

**Indian Institute of Science
Bangalore**

NPTEL

**National Programme on
Technology Enhanced Learning**

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Global Supply Chain Management

Lecture- 25 Supply Chain Design – part2

**Prof. N. Viswanadham
Department of Computer and Automation
Indian Institute of Science
Bangalore**

So we have will go through the step 5.

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We have finished four steps in terms of the global supply chain formation so let us look at Step 5 : Identify the feasible supply chain configurations for implementation.

what we did was after mapping the supply chain we looked at the supply chain strategy what are the kinds of innovations that are possible and we looked at a water all the supply chain risk that they face so we are now ready to look at what are the feasible supply chain configurations for implementation in other words we have we have done our homework in terms of the various for our vertical for our company.

What are the kinds of suppliers we need who are the logistics providers which countries are we in and we also have information on the suppliers financial this one which resources they have which countries they are in what are their governments what are the delivery mechanisms and so on so once we have this kind of information that is possible then we could now use this to identify what are the feasible supply chain configurations.

Step 5: Feasible Supply Chain Configurations for Implementation

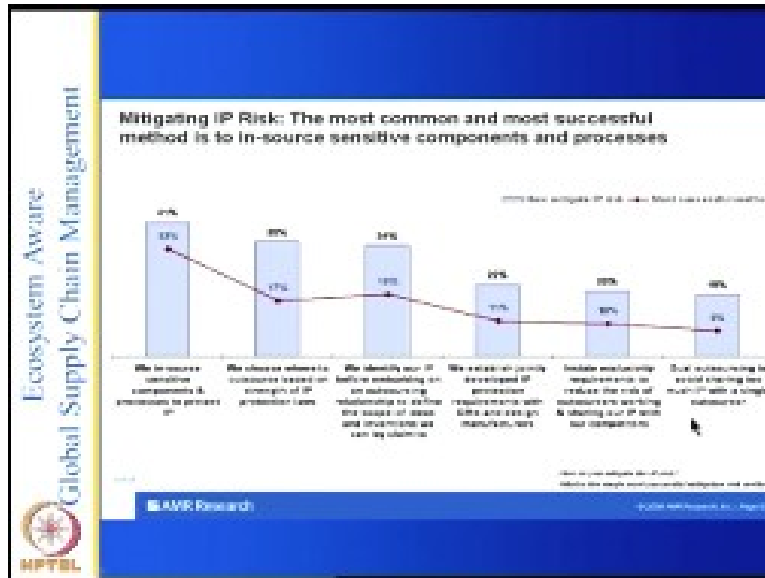
- For the product of your company (knowledge, product, solutions, value chains) Identify the partners (Companies & Countries) for the Goods, Information and Financial flows and also the risks of partnering
 - Use the ecosystem information of partners of your partners while assessing the risks (Failure of a Govt., Bank or an Earth quake)
- Map the supply chain processes including methods of collaboration and also for ensuring partner loyalty
- Map your supply chain for each customer order and have mitigation strategies for operational possible attacks, failures, etc.

Feasible Supply Chain Configurations for Implementation

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Map the supply chain processes including methods of collaboration and also for ensuring partner loyalty. Map your supply chain for each customer order and have mitigation strategies for operational possible attacks, failures, etc.

Multitier risk management is you should not only know about your suppliers but their suppliers their suppliers



How do you mitigate risk. Do not outsource very sensitive critical components and do the in sourcing i.e. make it yourself. Dual sourcing is followed to avoid sharing too much of IP with single source. Basically you have several methods of mitigating IP risk. In other words, you cannot avoid any risk but the several ways in which you can try to mitigate and be prepared to do it.

