

**Indian Institute of Science
Bangalore**

**NPTEL
National Programme on
Technology Enhanced Learning**

(Refer Slide Time: 00:07)

Copyright

1. All rights reserved. No part of this work may be reproduced, stored or transmitted in any form or by any means, electronic or mechanical, including downloading, recording, photocopying or by using any information storage and retrieval system without prior permission in writing from the copyright owner:

Provided that the above condition of obtaining prior permission from the copyright owner for reproduction, storage or transmission of this work in any form or by any means, shall not apply for placing this information in the concerned Institute's library, departments, hostels or any other place suitable for academic purposes in any electronic form purely on non-commercial basis.

2. Any commercial use of this content in any form is forbidden.



Global Supply Chain Management

Lecture -09

Supply Chain Risk –Part 1

Prof.N. Viswanadham

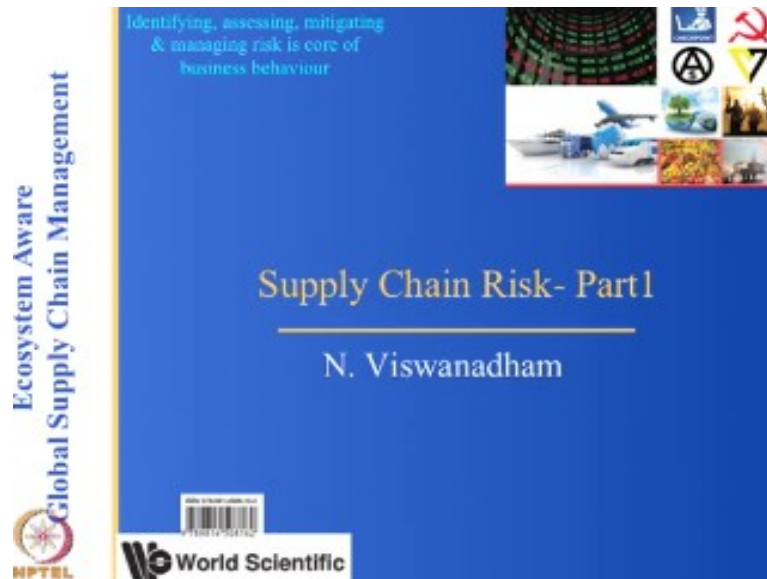
Department of Computer Science and Automation

Indian Institute of Science

Bangalore

These two lectures this one and the next one is going to be on the supply chain risk.

(Refer Slide Time: 00:22)



This is a very important subject. People are worried about their supply chain functioning and the risks the supply chain is facing. The supply chain risk management is identifying, assessing, mitigating and managing risk is the core of business behavior. Most of the businesses are now feeling the heat of supply chain risk. Several ecosystem parameters are causes for the risk of in the supply chain and how to mitigate the risk is catching the attention of several people.

In the early 1990s, companies were proud of their supply chains. Over the previous two decades, they had worked hard to reduce costs from the mechanisms and processes by which they got components and inputs to the right places at the right times. Companies have also perfected global delivery of goods from their low cost production centers to the customer sites. They had done this by implementing techniques such as the lean production, just-in-time manufacturing, single-source suppliers, and global outsourcing from low cost countries.

But more recent events such as terrorist strikes on ships, political instability in several natural resource rich countries, oil price and currency fluctuations, protectionist policies of the governments during global financial crisis, labor unrest and shutdown of shipping docks, financial institution (bank) failures and natural disasters, etc. have added to supply chain risks, some of which have been the consequence of the very actions companies had taken to drive costs out of their supply chains. Single-mindedly pursuing reduction of costs, as in chasing low-cost labor anywhere in the world, without sufficient regard for the many risks it creates, made the supply chain more brittle.

