The Ecosystem-Aware Global Supply Chain Management

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- Highly Connected Supply Chain & Fragility
- The Ecosystem Model
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High Performance Supply Chains: Efforts of Stakeholders for last Two Decades

- Lean, JIT, TQM, Outsourcing, Collaboration, Visibility, Supply hubs, Cross docking, etc
- Web, Software, Consultants & Implementation Experts
- Highly connected (logistically, informationally and financially)
- Final Goal: Global Supply-Demand Matching
SCNs act as Risk Transmitters & Amplifiers

- Efficiency Contributors of SCNs turned Risk Creators: Outsourcing, International Logistics, Internet, Credit through LCs, Trade & Financial Flow Liberalization, …
- 2008 Financial Crisis & Decline in Trade - De-Globalization
- 2011 March 11, Earthquake, Tsunami, Nuclear crisis & Plant Shutdowns in Japan threatened supplies of semiconductors to car parts to the globe.
- Due to the high connectivity the global supply chains react “just in time” to the events such as collapse in demand
The Great Trade Collapse

- Globalization & Highly Connected Supply Chains amplified & transmitted market collapse across the globe.
- Governments turned protectionist. Resources became expensive.
- High concentration Clusters became vulnerable.
- Organizations extraneous to Supply Chain (Governments, Traders, Energy, .. Social, Political factors) influence its performance
The Ecosystem Model

A framework to visualize all Operational, Strategic, Management & Execution Issues
The Supply Chain Ecosystem

- Ecosystems comprises of a network of
  - Companies, Countries and their Governments, Social and Political organizations
  - Natural, Industrial (clusters) and Financial & Human resources
  - Delivery infrastructure including Logistics & IT
  - Connections, and knowledge of the industrial environment

interacting together with the landscape (Vertical) and Climate (Economic & Industrial)
Ecosystem aware

Global Supply Chain Management

The Basic Ecosystem

Investment Climate
Co-Evolution, Conflict, Risk Propagation

Institutions
Supply Chain Ecosystem
Supply Chains
Resources
Delivery Services Infrastructure
The Four Forces in Detail

- Supply Chains
- Delivery Services Mechanisms
- Resources
- Institutions
Classical Economics define:

- Natural Resources
- Human Resources
- Financial Resources
- Industrial Resources
  - Clusters
  - SEZs
- Knowledge, Intellectual Property
- Relationships with stakeholders
- Infrastructure
Institutions and Supply Chains

- Governments control the inter-country entry and exit through the ports and airports affecting lead times and inventory.
- Important parameters for the companies to register superior performance
  - Hard & Soft infrastructure such as trade facilitation,
  - Regulations and deregulations: Privatization, Customs, free trade agreements, FDI, restrictions on entrance of foreign companies,
  - Business friendliness, enabling attitude and economic diplomacy of the governments,
  - Social factors such as labour unions, industry associations and other communities
  - Talent Creation
- Favourable institutional environment reduces transaction costs
Delivery Infrastructure Transforms Economies

- The Internet, Wireless and Sensor networks facilitate greater visibility into and control of the shipments through improved track and trace capabilities and real-time co-ordination.
- Several innovations in Transportation systems: from commercial jet aircraft to container shipping; Suez and Panama canals to Trade facilitation.
- In world class supply chains, the movements of components, final products, information and funds are not discrete functions, but are governed by a single integrated process, with the goal of tight management of deliveries, inventories, and costs.
The GRIP Framework

- Governance
- Risk
- Innovation
- Performance

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International Chains-Lead Time & cost

- Freight crosses several countries (ports) making supply chains long and fragile
- Lead times are dependent on Resources (Clusters) infrastructure, customs clearance, logistics and IT providers and their business models
- The pretax costs are dependent on tariffs, transport costs, energy costs and foreign exchange fluctuations
- Post tax net income depends on Transfer prices, Income Taxes and Rules in various countries
<table>
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<th>Enablers</th>
<th>Product &amp; Value Chain</th>
<th>Logistics &amp; IT</th>
<th>Trade Policies</th>
<th>Resource Management</th>
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<td>Modular Products, JIT, TQM, SRM, SC Visibility, Collaboration</td>
<td>Connectivity, Port, Road &amp; IT Infra., 3PLs, Software Vendors</td>
<td>FTAs, Customs, Forex Stability, Patent &amp; Legal System, Trade Facilitation</td>
<td>Natural, Financial Resources, Clusters, Water, Power</td>
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<tr>
<td>Lead Time</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
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<td>Cost</td>
<td>High Product Design Cost, Low Production Cost</td>
<td>Low Transportation &amp; Inventory Costs</td>
<td>Low Tariffs, High Profits</td>
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<tr>
<td>Quality</td>
<td>High Quality Products</td>
<td>High SC Service Levels &amp; Market Reach</td>
<td>High SC Service Levels</td>
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<td>Flexibility</td>
<td>Product Configuration and cost</td>
<td>Delivery Service To global customers</td>
<td>Supply and Market Globally</td>
<td>Multinational sourcing and management</td>
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- **Ecosystem aware Global Supply Chain Management**

- **Enablers**

- **Lead Time**

- **Cost**

- **Quality**

- **Flexibility**

- **Product & Value Chain**

- **Logistics & IT**

- **Trade Policies**

- **Resource Management**
Transaction Costs

- **Delivery**
  - Shipping, Inventory, Asset specific Hard & Soft Infrastructure

- **Resource**
  - Asset Specific Clusters, Human, Financial, Power, etc.