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Enablers and Supply Chain Performance

	Product & Value Chain	Logistics & IT	Trade Policies	Resource Management
Enablers	Modular Products, IT, TQM, SCM, SC Visibility, Collaboration	Connectivity, Port, Road & IT Infra., IPAs, Software, Vendors	FTAs, Customs, Trade Stability, Patent & Legal System, Trade Facilitation	Power and Natural Resources, Manpower, Capability, Management Skills
Lead Time	Low	Low	Low	Low
Cost	High Product Design Cost, Low Production Cost	Low Transportation & Inventory Costs	Low Tariffs, High Profits	Low Factor Costs
Quality	High Quality Products	High SC Service Levels & Market Reach	High SC Service Levels	High Management Quality
Flexibility	Product Customization and cost	Delivery Services To global customers	Supply and Market Globality	Multinational sourcing and management

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The table shown summarizes the effect of ecosystem components of a global supply chain on the performance measures. For example in the supply chain context product modularization, process standardization, Collaboration with partners and the Supply chain visibility using sensor networks, call centres and Internet, late customization and use of supply hubs will certainly reduce the lead time and increase the efficiencies and product flexibility but may increase the cost of production. The total landed cost to the consumer could be less however.

Availability of Natural, Human and Financial Resources, Clusters and R&D Institutions will reduce cost and improve the lead times. Needless to say that good logistics infrastructure such as Ports, Roads is essential for good performance; a favourable institutional framework will improve the trade, international relationships, multinational sourcing and service levels. 3PLs, IT, Software vendors, and Soft infrastructure: Trade facilitation will result in Low transportation and inventory costs & predictable lead times and Standardized Delivery to global customers

Since the logistics plays a very important role in global supply chains, we consider in this section the global logistics performance which is a result of the actions of the multiple governments and their agencies and also the delivery services business models and infrastructure

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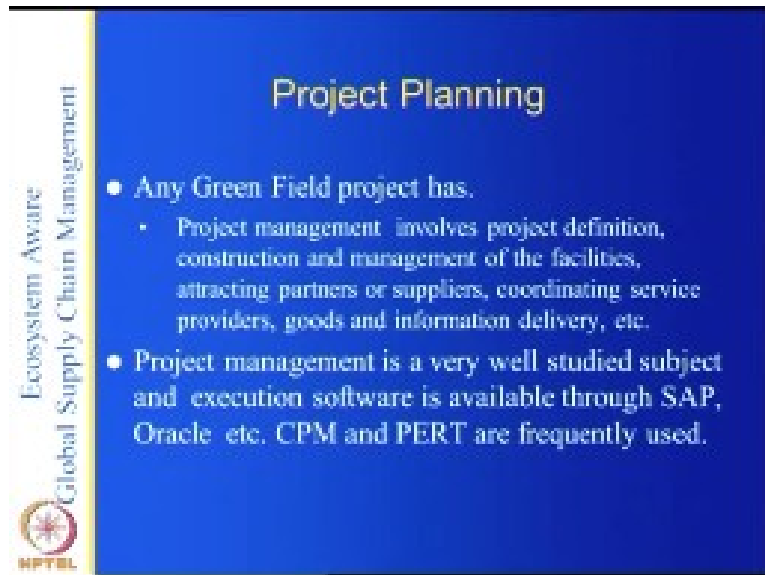
What do we have at the end of the Supply chain formation phase?

- Ecosystem map, various network partners (including manufacturing, logistics & IT) & their (country & regional) locations
- Risks that the ecosystem faces
- The innovations (product, process, business model) needed to make it big in the industry
- The value chain architecture with outsourced and ownership details.

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This is the kind of big data that you need for the supply chain design. It contains the textual data, it contains the data about the countries, it contains opinions of experts and several others. Now how do you select suppliers using this. You can use analytical hierarchy process, machine learning etc. The collection of data is the one that is important and that is the first step



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Project Planning

- Any Green Field project has.
 - Project management involves project definition, construction and management of the facilities, attracting partners or suppliers, coordinating service providers, goods and information delivery, etc.
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Possible Cost and Time Overruns

- Industrialization and land conversion creates tensions between the govt., industry and the farmers.
 - Construction of facilities requires several approvals and may require dealing with several government departments. This may result in time and cost overruns.
- IT and logistics infrastructure could be weak and end to end delivery service providers may not be available
- In case of electronic and apparel manufacturing project planning involves partner selection i.e. contract manufacturers from a global list and developing connections.
- In case of auto or electronic contract manufacturing, there could be land acquisition requirement and Government permissions then this step of project planning should be treaded carefully.

