

**LEVERAGING LOGISTICS TO ENHANCE INDIAN ECONOMIC
COMPETITIVENESS**

CII Logistics 2003 Theme Paper

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EXECUTIVE SUMMARY

Logistics and its Importance in the Indian Context

Logistics is about moving materials, information and funds from one business to another business or from a business to the consumer. Logistics is an important part of the business-economic system and is a major global economic activity. In fact, 10-15% of product costs are logistics related. World wide logistics is about 2 Trillion US dollars. For any country, the logistics cost are estimated to be between 9 – 20% of GDP. Logistics is a necessary evil to move the material from the seller to the buyer and there is generally no value addition to the product. Hence efficiency and cost effectiveness provide competitive advantage. *Over the last decade, the logistics costs have come down from 15% to 9% in the USA.*

In olden days logistics was local, involving storage and material movement from one city to another city by train or truck. The lowering of trade barriers by various countries, combined with rapid advances in global transportation and information technology, has led to the proliferation of global manufacturing networks. Now manufacturing and services are global to take advantage of low cost wage structures and also to reach the local markets. *In global manufacturing of this kind, components may be sourced from several countries, assembled in yet another country, and distributed to the customers all over the world.* Information transfer regarding the location and status of moving inventory, payments and also the customs paper work plays a big role in efficient logistics. These networks are not generally under single ownership but are group formations of independent companies in alliance for a specific and special purpose. They compete with similar cooperating networks. Such networks are common in all industrial sectors including the automobile, pharmaceutical, aero-space, electronics, computer, food, and apparel industries. Thus, logistics and supply chain management are of fundamental importance to any economy.

Since logistics involves global movement of materials, information and funds from country to country it requires excellent state of the art country infrastructure such as airports, sea ports, Internet and other IT and finance related facilities. *Having good logistics infrastructure and culture is becoming a prerequisite for attracting global manufacturing and service companies in to the country.*

Logistics Growth Strategies

While logistics is generally given importance in manufacturing, it has a vital and important role to play in agriculture and service industries. In this paper, we make the following important points.

1. In India manufacturing accounts for 25% of GDP, about USD 125 Billion and provides employment for 16% of the population. In other developing economies it is generally 40% of GDP. Recently there is a debate, following the success of IT companies in the global markets, whether India should jettison manufacturing and concentrate on IT and other service sectors. We strongly believe, however, that

this is based on wrong premises and that on the other hand *a ten-fold growth in manufacturing will be very important for India*. We cite the following reasons in support.

- a. 75% of India's working population (600m) has education middle school or below. Only Labor intensive manufacturing and related services can generate employment in adequate numbers
- b. Experience of Europe, America, Japan, the Tiger economies, and now China shows that Wealth creation is possible only through International trade oriented manufacturing.

More importantly, it is essential for India to increase its proportion of Global GDP through growth in all the three sectors of the economy. *It has currently 1/6 of population and 1/60 of the global GDP. Planned or wild, growth is essential and important. This could be through attracting MNCs to India or through Indian companies becoming MNCs and raising funds through NASDAQ or large number of small companies raising capital from international venture sources.*

2. With products being uniform, standardized and commoditized: same colas, same PCs, same hand phones sold through out the world, the logistics has become a dominant part of the competitiveness equation. In future, all competitive supply chains will have aggressive and excellent logistics partners. A well articulated logistics strategy is a must for India. While it may take decades to develop state-of-the-art air, rail, road and shipping infrastructure, it is necessary immediately to develop appropriate *supply chain clusters* to support the three sector of the economy. *A supply chain cluster is a geographically concentrated, self-flourishing ecosystem comprising of production systems, shippers, logistics service providers, IT vendors, infrastructure providers, regulatory agencies, research institutions, consultants and other logistics-related organizations that leverages on the interdependencies between them to provide highly efficient and effective logistics solutions and create innovative new solutions.* Simultaneous development of the supply chain cluster companies is possible with careful planning and aggressive marketing to attract MNCs in manufacturing and third party Logistics providers (3PLs). This is important since they bring with them global experiences and also provide the obvious economies of scale advantages.
3. As we said before, logistics in direct supply chains: raw material to product delivery to the customer is given importance through out the world. Logistics is equally important in other two sectors of the economy i.e. Agriculture and Service sectors. The techniques of supply chain management developed for manufacturing are also directly applicable in case of agriculture.
 - a. Improving distribution efficiency of the agri-supply chain from farmer to end consumer through intermediaries such as regional agents, wholesalers, fair price shops, retail stores and distributors. Mapping the supply chain and using IT for providing the visibility along the supply chain will improve the efficiencies by orders of magnitude.
 - b. Manufacture and distribution of fertilizers and farm equipment
 - c. Transformation of produce into processed and canned food and their subsequent distribution to consumers and storage along the way. Use of e-procurement kind of techniques in restaurants and in food courts

4. In the service sector, the opportunities are innumerable. In health care, construction industry, Infrastructure building, and in retailing logistics can play an important and pivotal role to improve the service levels.
 - a. In retail services, goods sold through stores are delivered through an elaborate network of distributors and logistics services.
 - b. Trade finance services provided by banks complement transportation services provided by 3PLs.
 - c. Healthcare services involve coordination between multiple parties of doctors, hospitals, pharmacists, medical equipment manufacturers, etc. These interactions and processes are logistics-based. In clinical trials, drugs and patient samples are exchanged between multiple patients and research institutes.
 - d. Storage and timely distribution of spare parts for repair and maintenance of heavy machinery and equipment is an important element of after-sales service ensuring reliable performance.

Opportunities specific to India

A number of opportunities, specific to the Indian context, present themselves to enterprising companies. Some of these opportunities are related to addressing national concerns while others would enable the Indian economy to be internationally competitive.

1. Outsourcing, Research & Development of IT enabled Logistics: India is a globally acknowledged IT powerhouse. This strength must be exploited by Indian companies to develop specific capabilities in IT-enabled Logistics such as the development and management of logistics planning and coordination systems. Leading Indian IT companies can complement their IT expertise with logistics domain knowledge to develop 4PL capabilities for global manufacturing and service industries.
2. Logistics for Large Infrastructure and Engineering Projects: The recent focus on infrastructure has given birth to a wave of projects such as the construction of airports, seaports, industrial parks and national highways. Often such projects run into costly time and budget overruns. These overruns can however be easily reined in through proper logistics management and coordination of various activities.
3. IT systems for International Trade Logistics: One of the key contributing factors for the inefficiencies of the Indian manufacturing and logistics sector is the complexity of the international trade documentation process. Internationally, pioneering countries such as Singapore and Hong Kong have implemented automated trade systems such as TradeNet and Digital Trade Transportation Network for trade documentation and customs permit applications. The UN has estimated that such systems can save up to 3% of import value through efficiencies resulting from automated and standardized trade documentation. Such systems would make Indian goods more competitive globally.