- **Institutions**
  - Taxes, Tariffs, SEZs, FTAs, Social groups

- **Supply Chain**
  - Production, Quality, Transport
  - Coordination Costs Broker fees

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Innovations Created Block Buster Industries

- **Products**: Nano, Video Games, Cell phones, Search engines, IPod, Wikipedia
- **Services**: E-mail, e-retail, Face book (social networking), Solar Power
- **New technology solutions** to redesign of services (water, power, gas, construction, banks, education) to be intelligent and smart
- **New Business models**: Containerization, Outsourcing, BPOs, FDI, Sell direct, e-retail, ATMs, Clouds, PPP, Orchestration, e-bay

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Innovations Created Block Buster Industries

- **Industrial Clusters**, Special economic zones (China), Freight corridors, New Universities,
- **New Delivery Infrastructure**: Digital delivery (Amazon), Containerization, Suez & Panama canals
- **Government regulations**: Process patent, Deregulation of Telecom & Airlines, VAT, Green, Free trade agreements, SEZs, PPP, WTO, New labor laws, etc
Supply Chain Risks

- **Product & Supply Chain risks**
  - Location risk
  - Outsourcing risk: Partner Risk, Breach of trust, IP theft
  - Design, manufacturing defects, Counterfeit, Inventory deficit
  - Delays or Bankruptcies of suppliers
  - Sudden loss of demand due to economic downturn, company bankruptcies, war
  - Breakdown of machines, power or water in plants, warehouses and offices.

- **Resource related risks**
  - Infrastructure deficit, Industry Clusters quality, Talent shortage, Labor Unions
  - Credit squeeze, Energy, Water shortage, Talent shortage
  - Social unrest, War, Natural calamities
  - Raw material: Price increase, Logistics costs, Disease in live stock, contamination

- **Institutional Risks**
  - Regulatory risk: FE, IP, Customs delays, Antidumping, Taxes, Protectionism
  - Trade agreements, VAT, Voluntary export restrictions
  - Political: Govt. changes, Center state relations, Environmental issues, Corruption,
  - Delays for clearances from several government departments for projects
  - Labor Unions, NGOs, Social interest groups

- **Delivery Infrastructure Risks**
  - Failure of IT infrastructure due to network, hardware or software failures or virus attacks, or natural disasters leading to the inability to coordinate operations
  - SC Visibility Failure
  - Inbound and outbound logistics failures due to carrier breakdown or weather problems
  - Lack of execution or governance mechanism
The supply chain is an inter-organizational network
A separate chain is formed for each order
Partner selection based on
- Structural features (asset specificity, capabilities)
- Relational ties (govt., social organizations, cluster managements, etc.)
Coordination: Determining who does what and when and communicating to everyone
Execution: Monitor order status so that processes work as per plan & control exceptional events
Governance: Partner selection, Coordination & Execution

Partner Selection

Order 1

Order n

Suppliers

Manufacturers

Distributors

Retailers

Logistics (L)

Execution

Coordination

Other Agencies
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.

Coordination, scheduling problems can be solved using Optimization techniques.

Expert systems, Decision support systems, Case based reasoning and Hybrid control systems are useful for Exception Management and Execution.
Applications of SES Framework

- Mapping and Benchmarking
- Location selection
- Green Supply Chain Design
- Smart Villages & Cities
- STERM models
The Five STERM forces

- **Science** research generates new and or improved products
- New **Technologies** (Internet, Search, Solar) emerge at a rapid pace
- New **Engineering** materials and designs come out every day
- Globalization brings new challenges of following **Regulations and policies** of several countries the intermediate products visits. Regulations such as Climate change require attention
- New **Management** techniques and business models such as outsourcing, sell direct, supply hubs are invented to face competition and enable growth.
Benchmarking Indian Food Chain

Ecosystem aware
Global Supply Chain Management

- Economic Integration
  - Packaging Duties High
  - Trade Tariffs
  - Protectionist
  - Economic Policies

- Logistics
  - No Cold Chain

- Information Technology
  - No Supply Chain Visibility

- Product Offering
  - Few Processed Products/Labs

- Supply Chain
  - Too many intermediaries

- Resources
  - Abundant

- Resources & Management
  - Inefficient and Fragmented

- Product & Value Chain Innovation

- Connecting Technologies
Conclusions

- The SES Framework holistically models all the factors that interact with the supply chain i.e. Institutions (formal and informal regulatory setups), Resources (inputs) and Delivery service infrastructure (Includes logistics & IT) and influence the flow of goods, information, and finance.

- This framework provides opportunities for analyzing and improving the Governance and Performance of the global supply chains by appropriate redesign.