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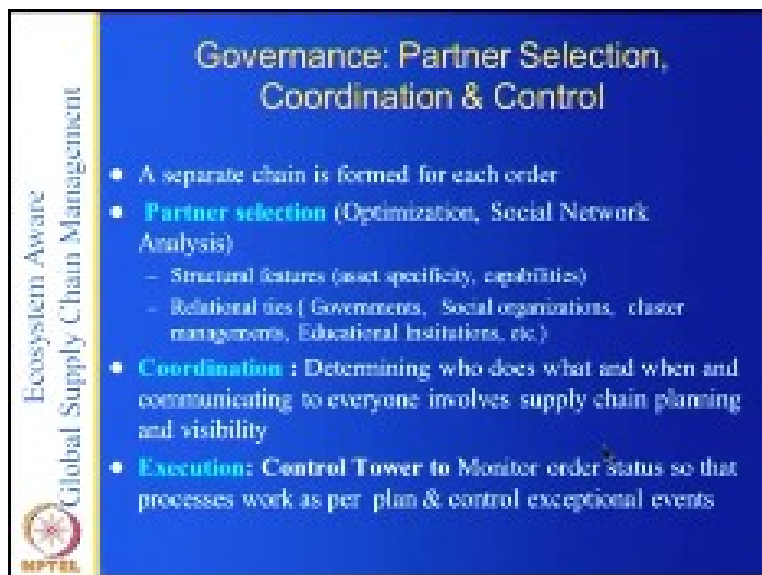
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Now we deal with Building Governance mechanisms or Frameworks for Partner Selection, Coordination & Control



Building Governance mechanisms or Frameworks for Partner Selection, Coordination & Control

- Governance: Partner Selection, Coordination & Control
- A separate chain is formed for each order

- **Partner selection** (Optimization, Social Network Analysis)
 - Structural features (asset specificity, capabilities)
 - Relational ties (Governments, Social organizations, cluster managements, Educational Institutions, etc.)
- **Coordination** : Determining who does what and when and communicating to everyone involves supply chain planning and visibility
- **Execution: Control Tower to Monitor** order status so that processes work as per plan & control exceptional events

You should select your partners for the order on hand. The order tells where the client is and the products and delivery mechanisms. You may want to minimize the cost or maximize quality and now you do the supply chain planning, coordination and also execution.



So let us look at the partner selection.

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Partner Selection

- We identify suppliers for various Components and Services from all over the globe
- We short list them based on the criteria mentioned such as Location, Country policies, Delivery costs, Asset Specificity, Risk proneness, Innovation capabilities, Technology sophistication of hard and soft infrastructure, etc.
- Optimization, TCE, Social Networks, are used in the pre-selection process

Partner Selection

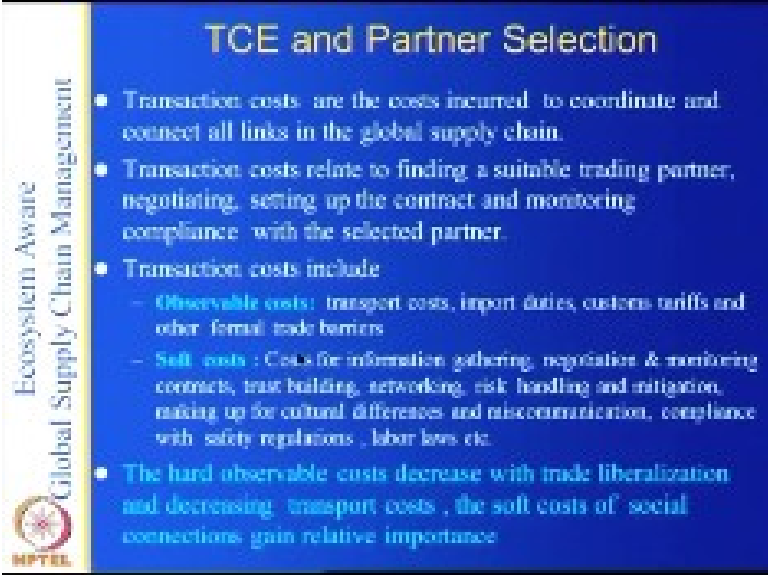
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Mathematical Models for Partner Selection

- The **partner selection problem** can be formulated as Fuzzy AHP or MIP problem. One can rank order the suppliers for each component based on the ecosystem parameters based **on TCE**.