Conclusions

India should recognize the extraordinary role logistics plays in economic development and in enhancing the competitiveness of all the three sectors of the economy. Given the emerging business and technological trends there are possibilities for the adoption of innovative logistics solutions specifically designed for India. In addition there is a requirement for an integrated strategy towards developing logistics and IT infrastructure and also enhancing its industry base. The resources needed for wholesale development takes enormous amounts of time and resources. A planned phased approach for Integrated Logistics is needed. Our Theme paper is an attempt at presenting such an approach.

1. INTRODUCTION

Increasing globalization and competitive pressures have forced businesses in all sectors of the global economy to focus on the improvement of their operations and logistics not only as a means to reducing their costs but also as a means to attaining greater differentiation in their service offerings. In fact, the success of today's market leaders

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such as Wal-Mart, Dell, Cisco and Toyota is primarily based on their superior operational and logistics capabilities. Also, several successful countries have developed world class infrastructural facilities in terms of physical facilities such as airports and sea ports and also in terms of the IT infrastructure. India should proactively attract investments by following the Supply Chain Cluster paradigm where in all the stakeholders in the supply chain such as

manufacturers, logistics providers, financial institutions, etc are collocated in the region creating a value chain of excellence which is difficult to replicate. The facilities in the cluster can be built simultaneously through careful planning rather than sequentially.

This paper highlights the importance of logistics not only in the manufacturing sector but in all three sectors of the economy and presents some thoughts on how the competitiveness of the Indian economy can be enhanced by adopting promising new technologies and next generation logistics thinking. We also underline the importance of exploiting current opportunities and trends such as the increasing outsourcing of business processes and the establishment of research centers in India by global multinationals to attract more FDI in the area of Manufacturing.

1.1 Logistics defined

Logistics is defined as the broad range of activities concerned with effective and efficient movement of semi-finished or finished goods from one business to another and from manufacturers/distributors/retailers to the end consumers. The activities within the sphere of logistics include freight transportation, warehousing, material handling, protective packaging, inventory control; order processing, marketing, forecasting, and customer service. The Council of Logistics Management (CLM) has also formulated the following definition of logistics with a flow and process orientation.

“The process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information and financials from point of origin to point of consumption for the purpose of conforming to customer requirements”

We employ this definition of logistics in defining the boundary for our subsequent analysis of the Indian logistics market and for highlighting the role of logistics activities in various economic spheres.

2. ECONOMIC RELEVANCE OF LOGISTICS

Even though logistics thinking and practice has progressed rapidly over the last few years, driven primarily by radical business and technological innovations, the true value and relevance of logistics in the business ecosystem is rarely appreciated. The importance of logistics in the economy of a nation is established both, by the size of the logistics industry, and by its ability to transform and impact all three sectors of the economy, agricultural, manufacturing and services. In fact investments in logistics infrastructure and services have a multiplier effect on the entire economy of a nation. A good logistics network can reduce inventory levels in the industry, increase the market reach of companies and allow them to procure supplies from a larger base of suppliers.

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2.1 Size of the Logistics Industry

Logistics is a major economic activity across the world. The global logistics industry is estimated at roughly over \$2 trillion, with less than 5% outsourced worldwide. Logistics costs on average account for 10-15% of the final cost of the finished product in the developed world. These logistics costs, based on studies conducted in the United States, include transportation costs which amount to 7-9% of the cost of the final product, warehousing costs in the range of 1-2% and inventory holding costs which are 3-5% of the final product cost. In the developing world, it is expected that logistics costs will be higher due to greater inefficiencies in logistics system and it is estimated that these costs are in the range of 15%-25% of the final cost of the product. In India the logistics costs are 13% of GDP (CII).

Logistics in India differs from the developed nations in three important aspects.

1. Relatively small manufacturing base.
2. High logistics cost relative to the GDP.
3. The very low penetration of specialist 3PL providers in the country.

2.1.1 State of the Indian Logistics Industry

These effects can be attributed to the lack of proper logistics infrastructure (both physical and infocomm), disorganized paper-based and manual processes, fragmented supply chains and other systemic flaws in the country that have resulted in huge process inefficiencies. The lack of a countrywide infocomm B2B network and the poor

conditions of roads results in capital being tied up in huge stockpiles of obsolete goods both in terms of moving inventory as well as at the factory sites. In addition, the mindset and culture of outsourcing logistics activities to capable third-party logistics service

Potential savings for India if logistics costs decrease by 1% are approximately \$4.8 Billion per year.

providers is just emerging. The lack of proper infrastructure has also resulted in the absence of world-class logistics service providers. In fact, there is no general awareness of standard logistics practices and due to the protected environment for Indian industries there was no incentive for companies to improve their operational

performance till recently. A part of the reason is the lack of professionally competent logisticians. Furthermore, there has been limited concerted effort by the government to articulate an Industry growth policy and also to prioritize the formation of industry clusters and identification of their logistics needs. We will elaborate on this later in this paper.

Table 1: *State of Indian Logistics*

Indian GDP = \$ 480 Billion	
Indian Economy Sector-wise Contribution	
<ul style="list-style-type: none"> • Agriculture - 26 % • Manufacturing - 23% • Service including retail - 51% 	
Country-wise comparison	
Country	Logistics Cost/GDP
India	13%
China	16-20%
US	8.7%
Europe	10%
Japan	11.37%
Potential savings for India if logistics costs decrease by 1%. = \$ 480 Billion x 1% = \$4.8 Billion per year.	

However, if these systemic obstacles are overcome significant benefits can be reaped through the multiplier effect of better logistics on all economic sectors.

2.2 Logistics in the Three Sectors of the Economy

Logistics sustains all three sectors – agricultural, manufacturing and service - of the economy by providing life-supporting arteries that transport essential goods and services

across the country. Furthermore, the competitiveness of the logistics sector and the three sectors of the economy are mutually reinforcing. An efficient logistics system can reduce costs for other sectors of the economy making their offerings globally competitive. In turn, increased demand for globally competitive products builds economies of scale for logistics operations.

2.2.1 Agriculture

The agriculture sector comprises of a number of inter-related value chains.

1. Agriculture Value Chain: The agriculture supply chain starts with the farmer who harvests food crops. The farmer sells its harvest to intermediaries such as regional agents, who comprises of millers and end consumers wholesalers, who in turn sell to distributors, retail shops and fair price shops who distribute the produce to the end consumer.
2. Supporting Manufacturing Services: The supporting value chain for agriculture comprises fertilizer producers and distributors, grain distributors, tractor, and farm equipment manufacturers. Logistics services play an important role in getting these goods to the farmer and in supporting the production of food crops. Financial institutions, Insurance agents, government agencies and other organizations play important supporting roles as well.
3. Processed Food Value Chain: The processed food value chain is responsible for converting food grains into processed/canned foods and getting it within reach of end consumers. Increasingly ready-to-eat food products are being targeted by a number of large manufacturing and the retail distribution companies. Also, linking the chain restaurants with the grain producers can induce efficiencies.

