CHAPTER 2

NEED FOR PROFESSIONAL INFRASTRUCTURE FOR EFFECTIVE AND EFFICIENT OPERATIONS OF WORLD CLASS WAREHOUSING IN INDIAN – THEORETICAL DISCUSSION
2.1 Introduction

Warehousing is one of the important auxiliaries to trade. It creates time utility by bridging the time gap between production and consumption of goods. The effective and efficient management of any organization requires that all its constituent elements operate effectively and efficiently as individual SBUs / facilities and together as an integrated whole corporate. Across the supply chains, warehousing is an important element of activity in the distribution of goods, from raw materials and work in progress through to finished products. It is integral part to the supply chain network within which it operates and as such its roles and objectives should synchronize with the objectives of the supply chain. It is not a ‘Stand-alone’ element of activity and it must not be a weak link in the whole supply chain network.

Warehousing is costly in terms of human resources and of the facilities and equipment required, and its performance will affect directly on overall supply chain performance. Inadequate design or managing of warehouse systems will jeopardize the achievement of required customer service levels and the maintenance of stock integrity, and result in unnecessarily high costs.

The recent trends and pressures on supply chain / logistics-forever increasing customer service levels, inventory optimization, time compression and cost minimization –have inevitably changed the structure of supply chains and the location and working of warehouses within the supply chains network. Certainly the old concept of warehouses as go downs to store goods has been outdated. Warehouses perhaps better referred to as distribution centers; exist primarily to
facilitate the movement of materials to the end customer. There are exceptions such as Strategic stock-holding, but in all commercial applications; effective and more efficient movement of materials to the customer is the key, even if some inventory has to be held to achieve this.

Warehouses are built in all shapes and sizes, from facilities of a few thousand square meters handling modest throughputs, to—despite the previous comments—large capital intensive installations with storage capacities in the 1,00,000-pallet-plus range, and very high-hundreds of pallets per hour throughputs. However, the concept of throughput rather than storage, and the pressure to optimize inventory with improved customer service level have also seen the development of distribution centers that do not hold stock—the ‘stockless depot’—such as trans-shipment depots with more cross-docking operations.

Another issue that has exercised companies in recent days has been the degree of technology to utilize in warehousing operations. The choice spans from conventional warehousing—racking and shelving with fork-lift or even manual operations through to fully automated systems with conveyors and automated guided vehicles (AGVs) and from carousels to robotic applications. The reasons for the choice of a particular technology level are not always clear cut, and run the gamut of financial, marketing and other factors, from company’s image or flexibility for future change through to personal perception of the appropriateness of a particular technology to a particular business or company.

2.2 Need for Warehousing

Warehousing is necessary due to the following reasons.

2.2.1 Seasonal Production: Agricultural commodities are harvested during certain seasons, but their consumption or use takes place throughout the year.
Therefore, there is a need for proper storage or warehousing for these commodities, from where they can be supplied as and when required.

### 2.2.2 Seasonal Demand:
There are certain goods, which are demanded seasonally, like woolen garments in winters or umbrellas in the rainy season. The production of these goods takes place throughout the year to meet the seasonal demand. So there is a need to store these goods in a warehouse to make them available at the time of need.

### 2.2.3 Large-scale Production:
In case of manufactured goods, now-a-days production takes place to meet the existing as well as future demand of the products. Manufacturers also produce goods in huge quantity to enjoy the benefits of large-scale production, which is more economical. So the finished products, which are produced on a large scale, need to be stored properly till they are cleared by sales.

### 2.2.4 Quick Supply:
Both industrial as well as agricultural goods are produced at some specific places but consumed throughout the country. Therefore, it is essential to stock these goods near the place of consumption, so that without making any delay these goods are made available to the consumers at the time of their need.

### 2.2.5 Continuous Production:
Continuous production of goods in factories requires adequate supply of raw materials. So there is a need to keep sufficient quantity of stock of raw material in the warehouse to ensure continuous production.

### 2.2.6 Price Stabilization:
To maintain a reasonable level of the price of the goods in the market there is a need to keep sufficient stock in the warehouses. Scarcity in supply of goods may increase their price in the market. Again, excess production
and supply may also lead to fall in prices of the product by maintaining a balance of supply of goods, warehousing leads to price stabilization.

2.2.7 Issues affecting Warehousing

Since warehouses, stores and distribution centers have to operate as essential component elements within supply chains network, key decisions when setting up such facilities must be determined by the overall supply chain strategies for service and cost.

The factors that should be considered include the following.

(i) Market and Product Base Stability: Long-term market potential for growth and for how the product range may expand will influence decisions on the size and location of a warehouse facility, including space for prospective expansion. These considerations will also impact on the perceived need for potential flexibility, which in turn can influence decisions on the type of warehouse and the level of technology to be used.

(ii) Type of Materials to be Handled: Materials handled can include raw materials, WIP, OEM Auto spare parts, packaging materials and finished goods in a span of material types, sizes, weights, products lives and other characteristics. The units to be handled can range from individual small items through carton boxes, special storage containers for liquids, drums, sacks, and palletized loads. Special requirements for temperature and humidity may also have to be met in the case of perishables and all of these will impact on the type of warehouses and technology level.

(iii) Warehouse Facility: Type, Size and Location: The type of operation, the design capacity and size of a warehouse and its location will all be influenced if
not directly determined by its exact role and position in the supply chain network, and the role, capacity and location of any other facilities in the supply chain. The customer base, level of inventory, the need for optimization of inventory, time compression in the supply chain and the overall customer service levels should also be considered when deciding on type, size and location. A further consideration here is whether the warehouse facility should be an own-account operation run by the company or outsourced and run by a 3PL.

(iv) Inventory and Inventory Location: Within a supply chain network there is an issue not only of what materials to stock and in what quantities, but also in what locations. Options can include distribution centers devoted to specific markets or parts of the product range, distribution centers dedicated to serving specific geographic areas, or regional distribution centers that hold for example the fast moving product lines, with the slower lines held only in a Regional distribution center (RDC). The option depends on such factors as customer base, product range and service levels required.

The options on the level of technology have already been noted, and the range can go from very basic installations with high manual input and least mechanization to fully automated and robotic installations.

The decision can be influenced by
1. Company-wide strategic marketing or employment policies,
2. Financial considerations,
3. Ability to achieve specified degree of throughput, and
4. Required customer service level.

Other factors can include the need for flexible operation to meet important demand fluctuations such as seasonal variations, and the perceived future stability and growth of the market and product range. The level of technology adopted in
any particular application should be chosen because it almost nearly matches the
given requirements and objectives. It is not true that automation or similar
technologies are accurate in every case. It is true that good, probably computer-
based, communication and information systems are vital in every application, irrespective of the technology level.

**(v) Choice of Unit load:** The option of unit load or loads – pallets roll or cage pallets, tote bins - will be determined by the nature and characteristics of the materials passing through the supply chain, and this clearly encompasses an enormously wide range of goods, unit quantities, and pack types and sizes. This may appear as a very important factor more subject to basic operation than to strategic influences. However, within the warehouse it can influence the option of handling equipment and the types of storage systems. In the wider context it will affect transport operations in terms of vehicle loading and unloading and vehicle utilization.

### 2.3 Warehousing in India

The warehousing industry in India provides a study in contrasts. The industry comprises both kinds of warehouses – the modern multi-purpose logistics centers as well as the traditional storage facilities, commonly known as godowns. More often than not, these two kinds of warehouses belong to two distinct types of warehouse providers as well. The modern logistics centers are provided by players from the organized sector, while the godowns largely belong to the unorganized sector.