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TCE and Partner Selection

- Transaction costs are the costs incurred to coordinate and connect all links in the global supply chain.
- Transaction costs relate to finding a suitable trading partner, negotiating, setting up the contract and monitoring compliance with the selected partner.
- Transaction costs include
 - **Observable costs:** transport costs, import duties, customs tariffs and other formal trade barriers
 - **Soft costs:** Costs for information gathering, negotiation & monitoring contracts, trust building, networking, risk handling and mitigation, making up for cultural differences and miscommunication, compliance with safety regulations, labor laws etc.
- The hard observable costs decrease with trade liberalization and decreasing transport costs, the soft costs of social connections gain relative importance

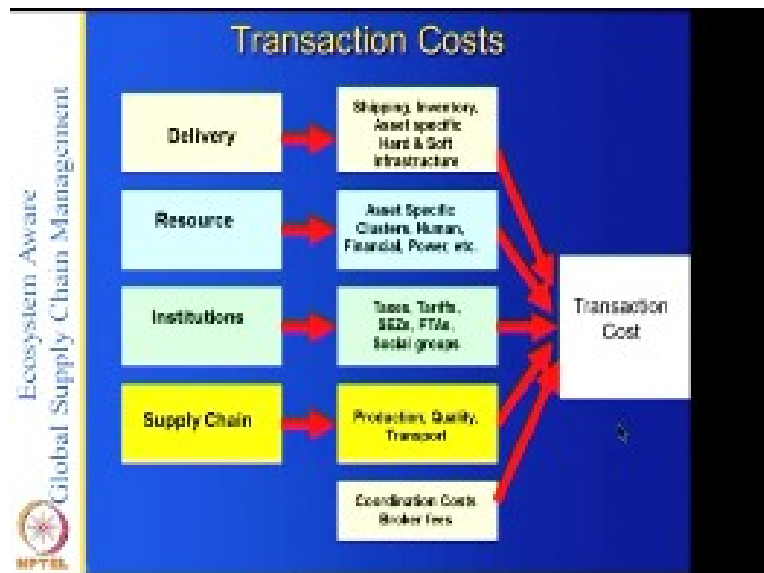
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Transaction Costs

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.

Transaction Costs

- Three characteristics of transactions affect the transaction costs: asset specificity, uncertainty and frequency.
- Transaction Cost Economics (TCE) Theory:
 - When transaction cost are low, use the spot market governance
 - When transaction costs are high, Hierarchy is efficient
- In between market and hierarchy, there is the governance structure *hybrid*.

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Asset Specificity & Ecosystem

- **Supply chain specific assets**
 - Good relationships between members of network or cluster
 - Assets such as specific dies, molds, and tooling for the manufacture
- **Resources:** The human, clusters, financial institutions etc. ports and airports, Location specific assets
- **Institutions :** create benefits to companies in taxes and tariffs , by creating special economic zones, special universities for training manpower, etc
- **Delivery Infrastructure :** Ports, Airports, Rail roads, Highways Special trucks for carrying finished vehicles and heavy power plant equipment such as boilers, Temperature controlled warehouses, refrigerated vehicles, Forklift trucks, guidance systems, etc.
- Some of these costs are not flexible or transferable across products or organizations: Infrastructure created, Manpower trained, Costs of attracting 3 PLs, Software providers

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The slide features a blue background with white text. On the left side, there is a vertical yellow bar containing the text 'Ecosystem Aware' and 'Global Supply Chain Management' along with a circular logo. The main content is a list of two bullet points.