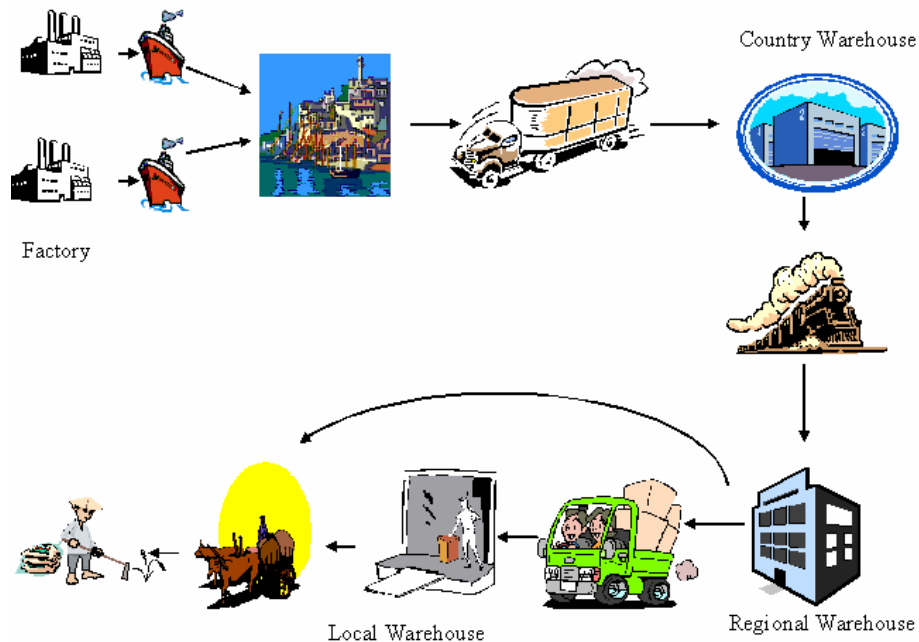


Figure 1: Supporting Value Chain for Fertilizers

Typically, the Indian agricultural value chain is long and slow. In fact, in many cases the end distribution of food grains, fertilizers and other agricultural products and services is undertaken through bullock carts, hand carts. Given that these products are perishable and also subject to attacks by pests, it is important that transport and storage of these items is undertaken with care. Currently the chain is full of inefficiencies introduced by various partners along the chain. There is also a lot of wastage at the interfaces in the chain, as can be seen from the huge stockpiles of rotting food grains at warehouses across the country. It is also not uncommon to see expired food products reaching the retail shelf. Agricultural trading and financing activities are also closely tied up with the logistics of agricultural produce but are still not well understood in the Indian context.

2.2.2 Manufacturing

Manufacturing today is driven by global demands and forces. Global manufacturing is characterized by the staged production of goods by multiple companies across multiple countries and regions. In a national context, components may be sourced from several

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different regions, assembled in another region, and distributed to customers across the country and even across the world. Logistics plays a critical role in coordinating procurement, manufacturing and distribution in such a distributed manufacturing environment. A well managed manufacturing logistics operation can help companies

reduce the cost of transportation and minimize inventory, reducing the cost of inventory holding and freeing up capital. In fact leading companies have successfully employed logistics and integrated supply chain networks to minimize their costs and simultaneously improve and differentiate their product and service offerings to their customers.

Integrated Supply Chain Networks

An Integrated Supply Chain Network (ISCN) is a collection of independent companies, possessing complementary skills and integrated with streamlined material, information and financial flows, that work together to meet the market demand. The formation of an ISCN is typically driven by the most dominant company in the supply chain that is seeking to focus on its core competencies and leverage on the manufacturing and logistics expertise of other companies in the chain. We refer to these dominant companies as network owners. Network owners dictate the structure of the ISCN through their choice of companies constituting the ISCN and ensure proper coordination between them. In the automotive and hi-tech value chain the OEMs typically play the role of the network owner. In case of the retail value chain the distributor is the normally the network owner.

An ISCN would normally be composed of best-of-breed suppliers, contract manufacturers, retailers and service providers held together by the logistics network of third-party logistics providers (3PLs), the Internet and the financial network provided by banks, as shown in Figure 2. The companies in an ISCN can be distributed across geographically distant regions, giving rise to a global supply chain network.

Information on market requirements and forecasts is communicated to all stakeholders in the ISCN through the information network, which is typically the Internet. This initiates material movement in the ISCN, with the logistics network transporting the materials from one production facility to another until the finished goods ultimately reach the customer. The upstream transfer of materials between companies in the ISCN triggers of the downstream payment cycle through the financial network.

An ISCN can deliver a customized, inexpensive and high-quality product to the customer by leveraging on the superior capabilities of individual companies in the network and by coordinating their activities through an Internet-based platform. Moreover, due to the fact that companies in an ISCN share a common destiny while collectively serving the market, competition nowadays is no longer between individual companies but between supply chain networks.

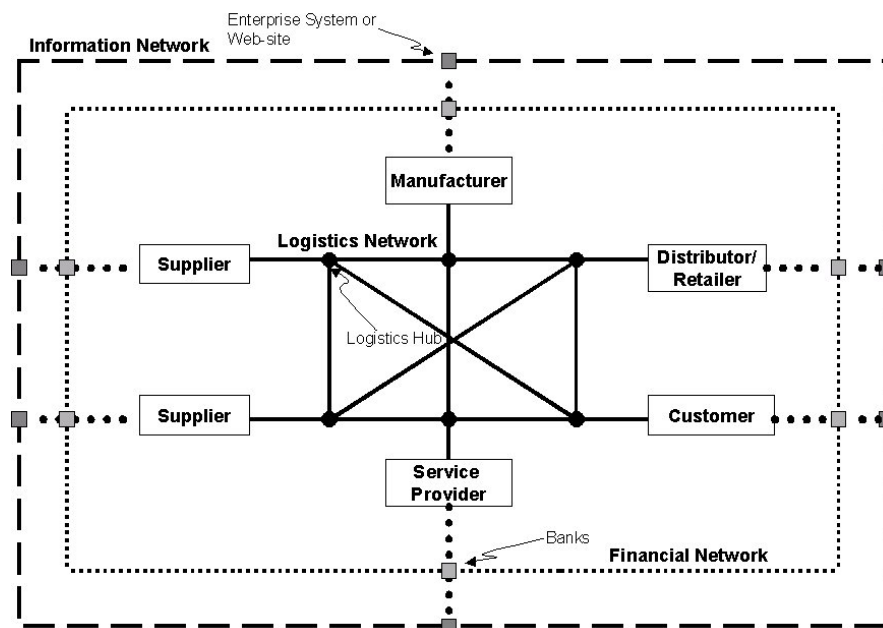


Figure 2: Integrated Value Chain Network (Viswanadham 1999)

2.2.3 Services Sector

Logistics-enabled service chains arise in a number of different contexts. The service sector amongst others comprises of the financial, healthcare, retail and the telecommunications industry. A number of processes in these industries are closely related to logistics. For example, the goods sold through retail stores are delivered through an elaborate network of manufacturers, distributors and logistics service

providers. Trade finance services provided by financial institutions are complementary to transportation services provided by logistics service providers. Healthcare services involve a tremendous amount of coordination between multiple parties of doctors, hospitals, pharmacists, medical equipment manufacturers, medical consumables manufacturers, etc., all managed through systematic management of patient records. Even though it might not be very obvious, on closer inspection it may be noticed that all these processes are logistics-based.