Supply Chain Risk: Definition

- “Any changes in the information, material and financial flows of the supply chain network – deviation, disruption, disaster – due to events in its Ecosystem (anywhere in its path or its network partners or in the industry vertical or in the economic environment) ”
- These changes create
 - Mismatch between supply and demand
 - Effect the supply chain functioning, efficiency & output
 - Sometimes company closure

Definition : **Supply Chain Risk:** “*Any changes in the information, material and financial flows of the supply chain network – deviation, disruption, disaster – due to events anywhere in its path or its network partners or in the industry vertical or in the economic environment* ”

The ecosystem has four parameters: the supply chain, the resources the institutions which are governments and social groups and finally the delivery mechanisms. The risks can come from any one of these elements like from network partners in the industry vertical or in the economic environment, etc. The mad cow disease or H1N1 will affect the entire industry vertical. One has to look at the all the factors that will affect your supply chain and the changes they will create. The effect of any risk can be a disruption, deviation or a disaster.

The risk can create mismatch between supply and demand. If there is no supply of components due to supplier failure, then the manufacturing factories need to be shut and people will be out of jobs. Some times companies need to be closed. We will see some examples in the later part of the lecture.

It is very important to study how to handle the risk, how to mitigate the risk, the ways in which you can handle the risk and come out of the situation.



Definition: **Supply chain risk management:** *Supply chain risk management is the identification and management of risks within the supply-chain or external to it, through a coordinated approach amongst supply-chain members and reduce supply-chain vulnerability as a whole.*

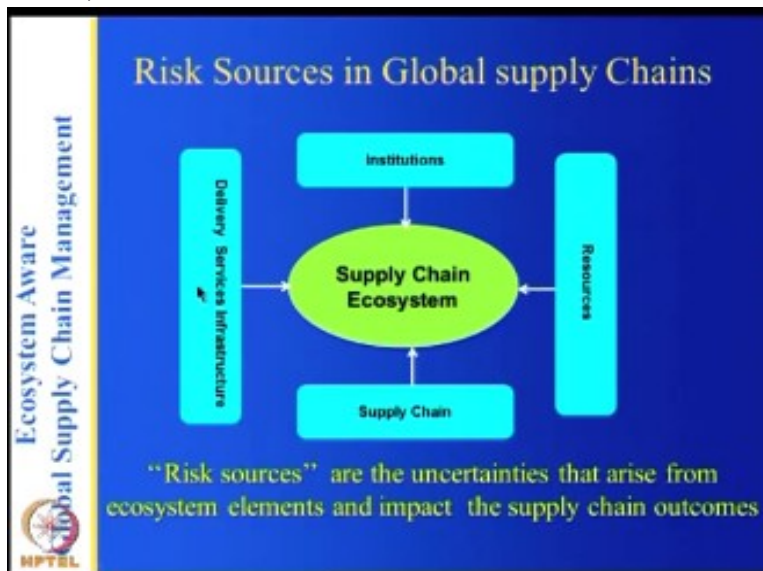
The aim of supply chain risk management is to reduce the supply chain vulnerability. You need to reduce the vulnerability by identification and management of risk within the supply chain and external to it in coordination with the partners. All the supply chain ecosystem partners have to coordinate and handle the risk; the first point is identification of the risk and second point is to identify what is the magnitude of the risk the third one is you have to coordinate with other partners to handle the risk.

If the coordination comes after the risk has occurred then it may take a long time to recover. When The disaster occurs and the supply chain breaks. But other hand, if you plan about the risk management, you can have a list of all the small big and large disruptions and if you have ways of dealing with them, then the losses can be minimized.



We study the supply chain risk in an ecosystem framework for global supply chain.

(Refer Slide Time: 08:40)



In a global supply chain, all the ecosystem elements of the supply chain network, the resources, the institutions and the delivery infrastructures can contribute to risk. We are going to see how each of them contributes to risk and how they impact the supply chain outcomes,

The increase in the price of oil or the labor going on strike are the kinds of uncertainties that arise for the resources. The government turning protectionist or there is a government change and so on are the kinds of risks that the institutions can create. If the ship sinks or there are

some problems with the ship transport or there is piracy that is affecting the deliveries are the kinds of risks that affect the delivery infrastructure. All the uncertainties that arise from the ecosystem elements and impact the supply chain outcomes are the risk sources.

