

**Indian Institute of Technology
Bangalore
NPTEL
National Programme on
Technology Enhanced learning**

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Global Supply Chain Management

Lecture – 24

Supply Chain Design – Part 1

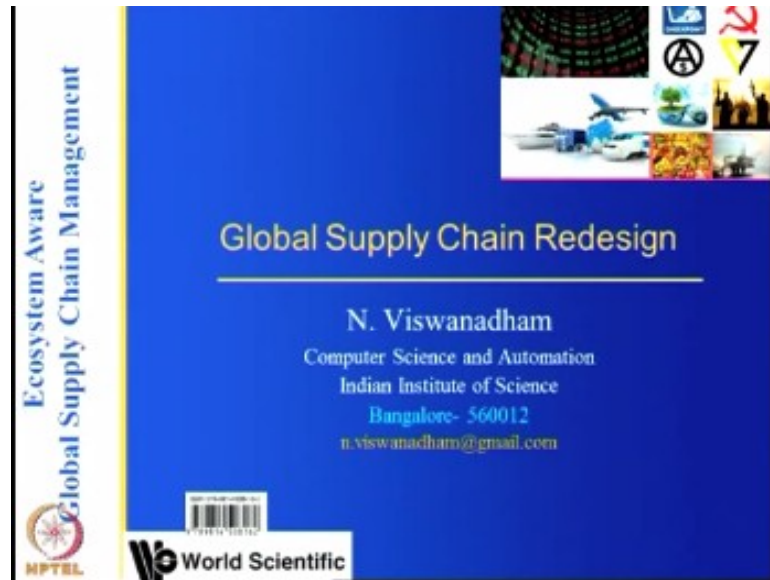
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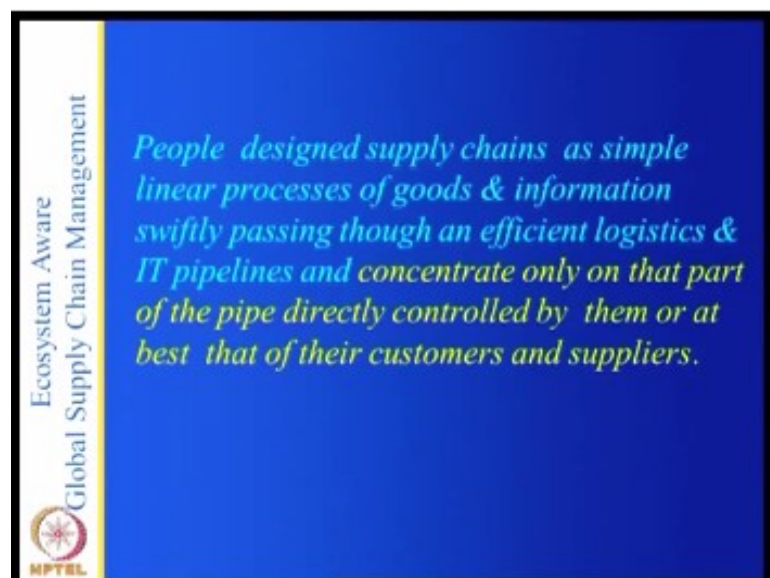
Bangalore

In this and the next lecture we are going to talk about global supply chain.



We are talking of not global supply chain design but redesign. This is because for a number of reasons the designs of today and the ways you design the supply chains they are not up to the mark. The supply chains are subject to all kinds of innovations, all kinds of disruptions and new customer expectations and hence there is a need to think about how to redesign the supply chains.

The topic of this lecture and the next one, we are going to use the ecosystem framework to redesign the supply chains.



This is a Myopic View: People designed supply chains as simple linear processes of goods & information swiftly passing through an efficient logistics & IT pipelines and concentrate only on that part of the pipe directly controlled by them or at best that of their customers and suppliers.

If you are a manufacturer you look at the supplier and you look at the logistics players but you don't look at the supplier suppliers or if you are a manufacturer you look at the distributors but you don't look at the retailers. If you are a distributor you look at the manufacturers and retailers.

The kind of view that we have is a myopic view and this has to change. People have to have an idea of the entire supply chain from end to end from materials inputs to the end customer. So what is supply chain redesign?