Another manner in which logistics manifests itself in service industries is in the form of supporting after-sales repair and maintenance of goods and products. The after the sale service sector for aircrafts, automobiles, and other capital goods is a highly lucrative emerging business. Some of the after-sales services involving logistics include returns handling of defective goods, spare parts distribution for repair of spoilt items based on service level agreements, servicing of products over their entire life cycle and reverse logistics for disassembly and green disposal. The distribution and maintenance of adequate spare parts to ensure timely repair of spoilt goods for the customer, within promised service level agreements, is a very important logistical function. Such services are often provided by manufacturers of automobiles, medical equipments, defense systems and airplanes.

Manufacturing related service industries support after-sales repair and maintenance of products such as aircrafts and airplanes.

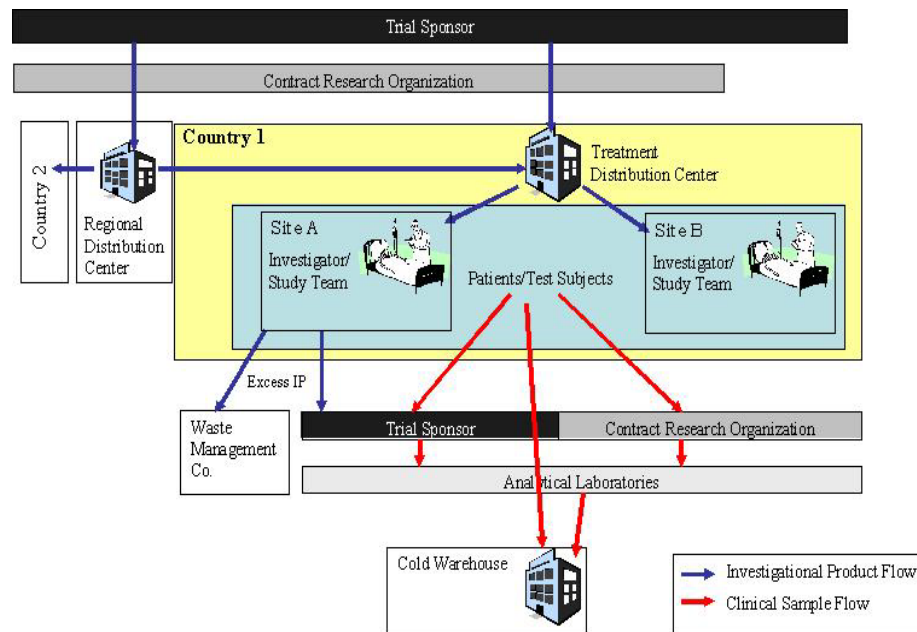


Figure 3: Logistics within Clinical Trial Process

2.2.4 Role of the Three Sectors in the Indian Economy

India has traditionally been an agricultural economy with a major segment of the working population engaged in farming-related activities. Recently however the services sector has grown strongly to account for 51% of the economy. Unfortunately, this growth in the services sector has been at a detriment to the manufacturing sector. In fact,

Despite India's recent growth in the IT and services sector, the importance of manufacturing to the Indian economy should not be underestimated. Only labor intensive manufacturing can generate employment in adequate numbers.

India is possibly the only country that leapfrogged from an agricultural-driven economy to a services-driven economy without undergoing structural economic changes driven by manufacturing. As a result, in India manufacturing

accounts for only 23% of GDP, equivalent to about USD 111 Billion and provides employment for 16% of the population. In other developing economies the contribution of the manufacturing sector to the GDP is generally around 40% of GDP.

Lately there has been a debate, following the success of Indian IT companies in the global markets, whether India should jettison manufacturing and concentrate solely on IT and other service sectors. Despite India's inherent strength in the IT and services sector, the importance of manufacturing in the Indian economy should not be underestimated. In fact, a ten-fold growth in the manufacturing sector will be very critical to the Indian economy for the following reasons:

1. 75% of India's working population (600m) has been educated till middle school or below. Only labor intensive manufacturing can generate employment in adequate numbers for this segment of the population.
2. Experience of Europe, America, Japan, the Tiger economies, and now China shows that wealth creation is possible only through international trade oriented manufacturing.
3. More importantly, it is essential for India to increase its proportion of Global GDP through growth in all the three sectors of the economy. It has currently 1/6 of population and 1/60 of the global GDP. Planned or wild, growth is essential and important. This could be through attracting MNCs to India or through Indian companies becoming MNCs and raising funds through NASDAQ or large number of small companies raising capital from international sources.

3. LOGISTICS SERVICE PROVIDER PERSPECTIVE

3.1 Emerging Logistics Trends and Opportunities

The past half-a-decade has been a time of tumultuous change. Customers have become increasingly demanding looking for better and innovative goods and services that are specifically customized to meet their unique needs. There is also an implicit requirement on the accuracy, timeliness, convenience, responsiveness, quality and reliability of the service offered to them. And all of this is desired at ever-lower prices. Simultaneously, the rapid pace of innovation has resulted in shorter product and technology cycles,

leading to uncertainties in supply and demand. Furthermore, the financial markets are looking for greater and assured returns on their investments in companies. The key drivers affecting change in the logistics industry are:

- a) Reliance on core competences and customer centricity require companies to work with different partners in fulfilling each customer order resulting in formation of trading partner ecosystems.
- b) Heightened expectation of financial markets in shorter cash-to-cash cycles and greater return on assets has lead to need for supply chain and financial chain integration, the emergence of asset-less fourth party logistics service providers and adoption of the value framework for corporate decision making.
- c) The significantly higher costs of not meeting performance expectations in terms of incorrect market forecasting or delayed delivery to customers has resulted in application of risk management techniques for supply chain planning and real-time monitoring and control of supply chains to quickly respond to exceptions.
- d) Pressure to improve profitability resulting in application of revenue management and dynamic pricing strategies, and development of new services such as reverse logistics, service chain management and design for logistics

Hence, the terms of competition, the manner in which companies are operated, and the tools, systems and technologies employed have all changed. The following are 10 Mega Trends in the area of Business Strategy, Technology and Service Innovation relating to the logistics industry. Within these Mega Trends there are a number of small trends as well.