Frequency and Uncertainty

- "Frequency of interactions" between the buyer and supplier is important for reasons of economies of scale
 - To recover the costs of specialized mechanisms created and establishing relations with partner's network partners
 - For transfer of tacit knowledge in customized exchanges
- "Environmental uncertainty" can come from suppliers, customers, competitors, regulatory agencies, unions, or financial markets, etc
 - The mode of governance used to coordinate partners depends on the sources of uncertainty. High uncertainty recommends hierarchy

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The mode of governance used to coordinate partners depends on the sources of uncertainty. High uncertainty recommends hierarchy



What we have next is the coordination



Coordination

Coordination is Determining who does what and when and communicating to everyone. The coordination includes Software based method for “For every order, selecting of suppliers; assigning functions to them such as what to supply, how is it to be produced (e.g., product tolerances and process standards), the production and delivery schedules , etc given the product

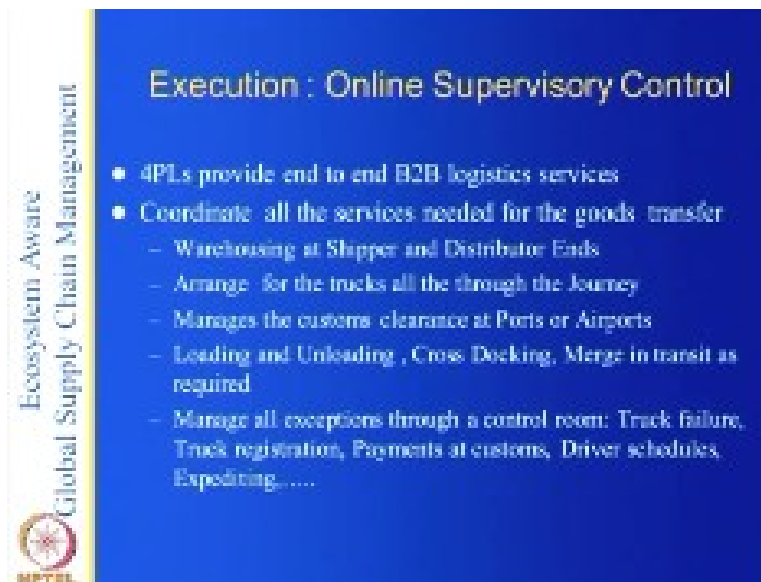
specification and communicating to the chain partners” Supply Chain Planning Software will be helpful here



Design of Control Tower

Cloud computing, Big Data Analytics are fundamental in this step. Expert systems, Decision support systems, Case based reasoning and Hybrid control systems are useful for Exception Management and Execution

Control Towers exist in Airlines, Power Networks, Rail Networks, etc. There are several applications such as 4 PLs, Monitoring and Execution using BPOs (Penske)

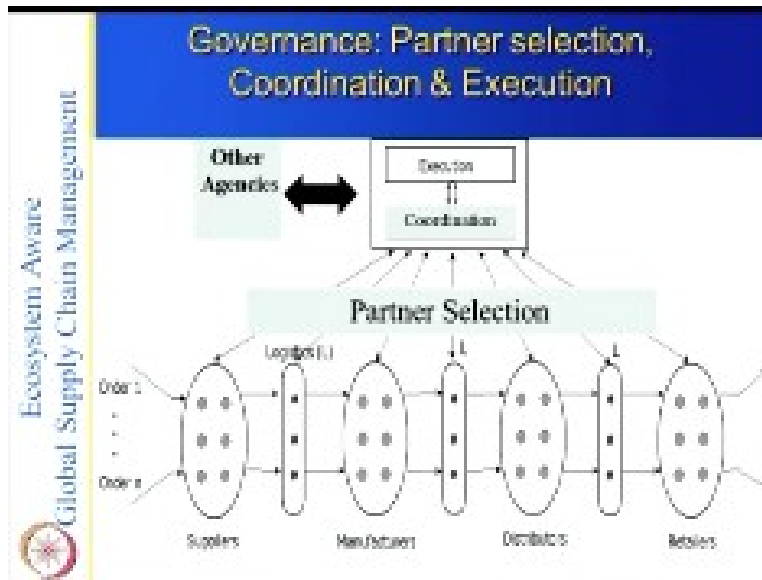


Execution : Online Supervisory Control

- 4PLs provide end to end B2B logistics services
- Coordinate all the services needed for the goods transfer
 - Warehousing at Shipper and Distributor Ends
 - Arrange for the trucks all the through the Journey
 - Manages the customs clearance at Ports or Airports
 - Loading and Unloading , Cross Docking, Merge in transit as required
 - Manage all exceptions through a control room: Truck failure, Truck registration, Payments at customs, Driver schedules, Expediting,.....