Currently, the organized sector has only a minor share, approximately 10 per cent or about 50 million sq.ft (Square Feet) of the 500 million sq.ft strong warehousing industry, which is valued at an estimated ₹.50 billion annually. However, when it comes to value, the organized sector claims a higher share of the
pie, approximately 15 per cent, or \$0.8 billion because of the premium it could attract from customers on account of superior quality. Invariably, this sector is the preferred choice for investors, who are eager to know how it will turn out in future.

The low presence of organized sector players in the industry is primarily due to two reasons: First, the Indian industry is yet to completely wake up to the outsourcing scenario. With nearly 40 per cent of the warehousing space being owned by companies themselves, the entry of warehouse providers is restricted. Second, the Indian logistics industry as a whole is in a nascent stage of maturity and the shift from storage godowns to logistics centers has only just begun. While the transformation is in its early stages, it has been steadily picking up. The organized sector is expected to grow at 25-30 per cent per annum, while the warehousing industry as a whole is estimated to grow at 9-10 per cent between 2010 and 2015.

2.4 Type of Warehousing in India

After getting an idea about the need for warehousing, let us identify the different types of warehouses. In order to meet their requirement various types of warehouses came into existence, which may be classified as follows.

i. Private Warehouses

ii. Public Warehouses

iii. Government Warehouses

iv. Bonded Warehouses

v. Co-operative Warehouses

(i) Private Warehouses: The warehouses which are owned and managed by the manufacturers or traders to store, exclusively, their own stock of goods are known as private warehouses. Generally these warehouses are constructed by the farmers near their fields, by wholesalers and retailers near their business centres and by
manufacturers near their factories. The design and the facilities provided therein are according to the nature of products to be stored.

(ii) Public Warehouses: The warehouses which are run to store goods of the general public are known as public warehouses. Anyone can store his goods in these warehouses on payment of rent. An individual, a partnership firm or a company may own these warehouses. To start such warehouses a license from the government is required. These warehouses are also used by manufacturers, wholesalers, exporters, importers, government agencies, etc.

(iii) Government Warehouses: These warehouses are owned, managed and controlled by central or state governments or public corporations or local authorities. Both government and private enterprises may use these warehouses to store their goods. Central Warehousing Corporation of India, State Warehousing Corporation and Food Corporation of India are examples of agencies maintaining government warehouses.

(iv) Bonded Warehouses: These warehouses are owned, managed and controlled by government as well as private agencies. Private bonded warehouses have to obtain license from the government. Bonded warehouses are used to store imported goods for which import duty is yet to be paid. In case of imported goods the importers are not allowed to take away the goods from the ports till such duty is paid. These warehouses are generally owned by dock authorities and found near the ports.

(v) Co-operative Warehouses: These warehouses are owned, managed and controlled by co-operative societies. They provide warehousing facilities at the most economical rates to the members of their society.

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7 Mohan .V E, Warehousing & Inventory Management , Post Graduate Diploma In Supply Chain Management, CII Institute of Logistics, Chennai, Warehousing.pdf, PP. 5-13
2.5 Selection of Warehouse

Warehouse Management and Physical Distribution are important flow control activities in the supply chain network. Regardless of the efficiency with which all preceding activities have been conducted, these activities have major influence in determining the degree to which total customer service level is achieved.

In present global business environment, the quality of warehousing and distribution management can have major impact on corporate performance and profitability. The following flow chart clearly shows hierarchy of decisions to be made about the selection of warehouses in the strategic marketing policies with an objective of achieving max customer service level.
**2.5.1 Sequence of Warehousing Decisions**

The following points to be ascertained during the progression of making warehousing decisions.

1. Should warehousing be used?
2. What forms of warehousing should be used (public or private)?
3. What should be the size and number of warehouses utilized?
4. Where should warehouses be located?
5. What warehouse layout and design approach should be followed?

2.6 Functions of the Warehouse

(i) Receiving: This includes the physical unloading of incoming transport, checking, recording of receipts, and deciding where the received goods are to be put away in the warehouse. It can also include such activities as unpacking and repackaging, quality control checks and temporary quarantine storage for goods awaiting clearance by quality control.

(ii) Inspection: Quality and quantity check of the incoming goods for their required Characteristics.

(iii) Repackaging: Incoming lot may be having non-standard packaging which may not be stored as it is in the respective location. In those cases these materials have to be pre packed in unit loads/pallet loads suitable for storage.

(iv) Put away: Binning and storing the goods in their respective locations including the temp locations from the receiving docking area.

(v) Storage: Binning the approved material in their respective locations.

(vi) Order-Order picking / Selection: Goods are selected from order picking stock in the required quantities and at the required time to meet customer orders. Picking often involves break bulk operations, when goods are received from suppliers in, say, whole pallet quantities, but ordered by customers in less than pallet quantity. Order picking is important for achieving high levels of customer service; it traditionally also takes a high proportion of the total warehouse staff
complement and is expensive. The good design and management of picking systems and operations are consequently vital to effective warehouse performance.

(vii) **Sortation:** This enables goods coming into a warehouse to be sorted into specific customer orders immediately on arrival. The goods then go directly to order collation.

(viii) **Packing and Shipping:** Picked goods as per the customer order are consolidated and packed according to customer order requirement. It is shipped according to customer orders and respective destinations.

(ix) **Cross-docking:** Move products directly from receiving to the shipping dock – these products are not at all stored in the specific locations.

(x) **Replenishing:** This is the movement of goods in larger order quantities, for example a whole pallet at a time, from reserve storage to order picking, to ensure that order picking locations do not become empty. Maintaining stock availability for order picking is important for achieving high levels of order fill.8

### 2.7 The Smart Warehouse – Need of the Day

A major reason behind this growth is the changing perception of companies. An increasingly mature Indian industry is viewing supply chain not as a cost center, but as a profit center - a strategic arm which could be leveraged to increase revenue and the overall profitability of a company. In this supply chain, logistics is a crucial element holding the key to both better customer satisfaction as well as cost reduction.

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8 Mohan. VE, Warehousing & Inventory Management, CII Institute of Logistics, Chennai, PP. 5-24
Modern logistics centers require better processes, technology, equipment a trained workforce and of course, better infrastructure. But for Indian companies, all this also comes with a rider- the need to justify the investment, increase in rentals and other costs, thus boosting the need for smart warehouses.

EXHIBIT: 2.3
WHAT IS A SMART WAREHOUSE

| S | Scalable: Customers are looking for warehousing solutions that can cater to their long-term needs-while being cost-effective for their current volumes and SKU complexity. According to most companies, the volumes and SKU proliferation is increasing at very high rates every year and they want stable warehousing solutions which can handle such needs over a period of at least five years. Many companies find it difficult to migrate |
operations from one facility to another in short intervals and the benefits of supply chain integration are lost if due to the need for adequate space, the operations have to be spread across multiple facilities in the same region.

**Mechanization – compatible:** Many companies believe that if not immediately, most of their distribution centers should be mechanized and operated through sophisticated warehouse management systems, at least in the near future. Companies want high throughputs and high density warehouses in their supply chains which could perform the multifaceted roles of the emerging logistics centers and mechanization is a crucial step forward. Supply chain directors are unanimous in their opinion that in order to handle the increasing volumes and complexity of products in the future, they have no option but to mechanize their operations, as otherwise managing the business will be next to impossible. Accordingly, warehouses need to be built with sufficient floor strength, column pitches, provisions for dock levelers and equipped with adequate power supply and charging points.

