle is reacting to customer demand (referred to as a pull process earlier in the chapter). Another extreme involves certain types of consumer products firms that must produce in anticipation of demand. In this case, the manufacturing cycle is anticipating customer demand (referred to as a push process earlier in the chapter). The processes involved in the manufacturing cycle are shown in Chart 1.6 and include the following:

1. Order arrival from the distributor, retailer, or customer
2. Production scheduling
3. Manufacturing and shipping
4. Receiving at the distributor, retailer, or customer

Order Arrival
During the order arrival process, a distributor sets a replenishment order trigger based on the forecast of future demand and current product inventories. The resulting order is then conveyed to the manufacturer. In some cases, the customer or retailer may be ordering directly from the manufacturer. In other cases, a manufacturer may be producing
to stock a finished-products warehouse. In the latter situation, the order is triggered based on product availability and a forecast of future demand. This forecast is similar to the retail order trigger process in the replenishment cycle.

**Chart 1.6 Manufacturing Cycle**

![Diagram of Manufacturing Cycle]

**Source:** Composed by the Researcher

**Production Scheduling** The production scheduling process is similar to the order entry process in the replenishment cycle where inventory is allocated to an order. During the production scheduling process, orders are allocated to a production plan or schedule. Given the desired production quantities, the manufacturer must decide on the precise production sequence. If there are multiple lines, the manufacturer must decide which products to allocate to each line. The objective of the production scheduling is to maximize the proportion of orders filled on time while keeping costs down.

**Manufacturing and Shipping:** The manufacturing and shipping process is equivalent to the order fulfillment process described in the replenishment cycle. During the
manufacturing phase of the process, the manufacturer produces to the production while meeting quality requirements. During the shipping phase of this process; the product is shipped to the customer, retailer, distributor, or finished-warehouse. The objective of the manufacturing and shipping process is to product by the promised due date while meeting quality requirements and keeping the costs down.

**Receiving:** In the receiving process, the product is received at the distributor, finished-goods warehouse, retailer, or customer, and inventory records are updated. Other processes related to storage and fund transfers also take place.

**Procurement Cycle:**

Procurement cycle occurs at the manufacturer/supplier interface and includes all processes necessary to ensure that materials are available for manufacturing to occur according to schedule. During the procurement cycle, the manufacturer orders components from suppliers that replenish the component inventories. The relationship is quite similar to that between a distributor and manufacturer, with one significant difference: Whereas retailer/distributor orders are triggered by uncertain customer demand, component orders can be determined precisely once the manufacturer has decided what the production schedule will be. Component orders are dependent on the production schedule. Thus, it is important that suppliers be linked to the manufacturer's production schedule. Of course, if a supplier's lead times are long, the supplier has to produce to forecast because the manufacturer's production schedule may not be fixed that far in advance.
In practice, there may be several tiers of suppliers, each producing a component for the next tier. A similar cycle would then flow back from one stage to the next. The processes in the procurement cycle are shown in Figure 1.7.

**Key Point** A cycle view of the supply chain clearly defines the processes involved and the owners of each process. This view is very useful when considering operational decisions, because it specifies the roles and responsibilities of each member of the supply chain and the desired outcome for each process.

**Push/Pull View of Supply Chain Processes**

All processes in a supply chain fall into one of two categories, depending on the timing of their execution relative to customer demand. In pull processes, execution is initiated in response to a customer order. Push processes are those that are executed in anticipation of customer orders. At the time of execution of a pull process, demand is known with certainty. At the time of execution of a push process, demand is not known and must be forecast. Pull processes may also be referred to as reactive processes because they react to customer demand. Push processes may also be referred to as speculative processes because they respond to speculated (or forecast) rather than actual demand. The push/pull boundary in a supply chain separates push processes from pull processes. At Dell, for example, the beginning of personal computers (PC) assembly represents the push/pull boundary. All processes before PC assembly are push processes, and all processes after and including assembly are initiated in response to a customer order and are thus pull processes.
A push/pull view of the supply chain is very useful when considering strategic decisions relating to supply chain design. This view forces a more global consideration of supply chain processes as they relate to a customer order. Such a view may, for instance, result in responsibility for certain processes being passed on to a different stage of the supply chain if making this transfer allows a push process to become a pull process.