3.1.1 Business Strategy

- Trading Partner Ecosystem: A number of dominant companies are building close-knit networks of suppliers, service providers and other trading partners within their supply chain that collaborate to enhance end-to-end performance of the supply chain.
- Fourth Party Logistics (4PLs): Driven by the advantages afforded by the Internet, new entities have emerged in the supply chain that are focused on virtually managing the supply chain through superior planning, management and knowledge discovery. These companies, known as fourth party logistics (4PLs) providers, are very adept at engaging capable operations-focused 3PLs to execute on their behalf.
- Risk and Security Management: Given recent socio-political trends, the importance of ensuring the security of goods that are transported and stored is now well understood. In addition, companies are putting in place safeguards to protect themselves from disruptive events in their supply chains.
- Value Framework: Due to investor pressure, the benefits of logistics are now being measured and justified in terms of value added to the company.

Given recent socio-political trends, the importance of ensuring the secure transportation and storage of goods is now well understood.

3.1.2 Technology

- Financial Flow Integration: Traditionally, the focus of logistics management has been on integrating and automating the material and information flows in the supply chain. However, recently the financial flows are also being integrated in decision making and are being automated for straight-through processing.
- Dynamic Pricing and Revenue Management: With increased visibility on market supply and demand companies are using dynamic pricing and revenue management tools to maximize their profits through better matching of supply and demand.
- Real-time control & Event Management using Radio Frequency Identification Tags (RFID) and Web-Services: RFID technology and Web Services are allowing better visibility into the status of orders, shipments and inventories. This in turn is facilitating real-time control, event management and planning of extended supply chain networks.

3.1.3 Service Innovations

- Reverse Logistics: Companies are increasingly providing reverse logistics services to ensure proper disposal and in some cases reuse of disposed products.
- Service Chains: Increasingly logistics practices and concepts are being applied for the better management of service industries.
- Design for Logistics: Products are being designed so that they can be transported more cheaply, efficiently and effectively.

3.2 Opportunities for Innovative Logistics Services in India

Apart the prospect of latching on to some of the above mentioned trends a number of opportunities, specific to the Indian context, present themselves to enterprising companies. Some of these opportunities are related to addressing national concerns while others would enable the Indian economy to be internationally competitive.

1. Outsourcing, Research & Development of IT enabled Logistics: India is a globally acknowledged IT powerhouse. This strength must be exploited by Indian companies to develop specific capabilities in IT-enabled Logistics such as the development and management of logistics planning and coordination systems. With the increasing trend towards fourth-party logistics this capability will be highly valued. In the past Norway has been able to leverage its history in maritime exploration to develop new areas of expertise such as Maritime IT systems and off-shore mining. In the Indian context, leading companies such as Wipro and Infosys can complement their IT expertise with logistics domain knowledge to promote 4PL activities within their companies and across the country.

India is also attracting several R&D centers from MNCs. Their presence should be leveraged to attract manufacturing industries with rapid product life cycles such as the electronics. Also, industries such as pharmaceuticals can be targeted with obvious benefits.

2. Agricultural Logistics: Even though the Indian economy is driven by the agricultural sector, minimal attention is paid to the logistics in the agricultural sector. Furthermore, the problem is complicated by the fact that the bread baskets of India are quite distant from the urban consumer base. Herein exists an opportunity for a logistics service provider to focus on the inefficiencies in the agricultural sector and better plan and coordinate the movement of food products across the country.
3. Logistics for Large Infrastructure and Engineering Projects: The recent focus on infrastructure projects has given birth to a wave of infrastructure projects such as the construction of airports, seaports, industrial parks and national highways. Often such projects run into costly time and budget overruns. These overruns can however be easily reined in through proper logistics management and coordination of various activities comprising the project, since the principles of infrastructure project management are very similar to logistics management. In fact, there is a critical need for logistics service providers who can develop specialized skills relating to the logistics of infrastructure projects ensuring timely and reliable delivery of materials on the project. Again IT systems can play an important role in coordination and planning of such logistics activities.

Infrastructure project overruns can be easily reined in through proper logistics management and coordination of various activities comprising the project.
4. Disease Management: Indian society is inflicted with a variety of deadly diseases, such as polio, AIDS and cholera, for the elimination of which there exists no coordinated national program. Setting up of mobile camps, ensuring the transportation of equipment, demographic profiling and track and trace of the disease are all activities closely related to logistics. Hence, IT-enabled logistics can help play an important role in the operational coordination of disease management and eradication.
5. IT systems for International Trade Logistics: It has often been cited that the inefficiencies of the Indian manufacturing and logistics sector make Indian goods uncompetitive internationally. One of the key contributing factors is the complexity of the international trade documentation process. Internationally, pioneering countries such as Singapore and Hong Kong have implemented automated trade systems such as TradeNet and Digital Trade Transportation Network for trade documentation and customs permit applications. The UN has estimated that such systems can save up to 3% of import value through efficiencies resulting from automated and standardized trade documentation. The government should consider spearheading the development of such trade systems. Such systems would make Indian goods more competitive globally.

4. GOVERNMENT PERSPECTIVE

4.1 Supply Chain Cluster View of Indian Economy

Given the weaknesses of the Indian logistics and industrial sector, it is important to develop a systematic methodology and strategy to enhance their competitiveness before the ever-growing and fast-changing global opportunities pass us by. Towards that end, in the following sub-sections, we develop a cluster-based framework to enumerate the various players involved, understand their interactions and role, and to identify opportunities in industry cluster developments. Finally, we outline a phased development strategy for development of nation-wide industrial and logistics infrastructure.

A cluster is defined as a geographic concentration of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also cooperate (Michael Porter, 1990). More specifically, a logistics cluster is defined as a geographically concentrated, self-flourishing ecosystem comprising of shippers, logistics service providers, IT vendors, infrastructure providers, regulatory agencies, research institutions, consultants and other logistics-related organizations that leverages on the interdependencies between them to provide highly efficient and effective logistics solutions and create innovative new solutions. A logistics cluster as defined herein incorporates four interdependent sub-clusters – Facilities Cluster, Infocomm Infrastructure Cluster, Knowledge Cluster and the Vertical Industry Cluster as given below.

One manner in which the competitiveness of the Indian logistics industry and hence the industrial sector can be enhanced is by identifying the various players in the industry and adopting an integrated approach in nurturing all of them. Specific actions should be driven by a strategy of balanced investments in information and physical assets, in knowledge creation and in industry development as shown in Figure 4 below. These four sub-clusters are discussed in greater detail later.