The slide features a blue background with a white vertical bar on the left side. The white bar contains the text 'Ecosystem Aware Global Supply Chain Management' and the NPTEL logo. The main title 'Supply Chain Redesign' is in yellow. Below the title is a bulleted list of factors affecting supply chain networks.

Supply Chain Redesign

- The current day supply chain networks are subjected to Disruptions & Innovations in the ecosystem elements, resources crunch and several other factors. These will affect the performance & cost savings.
- Disruptions can originate from the Banks, Governments, Bankruptcy of the supplier's suppliers, Natural disasters, Piracy, Cyber-attacks, Port strikes and other unknown factors. While One cannot anticipate all risks they cannot be ignored either.
- Innovations in products, manufacturing and delivery processes, Business models, Govt. to Govt. relations such as FTAs, Regulations and deregulations and many more affect the supply chain.
- Fluctuations in resources costs such as wages, oil prices, foreign exchange are important for the bottom line.
- Supply Chain Design should take these factors into account rather than resorting to expediting, cost saving measures when unknowns strike

The current supply chain networks are designed today and using all kinds of packages like ERP TMS and others and are subject to disruptions due to innovations in the ecosystem elements, resources crunch and several other factors. There can be disruptions due to earthquakes or due to financial crisis or due to wars or due to oil price increases and many others. Ultimately they will affect the supply chain performance and also reduce the savings.

So disruptions can originate from governments, bankruptcy of supplier suppliers, natural disasters, piracy, cyber-attacks, union strikes, etc. We do not know where the disruptions are

going to come, how can you mitigate them when they affect is the issue. They cannot be ignored either you cannot say I do not know the risk, these are known unknowns. People give all kinds of analogies *it is a perfect storm, it is like a black swan and you can give any number of metaphors and try to escape* but at the end of the day you cannot ignore them you have to do something to mitigate the disruptions.

There are technological disruptions which are happening like the cloud, big data, and wireless cell phones and they will disrupt your supply chain and fluctuation

You should anticipate the disruptions, maybe you may not be able to avoid them, but when they occur you should be able to deal with them.



The Global Supply Chain Design

The Design involves two steps

1. Global supply Chain Formation
2. Building Governance mechanisms or Frameworks for Partner Selection, Coordination & Control

The slide features a blue background with white text. On the left, there is a vertical banner with the text 'Ecosystem Aware' and 'Global Supply Chain Management' above a circular logo containing a stylized globe and the acronym 'NPTEL'. The main title 'Global Supply Chain Formation' is centered at the top. Below the title, a bulleted list contains five numbered steps. In the bottom right corner, there is a small inset image of a man with grey hair, wearing a white shirt, speaking at a podium.

Global Supply Chain Formation


- The Formation involves five steps
 1. Map the Supply Chain Ecosystem for the Industry Vertical
 2. Formulate the Supply Chain Strategy
 3. Select possible locations for the factories, DCs based on Investment climate
 4. Identify the Supply Chain Risks
 5. List the feasible supply chain configurations

The Global Supply Chain Formation step is crucial and requires Domain knowledge of the vertical & the companies: their products, capabilities & reputation for quality delivery, Corporate and Political connections and Soft skills for negotiation of acquisition of assets, Partner selection, Risk assessment and Talent recruitment

In emerging markets, disputes over the asset acquisition can turn wicked involving long drawn negotiations or abandoning the project

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Governance: Partner Selection, Coordination & Control

- In resilient supply chains a separate chain is formed for each order
- The Governance Function Involves
 - **Partner selection** from the group of preselected suppliers from step1 (Supply Chain Formation Stage)
 - **Coordination** : Determining who does what and when and communicating to everyone
 - **Execution**: Build a control tower to Monitor order status so that processes work as per plan & control exceptional events
- This step involves building frameworks for Partner selection , Coordination and Control for the company or the vertical under consideration

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Global Supply Chain Formation