**Accurate:** The customer today tolerates no mistakes and companies can therefore afford none. They want their warehouses to be able to ship out the orders to absolute perfection. The increasingly large number of modern retail stores, combined with reduction in supply chain layers, puts the onus of handling a complicated upstream and downstream network on the warehouse and missed, damaged, or misplaced deliveries are not an option. As a result, warehouse processes have migrated from a simple put away or picking procedure to a much more complex, multi-step process which has sequential checks and balances and which needs an entirely different approach to warehouse design. This design has to accommodate requirement such as adequate lighting and specific zones such as quality assessment, forward picking or staging area. It also needs to provide for safety measures such as fire protection, and pilferage control as well as training staff about various hazards, protections norms and safe work practices.

**Responsive:** Not only does the customer not tolerate any error, but she also wants the products on her shopping list immediately and fresh, whether she buys it from her neighborhood supermarket or from an online store. Companies need their supply chains to be agile and their warehouses, more
responsive than ever. Infrastructure has to gear up for extremely swift action and the workforce motivated on the same lines. This, therefore, means that warehouses from being the godowns of yesteryear, have to be turned into logistics centers of excellence. To take a step forward, warehouses need to attract, train and retain staff to ensure responsiveness and quality of operations and accordingly the work conditions and employment benefits have to increase in order to acquire a skilled workforce.

| Transportation – friendly: | Last but not the least is the need for warehouses to become conducive to emerging models of transportation operations are smooth. Modern warehouses, therefore have to be designed keeping in mind the ever growing utilization of multi-model transportation of containerized loads of longer trucks and trailers and of material handling equipment such as forklifts being used for mechanized loading and unloading. The space outside the warehouse is as much an important aspect of warehousing as is the design within. Logistics centers need to provide adequate parking space for trucks, sufficiently wide roads and turning area for trucks of the largest size, and as is becoming increasingly important, adequate facilities for drivers. |
| Source: Miebach Research 2012 |

2.8 Driving Factor for Growth Warehousing in India

So, what has changed the perception of companies? Is it the growing economy increasing production or higher volumes? The perception towards warehousing is changing because of all this, but also because of the increasing demands of the end consumer.

2.8.1. The Power of the Customer: The growing economy has resulted in a burgeoning demanding middle class in India, the segment which is diversifying in their discretionary expense and is exposed to the huge variety of consumer products available in the Indian market due to globalization. An increase in
incomes has been leading to more consumption and higher economic growth which, in turn, provides more employment opportunities and higher salaries.

The members of this segment are becoming increasingly aware of new product ranges launched across the world and the importance of product freshness. They also have increasing access to modern retail formats, where manufacturers of consumer products across the world are at war with each other to gain the highest market share. The customer today asks for more variety, higher quality and availability and is not ready to wait. The new increasingly aware customer has made corporates wary and eager to devise agile and responsive supply chains.

In a recent Miebach study, Miebach India Warehousing 2010, close to 50 supply chain heads across different industries were surveyed on various warehousing decision parameters. According to them, the most critical drives are an increasingly demanding customer increased SKU complexity increased volumes and an increasing demand for quick response from companies.
EXHIBIT: 2.4

TRIGGERS FOR THE NEED OF BETTER FACILITIES

- Increasing Use of Bigger Trucks / Trailers
- Increasing Importance on Safety and Hygiene
- Increasing Volumes from Consolidation of Supply Chain
- Increasing Customer Awareness about Freshness etc
- Increasing Demand for Responsiveness
- Increasing Volumes from Demand Growth
- Increasing SKU Complexity

Source: Miebach India Warehousing 2010

2.8.2. Government Support: Government initiatives have helped their cause to some extent and it will continue helping in developing a supply chain which relies on a short, compact supply chain, with thorough information flow, and a robust and swift transportation network.
EXHIBIT: 2.5
GOVERNMENT INITIATIVES TO FACILITATE THE GROWTH OF THE LOGISTICS INDUSTRY

2.8.3. India’s Emergence as Manufacturing Hub: A major stimulant of the growth of India’s warehousing industry has been the steady development of India as a global manufacturing hub. Along with the increase in domestic consumption, there has been a sizeable increase in India’s Exim trade. With a stable GDP growth of 9 per cent per annum, India has flourished in multiple industries, notably retail, auto, IT, telecommunications, pharmaceuticals and textiles. The volumes from these sectors have increased multiple times in the last decade and subsequently, their need for bigger and better logistics facilities has fuelled the growth of the warehouse industry.

2.8.4. The Development of Infrastructure: The recent policies and fiscal plans have focused heavily on infrastructure growth, the backbone of the country,
without which any dreams of becoming an industrial powerhouse can never be realized by the country. The development of some infrastructure in plans for the Dedicated Freight Corridor, the Golden Quadrilateral and the East-West Corridor, along with the new ports and terminals on both the east and west coasts of the country has resulted in increased growth in the warehouse sector as well. Apart from the rising number of warehouses along these corridors, the developing infrastructure has also created a new sector multimodal logistics parks.

2.8.5. The Indian Warehousing Map Selecting a Location: A very critical, if not the most critical decision, taken by a customer company during setting up or contracting a warehouse is the location of the warehouse. With the increased importance of each warehouse in the emerging consolidated supply chain scenario, a smart warehouse loses most of its inherent purpose if the location of the warehouse is wrongly chosen. A poorly chosen warehouse location can result in very high losses due to missed tax benefits, missed shipment deadlines on account of poor connectivity, unavailability of skilled workforce in a particular area or traffic bottlenecks, such as truck bans.

In such scenarios, the losses incurred would undermine any gains obtained from the best infrastructure and world-class processes within the warehouse. For these very reasons, logistics managers from various manufacturing companies stress heavily on identifying the best location for their warehouses.
Most companies place a lot of emphasis on the economy and infrastructure of the region before selecting a location. However, policy-related initiatives by the national and state governments have helped develop many non-traditional locations as probable hubs for logistics, especially warehousing activities. Such initiatives include policies like the Goods and Services Tax, the development of logistics-friendly infrastructure such as the Dedicated Freight Corridor, the Golden Quadrilateral and the East-West Corridor the new ports, as well as new inland container terminals container freight stations, and free trade warehousing zones across the country.
As a result of the development of the logistics map of India through various policy initiatives, and the growing demand of customers from surrounding regions, a large number of locations could claim to be very good hubs for warehousing in India. They could be categorized into three groups—the frontrunners, the challengers and the newcomers.
## EXHIBIT: 2.7
### CLASSIFICATION OF MAJOR WAREHOUSING HUBS IN INDIA

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
<th>Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontrunners</td>
<td>• Existing logistics hubs</td>
<td>NCR, Mumbai, Chennai, Bangalore, Kolkata, Hyderabad, Pune</td>
</tr>
<tr>
<td></td>
<td>• Primarily the major metros with a very large consumer base</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Excellent connectivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High availability of skilled labor and managerial workforce</td>
<td></td>
</tr>
<tr>
<td>Challengers</td>
<td>• Mostly Tier I or Tier II towns</td>
<td>Ahmedabad, Surat, Vishakhapatnam, Nagpur, Chandigarh, Guwahati, Kochi</td>
</tr>
<tr>
<td></td>
<td>• Connected by existing roads and to be better connected by new corridors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Location of major infrastructure projects such as ports</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A mix of rural and urban consumers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Target of most consumer products and retail companies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Growing pool of skilled yet less costly workforce</td>
<td></td>
</tr>
<tr>
<td>Newcomers</td>
<td>• Mostly Tier II towns</td>
<td>Vijayawada, Coimbatore, Jamshedpur, Lucknow</td>
</tr>
<tr>
<td></td>
<td>• High availability of labor but low on managerial workforce</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Linked to infrastructure projects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Promising because of large development initiatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Existing infrastructure is not very conducive to logistics</td>
<td></td>
</tr>
</tbody>
</table>

Source: Miebach Research

The job of the logistics manager however does not end at selecting the city. His job also requires going one step further and selecting a site, typically on the fringes of the city and on a major highway, which will provide the greatest
benefits in terms of the conditions stated above. Apart from the general conditions laid out before, logistics managers look for more specific details, the most important of which were covered by the study, Miebach India Warehousing 2010.