First you have to diagnose the sources of risk, map what is the effect of these on your supply chain then you can find ways to mitigate the risk.

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

H. Viswanathan

Product and Supply Chain risks

The supply chain partners are located across various parts of the world. The location risk such as Tsunami or earth quake or hurricanes or war in the supplier locations can disrupt the goods movements. The outsourcing risk can be from Partner Risk, Breach of trust or IP theft. The partner may not have equipment to supply modern high quality components or he can share the designs with your competitor and there could be an intellectual property theft. There could be delay or unavailability of materials from suppliers or there can be a total failure of suppliers. On the demand side, sudden loss of demand due to economic downturn, company bankruptcies, war, etc is a possible risk. There could be an expected Breakdown of facilities (Fabs, machine shops) or loss of power or water etc interrupting the production

Resource related risks

We consider four types of resources. They are the natural, human, financial and industry resources. In the human resources arena there could be skills shortages and employee attrition at one end, communicable diseases affecting the number of effective working days and strikes which lead to stoppage of production. There is also possible opportunistic behavior by the managers and staff such as theft of intellectual property. The input material shortages such as

grains, fruits and vegetables, live stock, quality problems due to diseases such as mad cow disease, chicken flu, price fluctuations such as Oil prices, foreign currency fluctuations all affect the supply chain effectiveness. Equipment failures, failure of power or water resources can lead to unavailability of plants, warehouses and office buildings. Power shortages, unavailability of spare parts are also issues that need attention. And there is also increase in the logistics costs because of the increase in the price of the trucks and taxes. Diseases in livestock contamination of milk, meat etc can affect the supply.

The image shows a presentation slide with a blue background. On the left side, there is a vertical yellow bar with the text 'Ecosystem Aware' and 'Global Supply Chain Management' in blue. Below this bar is the HPTEL logo. The main title of the slide is 'Supply Chain Risks' in white text. Below the title, there is a bullet point '• Institutional Risks' in red. Underneath this, there is a list of six items, each preceded by a minus sign: '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 of Projects by Government Departments.', 'Labor Unions, NGOs, Social interest groups'. In the bottom right corner of the slide, there is a small inset image of a man with grey hair, wearing a white shirt, speaking into a microphone. The name 'N. Viswanathan' is written in small text below the inset image.

Institutional Risks

The businesses are embedded in an institutional setting. The Institutions such as constitutions, laws, contracts, and regulations like the labour laws, import and export restrictions etc. They affect the supply chain performance. The Economic and Political Related Uncertainties affect businesses across all industries . The economic factors include economic *slowdown, country policies and ratings, foreign exchange, interest rates changes*, Political issues include *War, Country to Country relationships, Changes in Governments, Uncertainties in Trade agreements (Anti-dumping, Voluntary export restrictions)*. Government policy changes include price *controls, free trade zones, inadequate public services, nationalization, barriers to repatriation of earning or Security* related such as *terrorist attacks, virus, piracy etc*. Protectionist behavior Countries hiking the duties against the trade agreements, Textile Quotas abolition by USA and EU in January 2005 are some examples

The most pervasive and subtle forms of discrimination against the MNCs is regulatory discrimination such as anti dumping , continuously changing rules and regulations particularly in taxes and tariffs, foreign exchange regulations, Corruption: Inspections, site visits, delayed payments, Local company preference for indirect materials for Govt. contracts. These measures are sometimes intended to shield uncompetitive locals and also to protect natural resources.

The non-government organizations and social interest groups going on strikes and their objecting to the plant location or pollution can create the risks.