- This step is crucial and requires
 - Domain knowledge of the vertical & the companies: their products, capabilities & reputation for quality delivery
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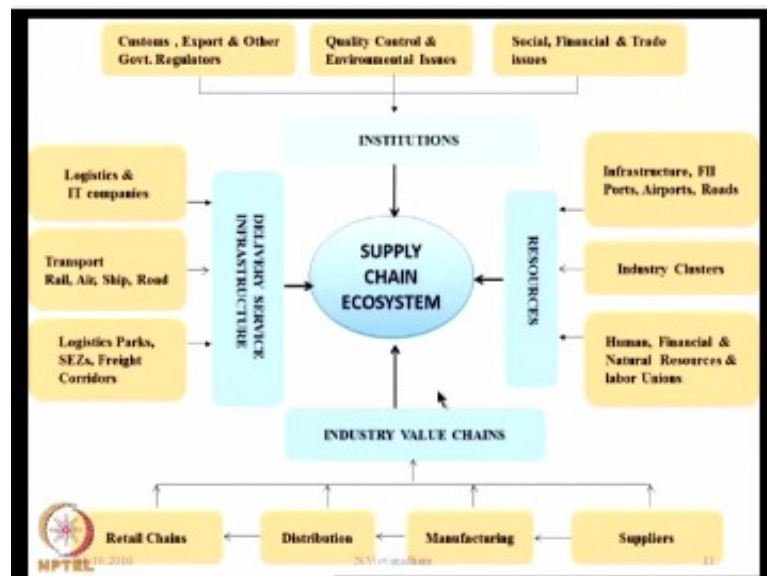
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Step1: Map the Supply Chain Ecosystem for the Industry Vertical

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Definition (Supply Chain Ecosystem): An Ecosystem comprises of networks of Companies, Countries and their Governments, Other Industrial, Social and Political organizations, Logistics and Information Technology Services Infrastructure and the third party service providers that connect the companies and the countries to the external economic and social environment and Resources including natural, financial and human resources with talent, connections and knowledge of the industrial environment, Industry clusters, Universities, etc interacting together with the Landscape (space or vertical) and Climate(economic and social).

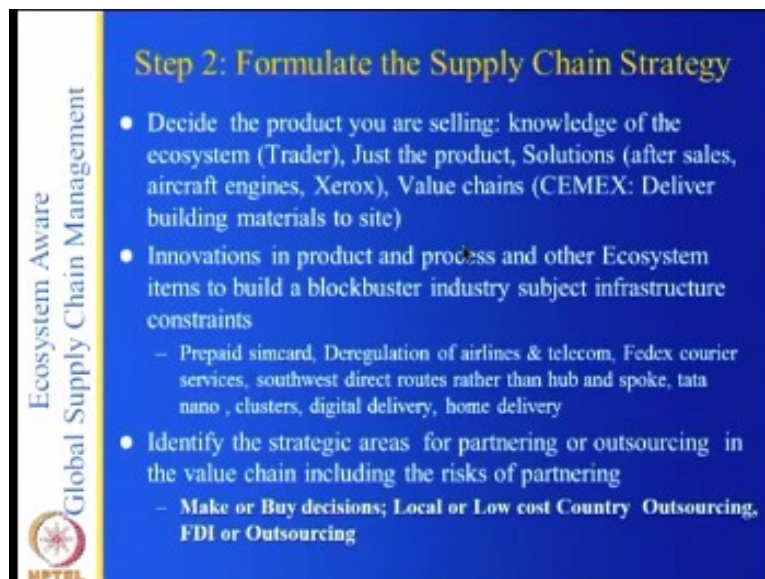


Supply chain Ecosystem has four distinct mechanisms

- Supply/service chains producing products/services
- Delivery service mechanisms such as Logistics and IT infrastructure
- Institutions involving Governments and Social groups that determine the social, trade and economic policies of all countries touching the supply chain network
- Natural, financial, human and industrial resources such as universities, clusters, banks, power, water, etc.



Let us look at what is the supply chain strategy here?



Step 2: Formulate the Supply Chain Strategy

1. Decide the product you are selling knowledge of the ecosystem (Trader), Just the product, Solutions (after sales, aircraft engines, Xerox), Value chains (CEMEX: Deliver building materials to site)
2. Innovations in product and process and other Ecosystem items to build a blockbuster industry subject infrastructure constraint
3. Prepaid simcard, Deregulation of airlines & telecom, FedEx courier services, southwest direct routes rather than hub and spoke, tata nano, clusters, digital delivery, home delivery
4. Identify the strategic areas for partnering or outsourcing in the value chain including the risks of partnering: **Make or Buy decisions; Local or Low cost Country Outsourcing, FDI or Outsourcing**

Product Innovation

- **Hyundai**, customized small-car Santro, to suit Indian market conditions with 90% local components.
- **Nano** is a fuel efficient one lakh car.
- **Cummins** produces diesel engines and power generators for small retailers, regional hospitals, and farmers
- General Electric announced two revolutionary products; **\$1,000 handheld electrocardiogram device and a portable, \$15,000 PC-based ultrasound machine.**
 - Originally developed for emerging markets (the ECG device for rural India and the ultrasound machine for rural China), now are being sold in US, pioneering new uses for such machines.