According to the study, the critical criteria put forth by most managers are: presence of a warehouse within a major warehousing or logistics hub, the proximity to the main demand center, accessibility to major highways and local taxation rules. Most of these are similar to the general location selection criteria. However, in addition to these, the other important factors governing the selection of warehouse location are issues such as proximity to local police stations, fire stations and hospitals; distance from schools or places of worships, and most importantly the environment of industrial relations in the area.

EXHIBIT: 2.8
PARAMETERS FOR EVALUATING WAREHOUSE LOCATION

![Diagram showing parameters for evaluating warehouse location]

Source: Miebach India Warehousing 2010

Hence, most Smart warehouses can be found along specific belts or in warehousing hubs like Manesar, Okhla, Ghaziabad, or Sonepat in NCR, Peenya in Bangalore, Bhiwandi and Panvel in Mumbai or in Dhul-agarh in Kolkata.
2.8.6 The Market Dynamics

The current warehouse industry in India could broadly be classified into three segments - the Laggard or pre-dominantly outdated categories or warehouses, the Leader or the Smart warehouse of today and the Niche, specialized, high – investment, warehouses catering to very specific demands of certain companies.

EXHIBIT: 2.9
SEGMENTATION OF THE WAREHOUSE INDUSTRY IN INDIA

<table>
<thead>
<tr>
<th>Segment</th>
<th>Laggard</th>
<th>Leader</th>
<th>Niche</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>Low Volume, Low SKU complexity</td>
<td>Moderate Volume, Low SKU complexity</td>
<td>High/Very high volumes, Moderate / High SKU complexity</td>
</tr>
<tr>
<td>Characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage Systems</td>
<td>Floor storage</td>
<td>Block Storage</td>
<td>Dense racks /Hybrid/Automated storage</td>
</tr>
<tr>
<td>Height (meters)</td>
<td>5-6</td>
<td>5-6</td>
<td>8-9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12-16</td>
</tr>
<tr>
<td>Size (sq. meters)</td>
<td>1000-2000</td>
<td>2000-5000</td>
<td>5000-10000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10000-30000</td>
</tr>
<tr>
<td>Current Supply</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very Low, not readily available</td>
</tr>
<tr>
<td>Implication for</td>
<td>High supply makes differentiation very difficult. The segment plays on cost and hence, value proposition is very low. Not an attractive segment to enter for new investors or service providers</td>
<td>Currently the SMART warehouse and preferred choice of many companies</td>
<td>May become the SMART warehouse of the future. At present, only build-to-suit</td>
</tr>
<tr>
<td>Investors</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Miebach Research
2.8.7 Customer Demand

The Laggard segment is no longer the piece of warehousing pie that the customer companies want. Most of them fail to meet the Smart criteria by a long shot; while the Niche segment meets almost all the criteria to perfection, they come at a very high price. Many companies are yet to reach a position where they could justify the investments on a Niche segment warehouses if they were to build one, or the costs of operating it, as these warehouses also need very specialized material handling equipment.

The Miebach India Warehousing 2010 study also revealed that a majority of customers want 8.5m high (Leader segment) warehouse for their operations as this fulfill their requirement of a Smart ware house under the present circumstances.

EXHIBIT: 2.10
DEMAND SPLIT-HEIGHT OF WAREHOUSE
Companies which have become users of the Niche segment are generally companies with futuristic requirements or corporates with a trendsetting vision in supply chain. However with the gradual migration of most companies towards the higher end of the warehousing value chain, the Niche segment warehouses of today are destined to become the Smart warehouses of tomorrow over a period of five to seven years.

2.8.8 Money Matters

In line with the demand-supply scenario for the three segments of warehouse, the risk and return portfolio also changes for the investors and the developers across the country, only varying slightly from region to region.

EXHIBIT: 2.11
RISK–RETURN PROFILING OF DIFFERENT SEGMENTS IN THE WAREHOUSING INDUSTRY

<table>
<thead>
<tr>
<th>Category</th>
<th>Risk</th>
<th>Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laggard</td>
<td>Very high supply, gradually reducing demand. New entrants may find no customers or customers at very low rates.</td>
<td>Return on capital employed: Less than 10%. Requires very low investment and design know-how to develop</td>
</tr>
<tr>
<td>Leader</td>
<td>Low risk, should avoid getting trapped by low rates offered by competitors from the Laggard segment</td>
<td>Return on capital employed: 10%-15%. Requires standard investment and design know-how, should incorporate good logistics practices during development.</td>
</tr>
<tr>
<td>Niche</td>
<td>Very high risk if built without an agreement with a ready customer, risks of not finding replacement customers if a running contract ends prematurely</td>
<td>Return on capital employed: 15%-20%, can be higher for very specific requirements, but are generally developed by customer companies themselves because of high complexity involved.</td>
</tr>
</tbody>
</table>

Source: Miebach Research
As highlighted earlier, this industry is highly fragmented with a very low presence of players from the organized sector. As a result, a very large range of prices could be observed in the major warehousing hubs. The lower end predominantly is quoted by players from the Laggard segment, while the higher end is charged by the Leaders. The Niche players, by virtue of the fact that most get into exclusive contracts and build-to suit agreements, have a long term arrangement and are therefore not a part of the range, which is meant generally for ready-to-occupy or public warehouse. Typical occupancy of the industry hovers around 65 percent – 85 percent, which could be explained by two factors – seasonality, and the lean period between two successive contracts.

EXHIBIT: 2.12
RENTALS OF WAREHOUSES ACROSS MAJOR HOTSPOTS IN INDIA

<table>
<thead>
<tr>
<th>Hub</th>
<th>Price Range (INR/sq.ft/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCR (Okhla)</td>
<td>35-45</td>
</tr>
<tr>
<td>NCR (Manesar, Ghaziabad)</td>
<td>12-16</td>
</tr>
<tr>
<td>Bangalore</td>
<td>14-18</td>
</tr>
<tr>
<td>Mumbai</td>
<td>12-18</td>
</tr>
<tr>
<td>Kolkata</td>
<td>14-18</td>
</tr>
<tr>
<td>Chennai</td>
<td>15-20</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>12-16</td>
</tr>
<tr>
<td>Pune</td>
<td>12-16</td>
</tr>
</tbody>
</table>

Source: Miebach Research

2.8.9 The Investors

This industry, till recently, has been dominated by the Laggards, and hence, has been low on financial returns. However, the returns achieved by the Leaders
and the Niche players have been much higher, and the shift of the industry from the unorganized to the organized also correlates to a shift from the Laggards to the Leaders and the Niche.

In the coming decade, this industry is poised to provide high and stable returns to the investors and developers who could provide the most required smart warehouse to customers. Simultaneously, investors and developers need to look beyond the four walls of the warehouse, and develop integrated logistics facilities. Instead of creating one smart facility, the should create a park multiple smart facilities. Sharing common amenities.

The organized warehousing market is set to grow threefold in size in the next five years. The business opportunity is not just in terms of the share of the total area covered by warehouse (the share of organized warehousing will grow from 10 percent 10 to 20 percent in terms of square feet), but it is in terms of the share of overall revenue from the market. From a 15 percent share of warehousing revenues, the organized market now commands 30 percent of the revenues from this industry, and that is a key driving factor which is influencing many investors towards investing in this market.
2.8.10 Logistics Parks

Creating a logistics park is in many ways more beneficial than creating stand-alone warehouse, both for the customer as well as investors and developers. While a logistics park allows the developer to create common utilizes, thereby reducing cost and maximizing the utilization of the overall area, the customer company benefits by getting better facilities such as a larger pool of trucks, guaranteed power backup from the park’s power station, and most importantly, a comfortable work environment to attract talent which would otherwise have been reluctant to join this industry because of the perception of a poor work environment.