**Chart 1.7 Procurement Cycle**

Supply chain management has come up as a source of gaining competitive advantage in the business world. Organizations are grappling with identifying and improving the strategic issues that their supply chains should cater to. Due to pressure from increased competition, globalization of supply and distribution networks, corporate restructuring, introduction of new manufacturing methods, high levels of service, as well as low price expectations, the importance of supply chain will continue to intensify.
CHAPTERIZATION:

CHAPTER-1 INTRODUCTION:

It deals with the introduction and presents Pharmaceutical Industry in Indian and Global Scenario. Market Trends and Growth in Select countries (USA, Europe, Japan), Key Events in USA, Europe, UK, Asia Pacific, Indian Pharmaceutical Industry - An Overview, Advantage India, The Growth Scenario, Steps to strengthen the Industry, Supply Chain Management in Pharmaceutical Industry, Statement of the Problem, Need and importance of the study, Objectives of the study, Hypothesis, Research Methodology, Sources of Data, Universe of Study & Sample Selection, Statistical analysis, Scope of the study, Limitations of the study, Profile of Dr. Reddy's Laboratories Ltd (DRL), Company Overview, Operational Definitions and Conceptual Framework of Supply Chain Management, The Objective of a Supply Chain, Decisions in a Supply chain, Process view of supply chain, Cycle View of Supply Chain Processes, Scheme of chapterization.

CHAPTER- II REVIEW OF LITERATURE

It reviews the literature related to Pharmaceutical Industry and Supply Chain Management with regard to Demand and Supply, Demand Signal Processing, Emerging issues in Supply Chain Management, Supply Chain Management, Supply Chain Configuration, Supply Chain Planning, Supply Chain Execution, Information Technology & System Support.

CHAPTER-III SUPPLY CHAIN MANAGEMENT – PROCUREMENT PROCESSES AND PRACTICES IN PHARMACEUTICAL INDUSTRY:

It deals with Procurement processes in Pharmaceutical industry in general and DR Reddy's Laboratories Ltd., in particular. Procurement Process-Imported Items, Purchase requisition, Enquiry and Quotation, Negotiation, Purchase Order
finalization, Purchasing terms and conditions, Materials specification and acceptance by vendor, Delivery responsibility/Transit risks/Insurance coverage, Payment terms, Procedure for Clearing & Forwarding Imported consignments, Re-export of Imported Goods, Procurement Process-Maintenance, Repair and overhauling items, Purchase requisition, Enquiry quotation and Negotiation, Purchase Order finalization, Terms of Payment, advances and cash discounts, Purchasing – Local Materials, Purchase requisition, Enquiry and Quotation, Negotiation, Purchasing terms and conditions, Materials specification and acceptance by vendor, Excise duty, Sales tax, Entry tax etc govt. regulatory requirements, Packing and Forwarding charges / Transportation charges.

CHAPTER-IV SUPPLY CHAIN MANAGEMENT-GLOBAL DISTRIBUTION NETWORK PROCESSES IN PHARMA INDUSTRY


CHAPTER-V DEMAND AND SUPPLY PLANNING, DELIVERY PLANNING AND SOURCING:

It discusses in detail with regard to Delivery Planning & Sourcing – Introduction, Procedure for Delivery Planning & Scheduling, Delivery Planning, Production Planning, Progress review & Change Management, Material Planning, Inventory Control, Production Planning, Logistics and inventory, Role of inventory in the Supply Chain, Role in the Competitive Strategy, Components of Inventory Decisions, Cycle Inventory, Safety Inventory, Seasonal Inventory, Overall Trade-off: Responsiveness Versus Efficiency Decisions, Route and Network Selection, In House or Outsource, Overall Trade-off: Responsiveness versus Efficiency.
CHAPTER-VI SCM AND ITS IMPACT ON THE FINANCIAL PERFORMANCE IN PHARMACEUTICAL INDUSTRY


CHAPTER-VII SUPPLY CHAIN MANAGEMENT AND THE CUSTOMER DELIGHT

CHAPTER- VIII CONCLUSIONS AND SUGGESTIONS

It presents the conclusions and suggestions with regard to Procurement, Strategic Sourcing, Supplier Management, Optimizing Supply Chain Management, Fostering a "cash culture", New markets, new customers, new risks, Enabling "glocal" access, Securing drug safety, Evolving regulations, Managing tax risks, Uncovering peak performance. Constructive and useful suggestions were made on the basis of findings and conclusions.