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Product Innovation

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device for rural India and the ultrasound machine for rural China), now are being sold in US, pioneering new uses for such machines.

Business Model Innovation

- *Business model innovation (BMI) is a reconfiguration of activities in the existing business model of a firm that is new to the product/service market in which the firm competes.*
- Business model innovation actually involves importing a business model from one product/service market into another. For instance:
 - Southwest Airline borrowed a business model from interstate bus transportation and applied it to the airline industry.
 - McDonald's brought traditional assembly line techniques into the fast food business.
 - Xerox does not sell copying machines but instead maintains copying machines in offices and charges per page.
 - Power by the Hour: aircraft engines are paid for the number of hours they are in the flying aircraft.

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Use Innovations in Regulations

- The governments have deregulated the telecom industry and made many positive policies.
 - Allowed private and foreign players to set up shops through FDI
 - Created Special Economic Zones to attract equipment and other manufacturers
 - Allowed foreign players to participate as manufacturing and service providers.
- Companies should use these to advantage

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Use Innovations in Regulations

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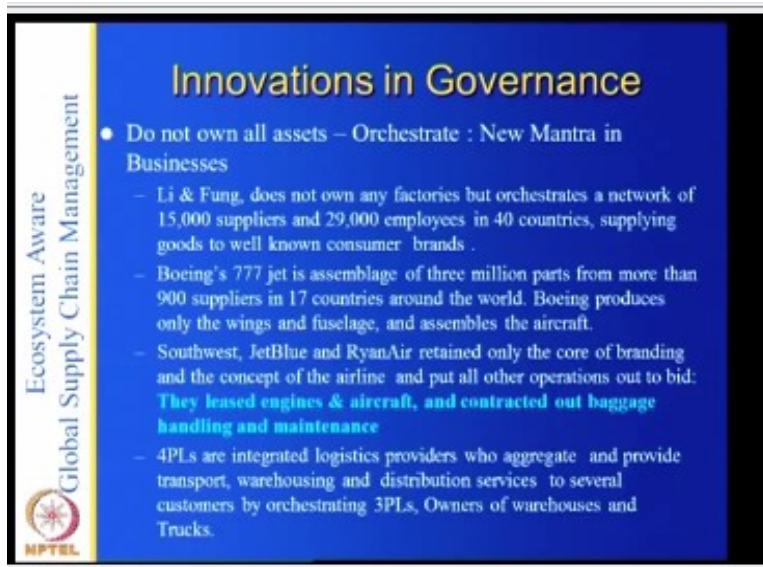
Disruptions Catalyzed by Cloud

- The growth of cloud delivery models helped the start up to follow pay per use model rather than buying , installing and maintaining servers.
- The new Cloud architecture can address the needs of Orchestrators trying to manage loosely coupled network partners
- Other Industries such as health care, Finance, Logistics, Education get disrupted by Cloud. In health care patient records can be accessed from cloud.
- **Cyber Security, Breach of Trust are big issues**

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Innovations in Governance

- Do not own all assets – Orchestrate : New Mantra in Businesses
 - Li & Fung, does not own any factories but orchestrates a network of 15,000 suppliers and 29,000 employees in 40 countries, supplying goods to well known consumer brands .
 - Boeing’s 777 jet is assemblage of three million parts from more than 900 suppliers in 17 countries around the world. Boeing produces only the wings and fuselage, and assembles the aircraft.
 - Southwest, JetBlue and RyanAir retained only the core of branding and the concept of the airline and put all other operations out to bid: **They leased engines & aircraft, and contracted out baggage handling and maintenance**
 - 4PLs are integrated logistics providers who aggregate and provide transport, warehousing and distribution services to several customers by orchestrating 3PLs, Owners of warehouses and Trucks.