Supply Chain Risks

- **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

Ecosystem Aware
Global Supply Chain Management
NPTIL

M. Viswanathan

Delivery Infrastructure Risks

Delay or unavailability of either inbound or outbound transportation to move goods due to carrier breakdown or weather problems will cause the supply demand matching problem. Failure of information and communication infrastructure due to line, computer hardware or software failures or virus attacks, will lead to the inability to coordinate operations and execute transactions. While the physical supply chain handles the movement of the physical goods the financial supply chain handles the movement of documents data and money. Thus any credit squeeze by the financial institutions will affect the supply chain. The letters of credit will also become more expensive.

There are lots of packages ERP , TMS etc which will give you the supply chain plans when to and how much to manufacture, when to pick up, where to deliver, how many trucks and which driver and so on . What happens if something happens and this cannot be executed as given. Who will direct them what to do, that is the execution.

**Ecosystem Aware
Global Supply Chain Management**

Supply Chain Risk Management

- The aim of SCRM is to reduce supply chain vulnerability by identification and management of risks within the supply-chain and external to it.
- Inter-organizational coordination of risks is a critical requirement in Global supply chains which are complex interdependent networks of suppliers, customers and third party service providers.
- The leaner and more integrated supply chains become, the more likely uncertainties, dynamics and accidents in one link will affect other links

NPTEL M. Viswanathan

The aim of supply chain risk management is to reduce the supply chain vulnerability by identification and management of risk within the supply chain and external to it. We define it as inter-organizational coordination of risk. It is a critical requirement in global supply chains which are complex independent networks of suppliers, customers, third party service providers. The leaner and more integrated supply chains become the more likely uncertainties, dynamics and accidents in one link will affect the others.

**Ecosystem Aware
Global Supply Chain Management**

Risks In the Supply Chain


NPTEL M. Viswanathan

Risk in Products and Value Chains

- Global supply chains are riskier than local supply chains
 - Need to deal with different governments on varying infrastructure and intellectual property issues
 - Some countries are high risk. The risks include intellectual property infringement, supplier and internal product quality failure, and security breaches.
 - Delay or unavailability of materials from suppliers due to natural disasters, War etc
 - Loss of demand due to Economic Downturn, Financial crisis, etc.
- High performance design makes supply chains are very fragile and they get severely affected by disruptions to transport, communications, raw material inputs, etc
- Breaches in partnerships: Violation of the integrity of cargoes, products (can be due either to theft or tampering) or company proprietary information.


Global supply chains are riskier than local supply chains. So let us look at the risks in the product and value chains. The global supply chains are riskier than local supply chains since they need to deal with different governments on varying infrastructure and intellectual property issues. Some countries are high risk. The risks include: intellectual property infringement, supplier and internal product quality failure and security breaches, Delay or unavailability of material from suppliers due to natural disasters, war etc., Loss of demand due to economic downturn, financial crisis, etc. So the high-performance design makes supply chains very fragile and they get severely affected by disruptions in transport, communications, raw materials etc. and breaches in partnerships due to violation of integrity of cargoes products either due to theft or tampering or company proprietary information.

Ecosystem Aware
Global Supply Chain Management



Japan's Disaster Causes Supply Chain Turmoil

- The March 11, 2011 earthquake, tsunami, and consequent nuclear crisis in Japan caused shutting supplies from semiconductors to car parts to manufacturers across the globe
 - Boeing faced delays in the delivery of the Dream liner.
 - GM shutdown production in U.S. factories due to a shortage of parts.
 - Key parts of Apple's iPad 2 suddenly became difficult to find.
- Japanese Auto companies suffered huge losses
 - Toyota Japan production in April 2011 fell 74.5 % to 79,341 vehicles while its global production declined 48 % to 346,297 vehicles.
 - Honda's production in Japan fell to 81.0 % in April to 68 vehicles, while its worldwide production declined 52.9 % to 248,024 vehicles.
 - Nissan, Japan production declined 48.7 % to 41,000 vehicles, and global production slipped 22.4 % to 248,024 vehicles.



Supply chains today are extremely vulnerable to events far outside the control of those who manage and rely on them. The devastating March 11, 2011 earthquake, tsunami, and consequent nuclear crisis in Japan caused Plant shutdowns in Japan shutting supplies to manufacturers across the globe of items from semiconductors to car parts. The damage to factories and suppliers in quake-hit north-eastern Japan and the fuel shortages nationwide and power outages in the Tokyo area have affected production, distribution and the ability of staff to get to work.