Many investors have already realized the benefits of developing logistics parks, and a large number of customer companies as well as third party logistics providers have started occupying warehouse in these parks. The more successful
warehouse closely, while those which have been unsuccessful, are facing the critical issue of low occupancy.

Another marked difference between these two types of developers is also that the former have gone for a mixed model of logistics park development, while the latter have opted for a standard warehouse park, thereby highlighting the trend that customers are more inclined towards a more integrated, mixed model of logistics park development. It will take some time, but by the middle of this decade, completely mixed model logistics parks will grow in numbers and by the end of the decade, they are expected to become the norm.

**EXHIBIT: 2.14**
**MODELS FOR LOGISTICS PARK DEVELOPMENT**

<table>
<thead>
<tr>
<th>Logistics Park Segment</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entirely Mixed Model</td>
<td>Integrated logistics facilities along with residential, community and commercial facilities which could cater to most of the day-to-day needs of the employees at the park</td>
</tr>
<tr>
<td>First Level Mixed Model</td>
<td>Integrated logistics facilities, comprising Smart warehouses, Niche Warehouses, multi-model transport terminals, and a few commercial facilities to act as basic amenities for employees at the park</td>
</tr>
<tr>
<td>Elementary Warehousing Park</td>
<td>Integrated warehousing facilities with basic amenities and almost no commercial facilities at all</td>
</tr>
</tbody>
</table>

Source: Miebach Research

Apart from customers and investors, even the government both at the national and local levels in interested in setting up logistics parks. The grounds for this interest are because of two predominant reasons:

a. Boost trade and along with it, the economy of the country or the region.
b. Solve traffic congestion and urban problems such as environmental degradation in densely populated areas.
The logistics park, as a sector in the Indian logistics industry, is fast growing to become a sought-after sector for investment. An illustrative list of recent investments in this sector. A part from the huge potential of this sector, a critical characteristic that attracts investors to logistics park real estate is the stability of returns from this sector when compared to other areas of investment. While the internal rates of return are similar from both the logistics real estate and other commercial real estate sectors, logistics parks offer a steady stream of revenue and hence cash flow, when compared to the highly fluctuating nature of the commercial real estate business⁹.

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**EXHIBIT: 2.15**

**RECENT INVESTMENTS IN LOGISTICS PARKS IN INDIA**

<table>
<thead>
<tr>
<th>Company</th>
<th>Based out of</th>
<th>Nature of Investment</th>
<th>When</th>
<th>Investments (Million USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future Capital Holdings</td>
<td>India</td>
<td>Launch logistics fund for setting up warehouses through a JV with Real term Global</td>
<td>Within three years, starting from February 2008</td>
<td>700</td>
</tr>
<tr>
<td>Arshiya International</td>
<td>India</td>
<td>Plans to set up five FTWZ</td>
<td>Announced in 2010, the first FTWZ operational in Mumbai since August 2010</td>
<td>560</td>
</tr>
<tr>
<td>Tata Real Estate</td>
<td>India</td>
<td>Tie-up with jafza to develop logistics parks across seven major locations in India</td>
<td>Funding commenced from November 2008</td>
<td>537</td>
</tr>
<tr>
<td>K Raheja Group</td>
<td>India</td>
<td>Tie-up with Prolog to develop logistics parks in WB, Karnataka, Tamil Nadu, and Maharashtra</td>
<td>Work commenced from September 2008</td>
<td>515</td>
</tr>
<tr>
<td>Uniworld Logistics</td>
<td>India</td>
<td>Integrated logistics park</td>
<td>Opened January 2009</td>
<td>500</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
<th>Description</th>
<th>Details</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khaleeji Commercial Bank</td>
<td>Bahrain</td>
<td>Investment in developing India’s largest integrated logistics park over 400 acres in Mumbai</td>
<td>Floated in August 2010</td>
<td>400</td>
</tr>
<tr>
<td>Everstone Capital Management</td>
<td>India</td>
<td>Raising new funds to invest in warehousing in India</td>
<td>First fund mobilized in Aug 2010, second part of fund to be raised by end of 2011</td>
<td>350</td>
</tr>
<tr>
<td>YCH Group</td>
<td>Singapore</td>
<td>Investment in next 5 years to set up 10 logistics parks across India</td>
<td>Announced in May 2008</td>
<td>225</td>
</tr>
<tr>
<td>Shree Shubham Logistics</td>
<td>India</td>
<td>Set up 41 agri-logistics parks across the country</td>
<td>Four parks completed by 2009, 11 more in 2010</td>
<td>135</td>
</tr>
<tr>
<td>Safe Express</td>
<td>India</td>
<td>Investing in 32 logistics parks</td>
<td>4 Parks before April 2010, 3 parks in south between April and December 2010, plan to complete 2 more by February 2011 and the rest in 2 years to follow</td>
<td>135</td>
</tr>
<tr>
<td>SKIL Ports and Logistics</td>
<td>India</td>
<td>Raised funds to finance a port logistics project</td>
<td>Raised in October 2010</td>
<td>121</td>
</tr>
<tr>
<td>Vision India Real Estate</td>
<td>India</td>
<td>Planning to develop logistics parks</td>
<td>Commencing from April 2010</td>
<td>110</td>
</tr>
<tr>
<td>Aegis Logistics</td>
<td>India</td>
<td>Investment in oil terminals</td>
<td>Commencing from November 2010</td>
<td>100</td>
</tr>
<tr>
<td>DARCL Logistics</td>
<td>India</td>
<td>Investment in Project Logistics</td>
<td>Announced in July 2010</td>
<td>100</td>
</tr>
<tr>
<td>Shri Kailash Logistics</td>
<td>India</td>
<td>Launching new logistics park</td>
<td>July 2010</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Miebach Research 2012

2.9 Opportunities for Warehousing in India

India has become a manufacturing hub for most industries. The main reasons for this are increasing domestic consumption and the cost-effectiveness of
outsourcing manufacturing activities. Some industries have gained tremendous traction over the last few years, cashing in on the ongoing trend of the economy. These include the following:

- Automotive
- Retail
- Pharmaceutical
- Agriculture

2.9.1 Automotive: The automobile industry in India has attracted much attention due to the sharp increase in the sales of automobiles in the country. In January 2010, total automobile sales in the domestic market reached 1,11,4157 units. The figures show an increment of 44.9 per cent compared to the sales units of 7,68,698 in the same period last year. Annually, the Indian automobile industry is growing at an average rate of 30 per cent and marking itself as one of the fastest-growing industries in India. The market, estimated to have a turnover of over ` 3 trillion in 2011, is expected to grow by 11 to 13 per cent during 2011-12.

Now, with the advent of foreign players into the market, the increasing importance of efficient logistics and Just In Time (JIT) services, has made the automotive logistics industry in India evolve much faster as compared to that in other sectors. Almost all players in the automotive industry use 2PL or 3PL for a part of their logistics operations. A trend towards creating a perfect blend of in-house and outsourced service components to effectively manage supply chains is leading to the emergence of 4PL services.

Warehousing has been gaining tremendous importance due to the growing need to reduce storage and lead times for inventory. In addition, the concentration of the auto manufacturing activity in a few places has led manufacturers to construct warehouses in strategic locations, which then serves as the central point
for distribution and collection of finished and intermediate products including auto
parts. This primarily works on the theory of augmentation and assortment.