Innovations in Governance

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Step3: Select possible locations for the factories, DCs based on Investment climate

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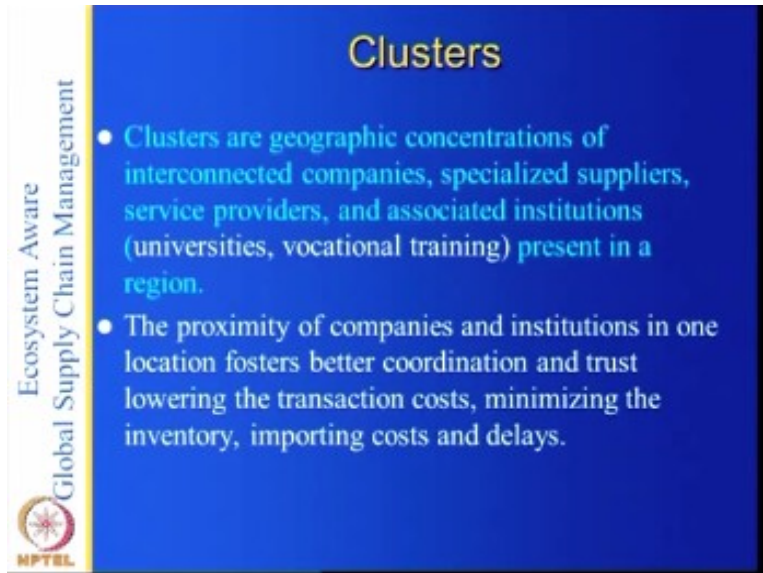
Select Locations: Factories, Partners, DCs based on the Investment climate

- For the industry vertical,
 - study the parameters that determine the investment climate of nations and regions and rank order the regions
 - Identify the asset specific requirements from the suppliers

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Step3: Select possible locations for the factories, DCs based on Investment climate

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The slide features a blue background with the title "Clusters" in yellow at the top center. On the left side, there is a vertical yellow bar containing the text "Ecosystem Aware" and "Global Supply Chain Management" in black, with a circular logo below it. The main content consists of two bullet points in white text.

Clusters

- Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, and associated institutions (universities, vocational training) present in a region.
- The proximity of companies and institutions in one location fosters better coordination and trust lowering the transaction costs, minimizing the inventory, importing costs and delays.

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Types of Supplier Asset Specificity

- **Physical asset specificity** refers to the mobile and physical features of assets such as specific dies, molds, and tooling for the manufacture of a contracted product.
- **Dedicated asset specificity** represents discrete and/or additional investment in generalized (as opposed to specific) production capacity in the expectation of making a significant sale of a product to a particular customer.
- **Human asset specificity** arises in a learning-by-doing fashion through long-standing customer-specific operations.
- **Site asset specificity** refers to the successive stages that are immobile and are located in close proximity to one another so as to economize on inventory and transportation.

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The Global Competitiveness Indicators

- Global Competitiveness Indicators based on which countries are evaluated include
 - National Policies for Openness in Trade and Markets
 - Best Practices for International Trade
 - Effective Legal and Enforcement Systems
 - Infrastructures for a Global Economy
 - Financial Services for Cross-Border Commerce
 - Human Capital

The Global Competitiveness Indicators

Global Competitiveness Indicators based on which countries are evaluated include National Policies for Openness in Trade and Markets, Best Practices for International Trade, Effective Legal and Enforcement Systems, Infrastructures for a Global Economy, Financial Services for Cross-Border Commerce and Human Capital



Government policies will directly affect global economic competitiveness. Countries that have a very good growth record like China, India, Vietnam, Laos, Indonesia, Pakistan and Bangladesh – rank very low on these indices .

Investment Climate at Various Levels

	Logistics & IT	Regulations	Resources & Management	
Country	Logistics & IT Infrastructure, I Pa & Software developers, Soft infrastructure	Customs, Trade, Tar, Policies, Industry and FDI incentives, Labor Unions, Firms, Legal environment	Human, Financial, & Natural resources, class, land, water & Management Skills	Country Competitiveness Index
Region	Regional Logistics & IT Infrastructure	Govt. Policies, Center-state relations, Tariffs, Duties, Sales Taxes	Same as above	
Industry Vertical	Vertical Industry Specific Logistics & IT Infrastructure	Industry Promotion Incentives like MEZs, Tax breaks, FTAs	Mixing & other skilled resources, Vertical Industry Clusters, R & AD Labs, Unions	
Firm Level	Firm specific Logistics & IT Infrastructure	Firm specific incentives & tax-breaks from Govt.	Firm specific skill, Financial & Cluster viability	Firm Competitiveness