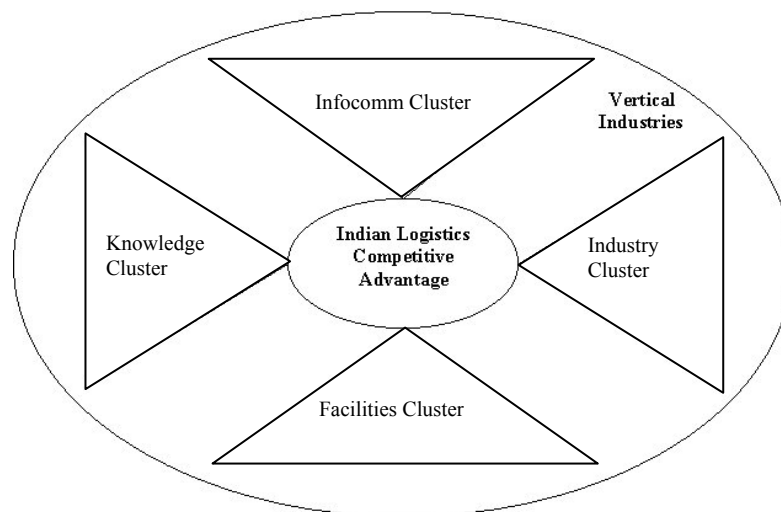


Figure 4: Gaining Competitiveness through Development of Logistics Sub-clusters

4.1.1 Facilities Sub-Cluster

A good logistics and transportation infrastructure is the basis for a world-class logistics industry. Development of physical infrastructure for intra-country and international movement of goods is very important given the global nature of trade today. The development of a world-class infrastructure requires a phased approach towards investment in various sectors of industry that comprise this physical infrastructure cluster.

The players within this cluster, as shown in Figure 5, include:

1. Infrastructure builders: These companies build logistics infrastructure – such as roads, airports, warehouses, etc. These companies need to have access to a lot of capital to be able to build such a network.
2. Infrastructure managers: These companies manage logistics infrastructure such as airports, seaports. The most critical job for these companies is to formulate policies that encourage greater throughput through their facilities. Hence, in certain cases they may need to put together comprehensive logistics solutions to meet the needs of logistics service providers and need to continually monitor their policies
3. Logistics Associations, Education Institutes: These organizations provide manpower to logistics service providers and to companies that build and manage logistics infrastructure. They also form the focal points for interaction between industry players.
4. Logistics Service Providers: This segment of the cluster includes 3PLs, Freight Forwarders, Distributors, Warehouses, and other traditional logistics and transportation businesses.
5. Manufacturers/Suppliers and Buyers/Customers interact with this cluster through the logistics service providers and the physical infrastructure designed should be developed to meet their specific needs. Some of these needs across industries will be common. However, each vertical industry will have its own special needs as well.

The quality of Indian physical infrastructure is far behind world-standards. This sector is highly capital and asset intensive requiring substantial participation from financial institutions. Furthermore, the development of this cluster can only progress through government attention and encouragement to logistics builders, logistics managers, logistics associations, educational institutions and logistics service providers.

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In particular the areas that the government should focus on in this regard are:

1. The development of 3-4 strategic routes and ports and then develop them to world-class standard
2. Identify selected vertical industry clusters of strategic importance and develop the physical infrastructure to meet their unique needs.

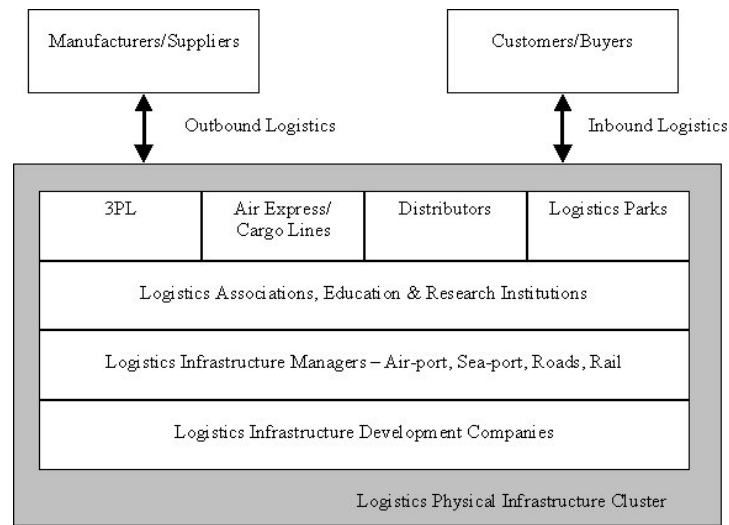


Figure 5: Facilities Cluster

4.1.2 Infocomm Sub-Cluster

In today's globally connected business environment global information networks have an increasingly important role to play. It is possible that some of the limitations of the physical logistics infrastructure can be overcome by a superior information infrastructure. Real-time information systems and decision-support tools are the key to increased supply chain productivity and efficiency. It has been widely reported that computerization and internet-based business interaction has contributed to a growth of 1.5% to the GDP of the US economy. Similar to the investment strategy in physical infrastructure, investments in information infrastructure need to be undertaken in phases so as to build up the various segments of this cluster.

The players within this cluster, as shown in Figure 6, are:

1. Telecommunications Industry: A strong and competitive telecommunications infrastructure is necessary to provide global high-quality connectivity across the country.
2. Technology Service Providers: A host of technology service providers, such as SCM Software Developers, Wireless Technology Builders, Industry Consultants, can exploit the telecommunications infrastructure to develop solutions, which address the information needs of the Logistics industry. The quality of their solutions will be very critical in determining the competitive advantage to the Indian logistics industry.
3. Content: This segment within this cluster relates to companies that provide information based content and services which are required by the industry.
4. Exchanges and Portals: These companies provide the means of delivering information-based content and services in a cost-effective manner on a industry-wide level through the Internet.

5. Integration: These information-based solutions and services need to be integrated to the financial settlement systems in banks and to the enterprise systems in the supply chain, to provide for an end-to-end automated logistics solution.

The e-enablement of financial institutions and inter-business interactions is the key to successfully leveraging information investments to overcome physical infrastructure limitations.

Investments in a National Trade System, such as the TradeNet System in Singapore, will eliminate trade inefficiencies and significantly enhance economic competitiveness.