The government has also contributed to the growth of the warehousing
sector. It has established Special Economic Zones (SEZs) especially for auto
manufacturers, usually close to the ports, to cater to the growing demand in the
automobile sector. SEZs in Haryana, Jharkhand, Karnataka, Maharashtra, Tamil
Nadu and West Bengal are established by government. It is now planning to set up
two new automotive manufacturing hubs spread across 10,000 acres each in
central and eastern India. Mahindra World City is a prominent SEZ, located in
Chennai, Tamil Nadu. Companies such as Wabco-TVS, Brakes India Limited,
Madras Engineering Industries, Sundaram Brake Linings, Sundaram Clayton,
Sundaram Fasteners, Timken India and UACL Fuel Systems have set up their
manufacturing units in the SEZ to harness the advantage of being the major auto
export hub in India. The main purpose of these SEZs is to help manufacturers
either set up their own warehouses or outsource them to 3PLs. The SEZs provide
manufacturers with dedicated as well as shared-user facilities wherein, two or
more manufacturers share the warehousing services in order to cut down their
supply chain costs. This has also increased the need for the use of modern
technology such as RFID and WMS to track the goods in the warehouses.

The 3PLs such as DHL and NYK also provide value-added services such as
assembling, pre-delivery inspection, cross-dock facilities, consolidation and
deconsolidation centers, automation and sorting, catering to the needs of the
automakers. The auto logistics market is expected to transform from traditional in-
house logistics to increased outsourced activity to specialised 3PLs. This in turn is
expected to result in sophisticated and mature supply chains, thus reducing costs
and fostering the growth of the auto logistics market.
2.9.2 Retail: The retail market in India has been one of the most attractive investment destinations for multinationals and private equities. According to US consulting group AT Kearney’s report published in June 2010, India is the third-most attractive retail market for global retailers among the 30 largest emerging markets. Favourable demographics, rising disposable incomes, increasing urbanisation, relatively low penetration along with large expansions by existing players and the entry of new players are the major drivers of the Indian organised retail market. Though the market slowed down due to the economic downturn, the rebound in late 2009 and consequent recovery in consumer sentiments helped the organised retail industry expand by 25 per cent in 2009-10.

Driven by buoyant consumer demand and the expansion plans of organised retail players, CRISIL Research forecasts the sector to grow at an average annual rate of 23 per cent to `. 3.4 trillion in 2014-15 from `. 1.2 trillion in 2009-10. Consequently, organised retail penetration is likely to increase to 9.1 per cent in 2014-15 from 6.4 per cent in 2009-10.

Increasing industrial investments in manufacturing (near Chennai) and IT investments (in Bangalore and other southern cities) are expected to drive the growth of retailing especially in south India, thus pushing the demand for modern warehouse space. In addition, the increasing relationships of logistics players—DHL, FedEx, Gati, with retail companies—Celio, Pantaloons, Future Group, Danone, are increasing the demand for quality warehousing spaces in India.

With the increasing demand for modern warehouses, global players have started foraying into the market either in partnership with domestic real-estate companies or by setting up their own subsidiaries in the country. For example,
Concerto Developments, one of the largest logistics and warehouse developers in Europe, has set up a company in India, Logistics India Real Estates, which is set to open a chain of modern warehouse and logistics projects. Its first warehouse infrastructure is to be constructed in Chennai, followed by one in Bangalore.

The success and credibility of retailers depends on ensuring continuous availability of a wide range of products in optimum quantities across a widely spread operational network. This translates to a high level of control on logistics. The retail segment also demands the highest quality of service from logistics solution providers. Global benchmarks are being increasingly applied to retail operations in India. Not only do logistics service providers require breadth of transportation network but also expertise in storage and value-added services to cater to such a dynamic market.

Food retailing has also gained importance in the recent past. India’s food retail sector, worth around ` 3.1 trillion is expected to more than double, to ` 6.7 trillion by 2025, riding on the emerging organised retail as well as the change in consumption patterns along with fast-changing demographics and habits. As food products are perishable, there arises the need for temperature-controlled warehousing and transportation services, thus opening up investment opportunities in cold storages for multinational companies and private equity firms.

Apart from foods retailing, the changing spending patterns in rural areas have also been attracting retailers to establish their bases in there. As rural areas do not have well-developed infrastructure, retailers are investing in cold storages and customised warehouses nearer to the farms and manufacturing places to avoid damage during transportation and to reduce costs.

The Department of Industrial Policy and Promotion (DIPP) has plans to induce FDI in multi-brand retailing. It wants FDIs to first set up their back-end
logistics to create employment in rural India before allowing FDIs to venture into multi-brand retailing.

2.9.3 Pharmaceutical: The pharmaceutical market is one of the few sectors, which has been relatively resilient during the economic downturn. A highly efficient logistics operation and integrated supply chain is essential to support the growth of the pharmaceutical industry. Most pharmaceutical companies have increased the outsourcing of their logistics functions to 3PLs mainly due to the pressure of lowering operation costs and increasing supply chain efficiency. Logistics costs account for about 45 to 55 per cent of the costs in the pharmaceutical value chain. These costs include packaging, distribution and other value-added services.

More consolidation and integration of logistics operations are likely to happen in the future as customers are constantly looking to outsource their logistics operations to logistics service providers. Pharmaceuticals require highly reliable and safe storage spaces as they are temperature-sensitive and require an environment where temperature range can be pre-defined to accommodate the specific qualifications of the cargo. As Indian pharma companies seek opportunities to supply drugs to the global market, more developed cold-chain management practices will be required to maintain their competitiveness in the market.

Some of the companies have either set up their own cold storages or have outsourced it to specialised 3PLs. For example, Eli Lilly in India have implemented initiatives such as having their own vehicles equipped with cold-chain management systems. Other companies such as World Courier have developed cold-chain management models to help pharmaceutical companies maintain the cold chain.
2.9.4 Agriculture: Agriculture, one of the main occupations of India, accounts for about 16 per cent of the GDP. Despite agriculture losing its share in GDP, it is still the largest economic sector. Lately, agriculture has been regaining its sheen, with the government and private entities taking special interest in developing the sector. However, the agriculture supply chain in India suffers from inefficiencies in the supply chain, leading to heavy losses of commodities throughout the country due to lack of proper storage and transportation facilities. It is estimated that about 20 per cent of the food grains are destroyed annually because of poor storage facilities.

There is a huge gap in the quantity of agricultural produce and the available storage. An estimated cumulative loss of 0.550 million is expected, owing to the lack of proper cold storage facilities for agricultural produce. The huge gap between the demand and supply of logistics services, which was left unattended due to the unorganised nature of the market, has opened up many opportunities for players.

Most supply chain activities for agriculture are handled and controlled by the state-run CWC and FCI or by the unorganised sector. Agricultural produce has to be procured from government designated canters, run inefficiently by middlemen, who operate in cartels. However, the scenario is now changing with the entry of many private and multinational retailers into the market. The advantage of backward integration of their existing activities into the agriculture sector has helped many companies join the fray. This move has encouraged several logistics players to enter the untapped agrilogistics market.

Players like Shree Shubham Logistics of the Kalpataru group, Adani Agri Logistics, Safex, National Bulk Handling Corporation (NBHC), National Collateral Management Services (NCMSL) and a host of unorganised players have
already entered the market by setting up facilities for the agricultural sector. For example, Shree Shubham Logistics Ltd has already established five out of the 11 planned state-of-the-art Agri-Logistics Parks (ALPs) providing world-class warehousing and storage facilities. It will provide cost effective end-to-end supply chain solutions, scientific and reliable storage facilities with support amenities such as weighing, testing and certification. Cleaning, sorting, grading, packaging and funding will be easily available. This will benefit the farming and trading communities as well as corporates. These ALPs are expected to bridge the gap between the demand and supply of the required logistics services.