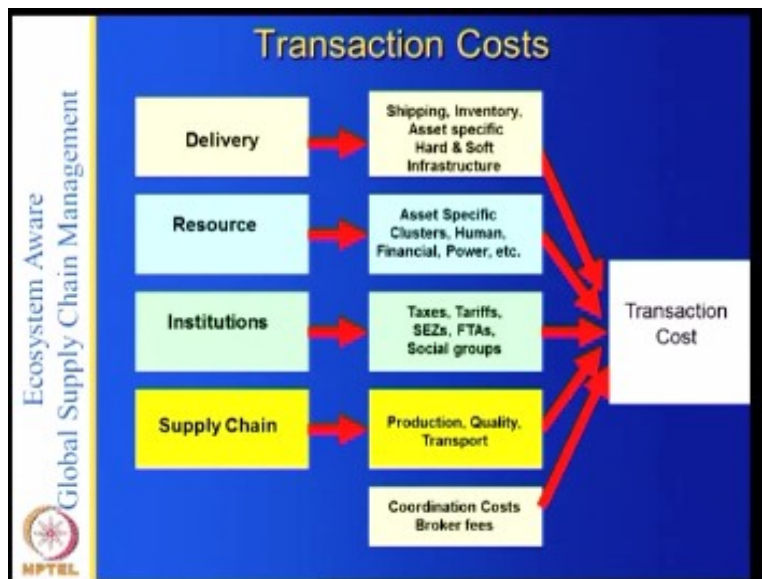
Investment Climate at Various Levels: Countries, Region, Industry level and Firm level can be determined using the following factors:

Logistics & IT Infrastructure, 3 PLs & Software developers, Soft infrastructure

Regulations: Customs, Trade, Tax Policies, Industry and FDI incentives, Labor Unions , Forex , Legal enforcement

Resources & Management of Human, Financial, & Natural resources : mines, land, water & Management Skills

One can identify the country competitiveness and firm competitiveness using the above data. It will indicate which country you should avoid and what firm you should make deals with etc.



Transaction Costs

A supply chain network has a large number of facilities connected by transportation and communication operations through which the products move.. Total landed cost model should include:

- 1. Supply chain cost:** This includes the labor, assembly and equipment costs (such as molds or other asset specific investments), and also the quality costs due to low yield rates, setup times, and costs. **Inbound logistics cost:** The logistics cost is the cost of moving materials and components to the factory site from the suppliers located in

different countries. Factories that are close to raw materials or supplier clusters will have cost advantage.

2. **Resource costs:** This includes the information technology and energy infrastructure, communications, administrative functions, legal personnel, and building costs.
3. **Customs, duties, and taxes:** These figures clearly change over time as nations modify their trade relations. Plant location can make a difference if there are special short or long term tax advantages to certain regions so it is important to involve accountants, lawyers, and tax experts.
4. **Delivery logistics cost:** The transportation issues involved include: supplier in LCC to the port, LCC port to domestic port, Domestic port to distribution centers, Pick and pack operations at the distribution centers (and plants, if appropriate), Distribution centers to customers. One need to consider the costs and lead times for all these segments and add them to get the final outbound logistics cost and lead time. **Inventory Costs:** Raw materials, work in process and finished goods inventories cost lot of money. It is important to consider issues such as who owns the inventory, how much is required to meet the throughput needs, and the associated costs.
5. **Coordination Costs:** The managers need to visit suppliers and inspect the performance and quality. The time and cost associated with managing a relationship with a company in a different time zone, culture and language can be significantly higher than managing a domestic supplier.

In addition there are Soft costs which include management time for creating a company or country brand, costs of sponsorships of local events. These costs are difficult to specify, but are incurred by most companies.