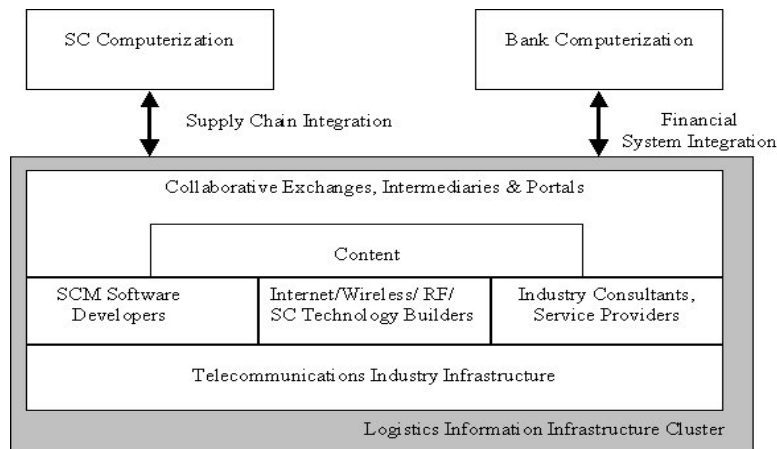


Figure 6: Infocomm Cluster

With regards to the development of the information based infrastructure government investment and initiative will be critical in the following areas.

1. Investments in a national IT infrastructure, and particularly a system that will automate trade document processing, similar to the TradeNet system in operation in Singapore.
2. E-enablement of the financial institutions to be able to handle on-line trade and support on-line trade settlement.
3. E-governance to handle end-to-end online trade transaction processing relating to taxes, customs clearances, e-commerce laws and their enforcement etc.

4.1.3 Knowledge Sub-Cluster

We have so far looked at investments in infrastructure that will drive the competitiveness of the logistics industry. However, the true potential of these investments will not be realized until competent manpower and breakthrough ideas and solutions become available to fully harness the power of these investments. Educational institutions and research centers and consulting firms have a crucial role to play in identifying the right direction for industry to take.

The players within this cluster, as shown in Figure 7, are:

1. Universities: The universities will need to provide professional, competent manpower who will be the agents of transformation in industry. Postgraduate degrees specifically in logistics need to be a feature in the leading universities and institutions in India. They will power the growth of knowledge companies who shall be the primary knowledge creators within the industry.
2. Knowledge companies: Policy makers, consultants, logistics research centers and industrial operations research outfits will play a critical role in transforming the creation and adoption of appropriate logistics strategies within their spheres of influence.

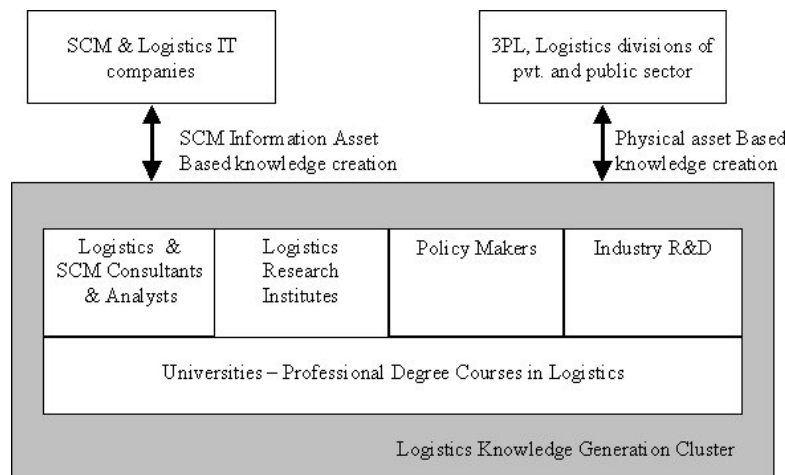


Figure 7: Knowledge Cluster

The government has a pivotal role to play in the development of a knowledge-based logistics industry. In this regard the following initiatives may be considered.

1. Institute educational programs to develop professional manpower.
2. Establish government funded logistics research centers for applied research. These centers should focus on strategic research into vertical logistics markets and develop solutions and techniques for the unique requirements of the Indian logistics market.
3. Support establishment of Logistics R&D teams and logistics consultants in private sector.
4. Educate businesses on logistics strategy and opportunities through ongoing professional education.
5. Provide support (technical & financial) and incentives for companies wanting to adopt supply chain best practices.
6. Promote industry-wide consortiums getting together the manufacturers, suppliers, distributors, retailers to develop benchmarks and standards.

4.1.4 Vertical Industry Sub-Cluster

The knowledge created by the knowledge creation cluster has to be transferred to industry and deployed in the business world to utilize the superior infrastructure and

ultimately bring about the improved industry performance that is desired. Approaches towards developing industry will need to be focused on specific vertical industries, since the approach to be adopted will be very different from industry to industry.

The various industry players that will be involved in industry development initiatives, as shown in Figure 8, are:

1. **Supporting Industries:** These are the industries that support the activities of the particular vertical industry. At the least the companies that are interfaces to the vertical industries will need to be transformed to adopt logistics best practices, in order to make the selected vertical industry competitive.
2. **System Integrators:** These companies will be responsible for linking up entire supply chains and industries electronically and implementing the information-based solutions.
3. **Logistics & Transportation Companies:** These companies will provide the automation and integration in the material flow, between companies in a supply chain. Their solutions will also need to be customized to the needs of the specific vertical being served.
4. **Suppliers, Manufacturers, Distributors & Retailers:** These are the companies forming the vertical industries. They will need to adopt operations best practices in order to make their supply chain competitive.

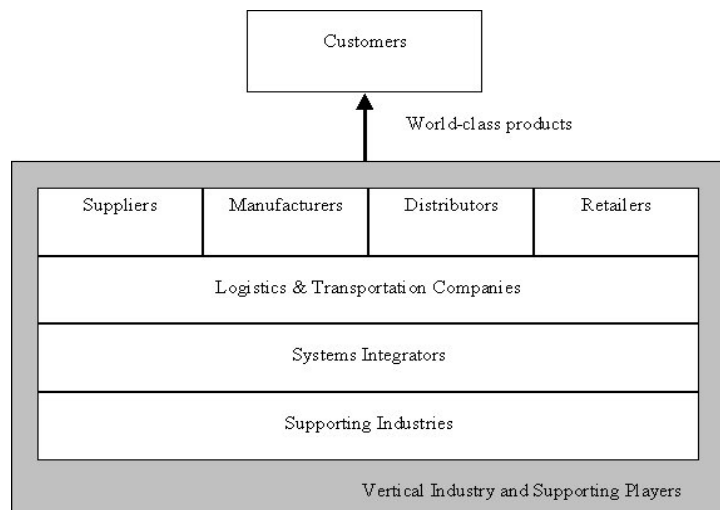


Figure 8: Industry Cluster

The government should act as a promoter and facilitator in the development of these selected vertical industry clusters.

1. Promote industry initiatives and provide incentives to electronically integrate suppliers, manufacturers, distributors, retailers, logistics providers and banks.
2. Promote industry associations to foster trust and cooperation between industry players for industry development.
3. Provide incentives for 3PL companies, encouragement for them to incorporate value-added services, and outsourcing.