Apart from the logistics companies, even industry houses such as Reliance, Godrej and the Aditya Birla Group are entering the retailing segment of fresh produce and commodity markets. They are building their own warehouses and arranging transportation from farms to retail outlets. With the increasing participation of private players in the market, the agri-logistics market, predominantly an unorganized sector is expected to consolidate and evolve gradually over time. This consolidation will result in the requirement of huge warehousing capacities with proper infrastructure and seamless backward and forward integration to manage the supply chain.

2.10 Key Challenges for Warehousing in India

Despite its strategic importance in the Indian economy, the opportunities that the Indian landscape presents and its immense potential for growth, the Indian warehousing sector confronts several challenges. While the lack of sufficient physical infrastructure is one of these challenges, the time lag between devising and implementing strategies due to the lack of international warehousing standards is another. Indian warehousing players face challenges and bottlenecks at various stages of their operation lifecycle. Some of these challenges are strategic while others are operational and need to be managed on an ongoing basis.
The sustainable growth of the warehousing sector will rely heavily on how effectively industry players and the government can work together to address challenges in the long term. Some key challenges that Indian warehousing players face are briefly discussed below:

2.10.1 Strategically Challenges

Some of the strategically challenges faced in effective warehousing managements are listed below:

i. **Infrastructure:** Infrastructure is one of the most important components of the warehousing sector. An efficient warehousing operation hinges critically on high-quality supporting infrastructure that includes a good national highway network, interstate roads and congestion free city roads. The total share of organised warehousing space is less than eight per cent of the total warehousing space in India. The industry is fragmented and largely unorganised and is dominated by small players with small capacities, not well-linked with the national highway network and interstate roads.

ii. **Land Availability:** Procurement of land in a strategic location with clear title and proper approvals is still a key challenge for any new entrant to set up a warehouse. Government policies have intervened with the help of various initiatives through various agencies. The lack of existing clear land classifications in Indian cities and the reclassification of land are major concerns as far as the development of warehouse zones are concerned. With land values peaking in the last three to five years, the availability of affordable land is another concern for the industry. It is getting increasingly difficult to procure land at affordable prices for building warehouses in India due to escalating valuations even in the fringes of large cities. To add to the misery, further different states have different rules...
regarding agricultural land acquisition, which create entry barriers and have serious cost and time implications.

iii. Lack of Standardization: The demand for warehousing comes from many sources with specific needs. The lack of warehousing standards and accreditation poses a significant challenge to the industry where quality and flexibility of available warehousing space is a major concern. In most cases for ready-to-occupy warehouses, the companies have to invest further in order to upgrade the space and its specifications to standards that support their operations. As we go forward, the demand from occupiers is expected to put pressure on developers and owners to adopt the standards formulated by policymakers. Many of the ready-to-occupy off-the-shelf basic warehouses do not easily lend themselves to upgradation in terms of technology compliance or accommodating automated equipment.

iv. High Cost of Credit: Access to adequate and timely credit at a reasonable cost is one of the most critical problems faced by this sector. The main reason for this has been the high-risk perception among banks about the unorganised nature of this sector and the high transaction costs for loan appraisal. Since a majority of the players in this sector are small or medium entrepreneurs, they are unable to provide collateral in order to avail of loans from banks and are hence denied credit.

v. Fragmented Market with Unorganised Players: Economies of scale cannot be explored as the warehousing sector in India is dominated by small players with small capacities spread across India. Also cold-chain logistics solutions are always driven through consolidation. All over the world, cold-chain service providers have large fleet sizes and big warehouses with state-of-the-art technology. So far, the current practices of fleet ownership and other policies in India have not encouraged large ownership of fleets. Thus, the costs of cold chain supply are prohibitive at a large scale in India.
vi. Power Outages: Power outages are a major problem currently plaguing cold chains leading to a huge wastage of agri-products every year in India. The increasing cost of power adds further to the warehousing cost for agri-products.

vii. High Costs Due to Long Transit Time: Longer transit time and inadequate infrastructure also increase transportation costs. This leads to collection of material directly at mini-warehouses distributed across locations thereby defeating the purpose of augmentation and distribution.

viii. Complex Tax Regime: The delay in the implementation of GST and the existing complex sales and transport tax system tends to discourage the establishment of a national-level centralized distribution center or hubs, the likes of which are often seen in developed countries.

2.10.2 Operational Challenges

Some of the operational challenges faced in effective warehousing managements are listed below:

i. Lack of Integration with Complete Supply Chain: Though warehousing is an integral component of the supply chain, currently warehouses are structured on a standalone basis. Warehousing service providers often struggle with other supply chain stakeholders for integration of information and visibility. This disintegration in the upstream, downstream or both ends of warehousing leads to unpredictability of usage of space and facilities. In addition, this impacts the value-added service performance level expected from warehousing service providers.

ii. Lack of Trained Manpower: The lack of training institutes adds to the woes of the warehousing sector. Evolving warehouse management processes and operations with more demanding customers, lack of attraction for new recruits
arising from poor working conditions, relatively less attractive incentives and benefits, and the emergence of attractive alternate career options are reasons that contribute to the skill shortage in the Indian warehousing sector.

**iii. Lack of IT Penetration:** The warehousing sector in India, with some exceptions, is characterised by low technology levels that act as a handicap in the emerging Indian and global market. Limited real-time visibility with manual inventory management, warehousing management, documentation, billing and reporting has raised doubts on the sustainability of a large number of warehousing players. The existence of these will be in jeopardy in the face of international competition from 3PL and 4PL service providers.

**iv. Lack of Expertise in Warehousing Technologies:** A majority of the Indian warehousing players today have inefficient methods of storing, handling and monitoring of goods. They also suffer from stock visibility issues, stock traceability, higher pilferages and damages.

**v. Process Inefficiencies:** There is an absence of standardised operating processes and procedures at warehouses. The material unloading, handling, storing and loading are more often carried out in an ad-hoc manner. This not only builds in inefficiency but also leads to many mishandling problems including damages and subsequent increases in cost\(^\text{10}\).

**2.11 Others**

Some of the other challenges are:

\(^{10}\) Rachna Nath (2011), Building warehousing Competitiveness, pwc, PP. 10-16, [www.pwc.com/india](http://www.pwc.com/india)
2.11.1 Means of Increasing Warehouse Productivity:

Warehouse efficiency promotes productivity, which is essential to customer satisfaction. Jason Minghini, senior director, best practices, at Chattanooga, Tenn.-based third-party logistics provider Kenco Logistic Services offers the following tips for creating more efficient, productive warehouse operations.

i. **Communicate Effectively:** Clearly communicating to workers your organizational goals and the processes to achieve them is one key to effective warehousing operations. When managers fail to create an environment of open and clear communication, employee productivity suffers, resulting in high turnover and wasted resources.

ii. **Standardize your Processes:** By reducing potential variation in areas such as unloading, accounts payable, shift scheduling, and facilities management. Standardization saves time and money, and reduces errors.

iii. **Measure what Matters:** For continuous improvement in your processes. If an outcome is not important to customers and shareholders, don't waste time measuring it. One 3PL-managed distribution center for a major U.S. manufacturer adopted a work measurement program to gauge and report warehouse performance at the employee level. The facility increased productivity by 10 percent and reduced labor costs by 11.3 percent.

iv. **Determine What Drives Processes to Ensure the Proper Causal Connection between Outcomes and Enablers:** Key performance indicators reflect the past; standardization and error proofing are the answer to productivity now.

v. **Use the DMAIC Method:** To understand the "why" of your operations, not just the "how." This five-step approach (Define, Measure, Analyze, Improve, and
Control) reduces costly process variations. The backbone of Six Sigma methodology, DMAIC ensures sustained, defect-free performance and highly competitive costs.