Step 4: Identify the Supply Chain Ecosystem Risks

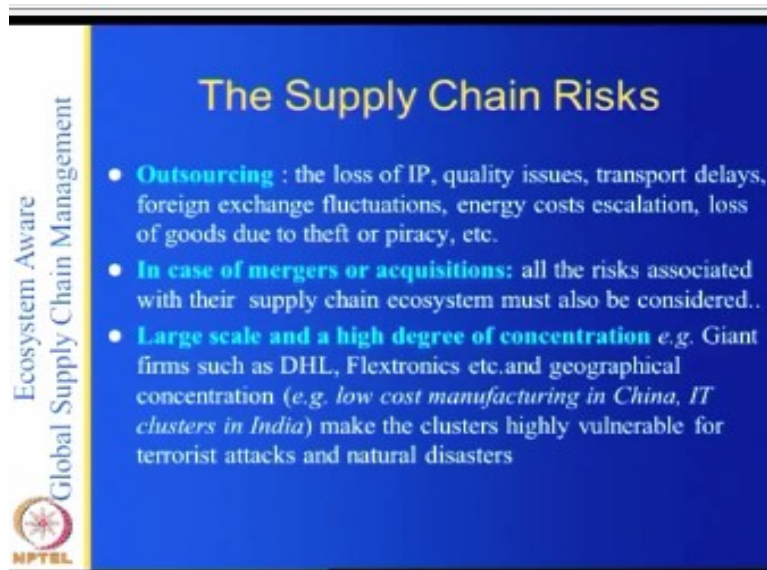
- All possible social, political & environmental risks that may affect your ecosystem and the goods, information and financial flows.
- Estimate the risk and identify what it takes for their resolution

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Step 4: Identify the Supply Chain Ecosystem Risks

All possible social, political & environmental risks that may affect your ecosystem and the goods, information and financial flows. Estimate the risk and identify what it takes for their resolution



The slide is titled "The Supply Chain Risks" and is part of a presentation on "Ecosystem Aware Global Supply Chain Management" by NPTEL. It lists three key risks:

- **Outsourcing** : the loss of IP, quality issues, transport delays, foreign exchange fluctuations, energy costs escalation, loss of goods due to theft or piracy, etc.
- **In case of mergers or acquisitions:** all the risks associated with their supply chain ecosystem must also be considered..
- **Large scale and a high degree of concentration** e.g. Giant firms such as DHL, Flextronics etc.and geographical concentration (e.g. *low cost manufacturing in China, IT clusters in India*) make the clusters highly vulnerable for terrorist attacks and natural disasters

The Supply Chain Risks

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The Supply Chain Risks

- **Political and Societal risk:** Land acquisition or people displacement are involved : Risks such as change in the government, State- Center relations, Corruption, Social factors need to be assessed
- If resource intensive shortages such as infrastructure, oil, power , water, mining etc should be quantified.

The Supply Chain Risks

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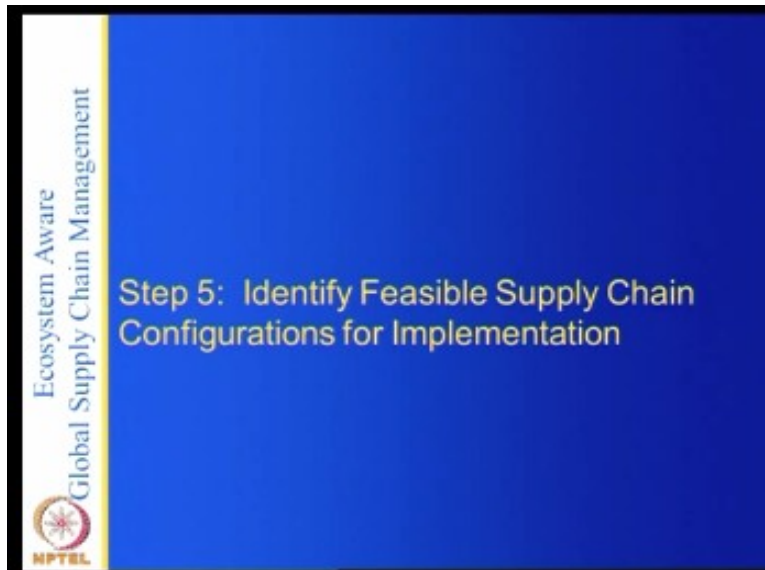
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Cyber Security: Biggest Risk of Connectivity

- Computer systems are subjected to electronic attacks originating from sources that are usually unidentified.
- The terrorist and counterfeit networks are also globally connected and indeed they follow the HR practices of recruitment, training of people and also systematic planning processes for implementing their objectives

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In the next lecture. I will talk about the feasible supply chain configuration for implementation .

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