4. Promote supporting industries – IT systems integrators, facilities construction and management, call-centres, etc.

4.2 Phased Supply Chain Cluster Development Strategy

It is obvious that for a country the size of India, it would be difficult given the resource limitations to develop a globally competitive logistics infrastructure in one go. Hence it is important to prioritize the focus of industry and government towards a phased development of selected industries and logistics sectors and regions. In this regard, the following three strategies may be adopted, to prioritise between the various options as shown in Figure 9.

1. Balanced Investment between IT and Physical Infrastructure
2. Development of selected Vertical Industry Clusters
3. Development of selected Logistics Sectors

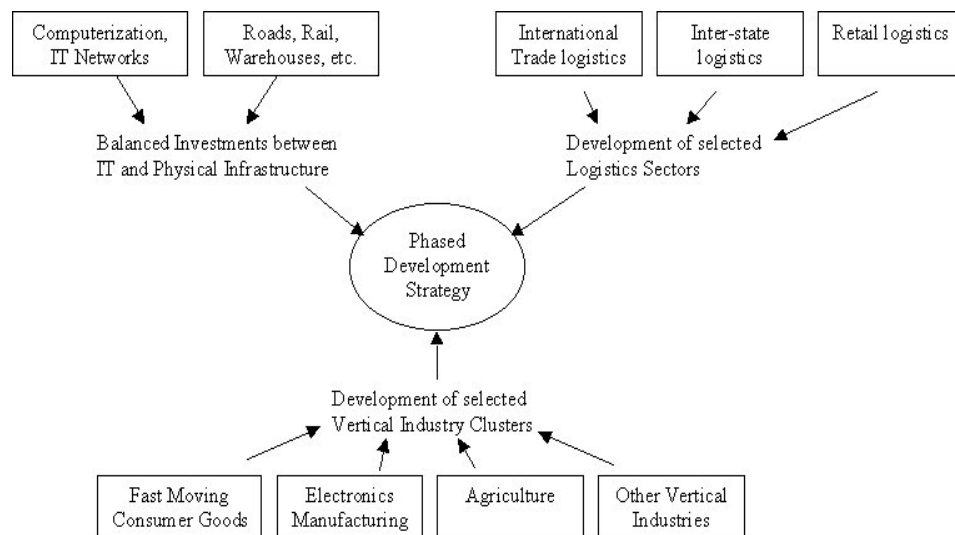


Figure 9: Phased Development Strategy prioritizing between the various options.

4.2.1 Balanced Investment between Infocomm and Facilities Clusters

Investments in physical infrastructure are more expensive and take a long time to give returns. Also the way the developed economies have traditionally progressed is through a systematic development of physical infrastructure. However, the question that arises is that given the sudden rise of the Internet, is it possible that an approach to economic development based on superior information infrastructure as compared to superior physical infrastructure would be better.

It is important to prioritize the focus of industry and government towards a phased development of selected industries and logistics sectors and regions.

The objective is to optimally leverage investments in information infrastructure to eliminate/reduce the deficiencies of the poor physical infrastructure. A good information infrastructure can provide visibility into industry supply chains thereby reducing uncertainties, inventories and inefficiencies in the industrial sector, without requiring any new and expensive investments in improving the physical infrastructure. It is assumed that given the competitive nature of the infocomm industry in India, the establishment of a good information infrastructure will be cheaper and speedier. Furthermore investments in information infrastructure will have multi-pronged impact on other industries as well. However, this does not imply that investments in the physical infrastructure be totally ignored, just that the investments in the information and physical infrastructure need to be balanced so as to optimally leverage their unique strengths.

4.2.2 Development of selected Vertical Industries

As stated earlier, the industrial development policy needs to be rethought to specifically focus on the development of certain strategic industries. The strategy to adopt in this regard is to promote vertical industry clusters, which encourage all companies, supporting industries and organizations to set-up synergistic operations in geographical proximity to each other. Some of the vertical industries that the government can consider for the development of clusters are:

1. Agriculture/Food Cluster
2. Manufacturing Clusters such as Automotive and Pharmaceuticals.
3. Fast Moving Consumer Goods Cluster.

In order to set the direction for these cluster development initiatives, it is important to benchmark against other industries and nations and accordingly identify key processes, and design an appropriate logistics network. Within the clusters it is important to improve the efficiency of SMEs by encouraging the adoption of e-practices. This can be achieved by providing the SMEs support and advice, both financial and technical.

4.2.3 Development of selected Logistics Sectors

A world-class logistics cluster is central to a globally competitive industrial sector. However, the development of this cluster has to be undertaken in phases due to the enormity of the task. There are three logistics sectors in India that can be developed separately.

International Trade Logistics

It is not too difficult to set-up small special economic zones with world-class IT and logistics infrastructures. Certain industries such as electronics manufacturing can be encouraged to set-up operations within these zones. The infrastructure within these zones will obviously be developed for the specific needs of the industries. Raw materials for these clusters may come from foreign nations, the industries within the cluster will add value and the goods will be directly shipped out to the global market, without having to enter the Indian economy. The world-class infrastructure within these clusters will allow these industries and companies to be competitive globally. This first phase of

logistics industry development focusing on international trade logistics will provide immediate tangible benefits with least effort.

Inter-state logistics

The second phase of logistics industry development should focus on the development of an infrastructure to support inter-state trade and logistics. This infrastructure will promote the development of other industries that support the selected strategic vertical industries and will provide a channel to distribute the goods manufactured in the special economic zones to the markets across the country. The infrastructure will require the establishment of a national IT network for taxation and trade settlement in inter-state material movement. Additionally, a good logistics network of roads, rails, airports and seaports will also need to be developed. Regional warehousing and logistics clusters will need to be developed to cover the entire country.

Retail logistics

The final phase of attaining world-class levels in logistics has to deal with addressing the needs of inventory management and logistics in the chain between the distributors and the customers. A good retail logistics network should ensure lower levels of inventory holding in the supply chain and bring the fruits of development within the reach of the entire population.

At this stage, we have confined ourselves to developing the cluster framework for India. Time and resources permitting we would like to undertake specific cluster analysis for industries such as agriculture, auto, pharmaceuticals and high-tech.

5. CONCLUSIONS

India should recognize the extraordinary role logistics plays in economic development and in enhancing the competitiveness of all the three sectors of the economy. Given the emerging business and technological trends there are possibilities for the adoption of innovative logistics solutions specifically designed for India. In addition there is a requirement for an integrated strategy towards developing logistics and IT infrastructure and also enhancing its industry base. The resources needed for wholesale development takes enormous amounts of time and resources. A planned phased approach for Integrated Logistics is needed. This brief document is an attempt at presenting such an approach.

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