vi. Involve, Align, and Empower your Associates: The people who do the work every day are process experts who know how to reduce or eliminate waste. Aligning your managers and staff to a company culture committed to inquiry, responsibility, partnership, and customer satisfaction can significantly impact warehouse productivity.

vii. Educate your Leadership: To ask the right questions, gather necessary information, make decisions, and take appropriate, corrective action. This is vital to improving processes, products, and services.

viii. Create a Robust Training Program: That incorporates cross-training. Break a job down and present the operation to new associates. Allow them to test their performance before releasing them to the process. This is more effective than the traditional sink-or-swim method.

ix. Incorporate the use of TAKT time: To achieve a steady fulfillment flow with standardized work instructions. By specifying the maximum cycle time allowed to produce a product in order to meet demand, TAKT time allows you to set targets by showing operators exactly where their work output should be at any given point.

x. Look at Variation, Not Just Averages: To increase productivity. This is the heart of Six Sigma: reducing variation—or variance—to make a process more
stable and predictable. Find a significant measure that reflects your process, then reduce the variability of that process as much as possible\textsuperscript{11}.

2.12 Factors Ensuring Efficient Warehouse Management

Planning is the key to gaining efficiencies in the operation of today’s warehouse facilities and requires the consideration of a large number of factors. This goes for both existing facilities and greenfield facilities. I have outlined what needs to be considered when conducting this planning below. This is, however, by no means an exhaustive list of the items that need consideration in the planning of an efficient warehouse operation.

i. **Product Mix:** Depending on the mix of products and the storage units of measure expected to be handled, the type and mix of the warehouse storage equipment could be anywhere from simple to complex. The complexity increases if the products are stored in one unit of measure and shipped in different units of measure; for example, stored on pallets, but shipped in reaches and/or cases. Adding to this is whether the units of measure can be shipped as is or if they need to be packed into shipping containers. Increasing the complexity further is the mix of product sizing. For example, auto parts will have a range of product sizes from small nuts, bolts and washers to large body panels and gearboxes. Further complexity is added if there are products that require specific storage and handling, such as hazardous materials and temperature-controlled goods.

In addition, from a handling perspective, there may be goods that can only be handled using special equipment, such as drum clamps, or may require operators to wear protective clothing when handling them, such as freezers or chillers. Having a good understanding of the types of products and the way they

are expected to be handled is essential to building the first part of the efficiency picture.

**ii. Throughput (Goods Handling Capacity):** Having determined the product mix expected to be handled, the next step is to gain an understanding of the expected throughput of the products down to the unit of measure level for both inbound and outbound activity. This throughput is rarely linear, so understanding and planning for high and low seasonality, promotional activities and product life cycle is essential. For example:

- Apparel is extremely seasonal, but the seasons are well-defined and repeated. This typically requires a complete relay of the warehouse for each season.

- Some food and beverage products are also seasonal, but the seasons often vary according to the weather, so planning is more difficult. In grocery, there is usually a seasonal relay for the seasonal products in anticipation of their usual selling season.

- Books and DVDs typically have very high throughput at release, but slow to steady volumes quickly. This scenario typically requires short-term, dynamic, high-volume forward pick locations with the products falling back to low-volume pick locations soon after the initial release.

- Auto parts are a little more difficult. After a new vehicle is released to the market, there is usually a surge of buying of the new vehicle followed some time later by a surge in spare parts requirements as the vehicles age. This can be predicted to a degree, but with limited accuracy. There is also a requirement to keep parts in stock for many years after the end of the vehicle’s sales. This scenario usually requires
higher volume pick locations for a time and then low to very low volume pick locations later in the vehicle’s life cycle.

iii. Processes: Having determined the nature of the products expected in the warehouse and their expected volume, it is now possible to make some decisions on how the products need to be handled. Typically, products will go through a fairly standard set of processes, such as receipt, put away, replenishment, pick, pack, stage and ship. There are almost always variations on this, however, often at the product or unit of measure (UOM) level. These variations could include such things as:

- Quality assurance: do any of the products require a quality assurance process on receipt, during their life cycle in the warehouse or during the shipping process? If so, what are the quality assurance criteria and how are exceptions to be handled?

- Repacking: do any products require repacking on inbound, during their life cycle or on outbound? If so, how is this to be incorporated in the process?

- Attribute capture: do any products require the capture of certain attributes, such as lot/batch numbers, best before dates, serials and temperatures? If so, how is this to be done? Are the products appropriately labelled to enable the capture of this information?

- Cross-docking: is cross-docking enabled in the warehouse or for certain products? If so, how is this to be managed?

- Hazardous goods: do hazardous goods need to be stored in a controlled environment? Is any special equipment required in their handling?
iv. Layout, Equipment and Labour: Having built the knowledge around products, throughput and processes some decisions can now be made about the type of storage and handling equipment to be used and the layout of the warehouse. For existing warehouses, there may be no option except to use the existing layout; however, based on the knowledge gained above, it is possible to dramatically increase the efficiency even in existing facilities.

Some of the items that need to be considered include:

- Zones: typically warehouses are divided into a number of zones, which usually comprise groups of locations with similar characteristics, such as pick faces, bulk storage, selective racking, freezer and chiller. These are usually further refined by logical product groupings, such as hazardous class, pet food and slow moving.

- Operational areas: overlaying and often overlapping the zones in a warehouse are the operational areas. These are usually defined around the type of equipment and operators that can operate in these areas. The main use for these is the assignment of directed tasks to the operators in the area with the appropriate equipment to execute the task.

- Hazardous materials storage areas: if hazardous materials are handled, it is often a requirement that they be stored in specific parts of a warehouse where there may be appropriate equipment for managing spills, and appropriately equipped operators and handling equipment, as well as ensuring effective separation from other goods.

- Freezer, chiller and ambient storage areas: these are usually required in grocery, food service or other food and beverage warehouses. Operators usually need protective clothing in the chillers and freezers and, typically,
transactions are effected using voice technology to eliminate operators needing to remove their gloves.

- Other storage equipment: selective racks, drive-in racking, block stacks, carton flow, shelving and bins can be used for the different types of storage and handling requirements. The use of these can be determined by the expected throughput.

- Workflow: the warehouse layout can often prescribe the workflow within the warehouse. For example, the width of the aisles and the height of the racks in a racking area will determine the type of forklift that can access the aisle and whether the aisle is one-way or two. The layout of the aisles will affect the direction that operators must travel along the aisles for picking and put away activities. Determining these travel paths is crucial in improving warehouse efficiency.

- Labour management: using labour management functionality, especially configurable task assignment strategies will greatly improve efficiency, especially when combined with task interleaving. Task management will give accurate real-time task status. In addition, determining labour standards will help determine the most effective travel paths and the number of operators normally required for each task type in each area, and allow effective monitoring of the effectiveness of the warehouse operators. Labour planning uses labour standards to provide demand-based labour requirements for daily activities.

- Slotting: a good slotting solution can help with a lot of these decisions, especially with pick slot assignment, travel path definition, storage
equipment type recommendations and move chain creation for seasonal relays, to name a few\textsuperscript{12}.

2.13 Conclusion

Warehouses use resources (facilities, equipment, inventory investment, labor, etc.), to produce an economically valuable service (customer orders shipped). Traditionally, warehouse performance has been measured using a host of single factor performance and single factor productivity metrics. But, the modern day warehousing systems have changed with the changing demands of end users. Who demand efficient warehouse services that is render at international standards. The following chapter IV focuses on empirical analysis world class warehousing services is offered across Indian, by analysis warehouse designers view point, warehouse service provider and end-users i.e, customers.