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This diagram summarizes the governance which is partner selection, coordination, and execution.

The supply chain design has basically two parts the first one is the supply chain formation which includes the five steps that we have mapping the ecosystem to finding the final configuration and the second step is the design of the governance and which includes partner selection coordination and execution. This basically gives you an integrated supply chain design procedure which is valid for not only global supply chains but local supply chains as well.



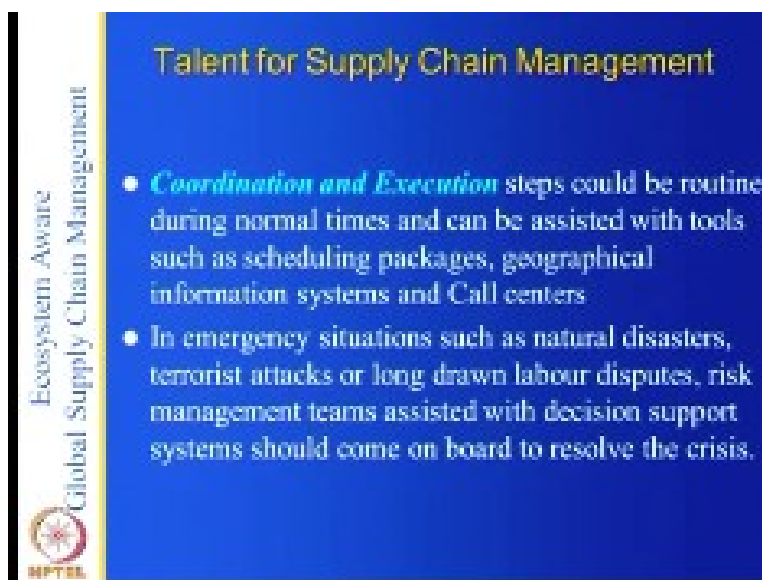
but what is the kind of talent that you require

Talent for Supply Chain Management

- **The talent (soft skills, R & D, execution abilities, connections, domain knowledge) needed for each step in the supply chain design is different.**
 - The talent needed for the group working on *supply chain formation* is more knowledge and data intensive and requires domain industry knowledge, Political and economic factors of the countries or regions, strategy formulation, innovation and risk evaluation and finally use of analytical techniques for location selection and group formation.
 - *Project management* requires skills to interact and manage with the Government and local communities. Local connections and knowledge will help to get approvals quickly and resolve any dispute that may arise with land owners, local communities and labour unions.

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Talent for Supply Chain Management

- *Coordination and Execution* steps could be routine during normal times and can be assisted with tools such as scheduling packages, geographical information systems and Call centers
- In emergency situations such as natural disasters, terrorist attacks or long drawn labour disputes, risk management teams assisted with decision support systems should come on board to resolve the crisis.

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Talent for Supply Chain Management

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If you have going global and if the markets are becoming volatile and if the countries on governments are changing their strategies every day then the supply chain formation becomes a very important step. In emergency situation such a natural disasters terrorist attacks are long drawn labor disputes risk management teams play an important role

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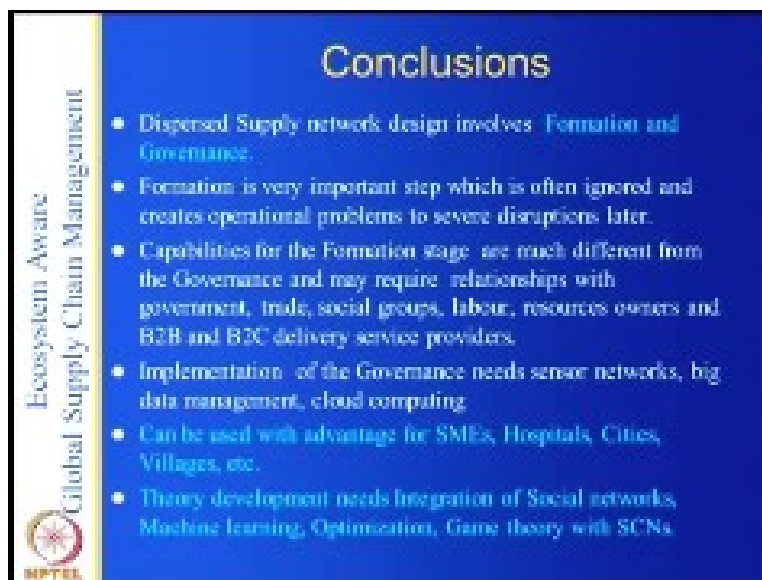
Jatasya maranam dhruvam: Same is true for Companies & Strategies

- No design, product, process, network, ecosystem is permanent. All of them keep evolving and your designs, products, processes, networks, ecosystems must evolve suitably to keep global competitiveness.

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Conclusions

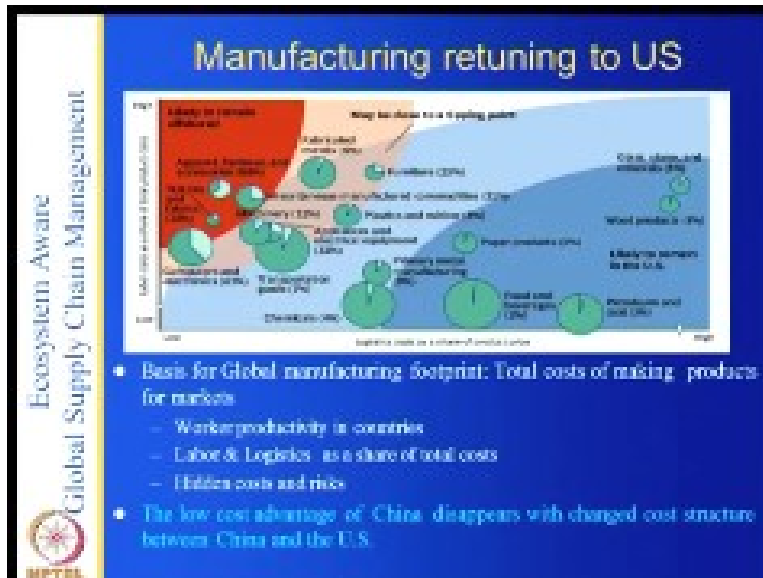
- Dispersed Supply network design involves Formation and Governance.
- Formation is very important step which is often ignored and creates operational problems to severe disruptions later.
- Capabilities for the Formation stage are much different from the Governance and may require relationships with government, trade, social groups, labour, resources owners and B2B and B2C delivery service providers.
- Implementation of the Governance needs sensor networks, big data management, cloud computing.
- Can be used with advantage for SMEs, Hospitals, Cities, Villages, etc.
- Theory development needs Integration of Social networks, Machine learning, Optimization, Game theory with SCNs.

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We are seeing at all turn around in outsourcing and globalization.



Manufacturing retuning to US

Basis for Global manufacturing footprint: Total costs of making products for markets

- Worker productivity in countries
- Labor & Logistics as a share of total costs
- Hidden costs and risks

The low cost advantage of China disappears with changed cost structure between China and the U.S.



The Future of Global Supply Chains

An increase in objective and subjective transaction costs, from higher oil prices to "buy local" campaigns and murky protectionism (government procurement in favor of local firms), indicates that in the future, supply chains will probably be smaller and more regional. Several companies such as Boeing are restructuring their supply chain.

Frequent supply chain redesign is needed and it is not that though you can design your supply chain and sit back and relax for years thank you.

Programme Assistance

Guruprakash P
Dipali K Salokhe

Technical Supervision

B K A N Singh
Gururaj Kadloor

**Indian Institute of Science
Bangalore**