Japanese-made equipment and materials play a key production role in many of the region's main industries, from automobiles in Thailand to semiconductors in the Philippines. Manufacturers may be able to shift to chip suppliers outside Japan. But that can be difficult if product specifications call for a particular brand.

Boeing faced delays in the delivery of the Dream liner. GM slows or shutdown production in U.S. factories due to a shortage of parts. Key parts of Apple's iPad 2 suddenly became difficult to find. Toyota factories were shuttered. Apple relies heavily on Japanese partners for critical components for its iPhone and iPad, Some of these components require lead times of 6-18 months, and alternate sources can't simply be supply on line in a matter of days. The consumers might not want to wait that long.

Toyota Motor Corp. reported that Japan production in April fell 74.5 percent to 79,341 vehicles while its global production declined 48 percent to 346,297 vehicles. Meanwhile, Honda's production in Japan nose-dived 81.0 percent in April to 14,168 vehicles, while its worldwide production declined 52.9 percent to 138,498. At Nissan, Japan production declined 48.7 percent to 44,193 vehicles, and global production slipped 22.4 percent to 248,024 vehicles.

You can see the huge impact that a natural disaster like earthquake. Basically this is what we call the location risk for the product value chains.

Ecosystem Aware
Global Supply Chain Management

Philips Semiconductor Plant


- In 2001 a small fire in a Philips semiconductor plant in Albuquerque New Mexico disrupted the supply of RFID chips to the mobile phone industry.
- Nokia reacted with great urgency to ensure that the inventory is available worldwide.
- Ericsson did not. Ericsson was not able to launch a new high volume product costing the company an estimated \$400m.
 - Ericsson recovered some of the losses through insurance, but the premiums have increased sharply.
 - The company lost market share
 - Ericsson now produces handsets in partnership with Sony.
- **The effect was felt by all members of the network, some acted and saved the company and others got affected**

M. Wamanathan

In 2001 a small fire in a Philips semiconductor plant in Albuquerque, New Mexico disrupted the supply of RFID chips to the mobile phone industry. Nokia reacted with great urgency to ensure that the inventory is available worldwide. Ericsson, their rival did not. As a consequence Ericsson was not able to launch a new high volume product costing the company an estimated \$400m. While Ericsson was able to recover some of their loss through insurance, their premiums have increased sharply. Consequential losses for the company were the reduction of market share, Today Ericsson does not produce its own handsets; it does so in partnership with Sony. The effect was felt by all members of the network, some acted and saved the company and others got affected

Ecosystem Aware
Global Supply Chain Management

The Land Rover



- Land Rover outsourced the production of the chassis of its Discovery model to a sole supplier, UPF Thompson.
- UPF Thompson became bankrupt and demanded £46m from Land Rover to ensure supply or and they would not be able to provide the chassis
- Receivers KPMG threatened to halt supply exploiting **a legal loop hole under the sole supplier agreement** unless Land Rover made an immediate up-front payment.
- By paying £20m to Thompson, Land Rover guaranteed supply of chassis, and protected the company's future. They also protected the future of the 10,000 jobs of employees of other network members.

M. Wamanathan

When you are outsourcing a production you can tell the partner that he is a sole supplier which means you are not going to source that product from anybody else. Well you are going to run the risk of when the sole supplier fails due to some reason and he cannot supply the materials.

When chassis manufacturer UPF-Thompson became insolvent at the end of 2001, the impact upon its major customers was sudden and severe. UPF was the sole supplier of chassis for the Land Rover's best-selling model, the Discovery. The receivers, KPMG, threatened to halt supply unless Land Rover made an immediate up-front payment of between £35 and £40 million. KPMG justified its actions by pointing out that it was legally obliged to recover money on behalf of its creditors and the sole supplier agreement represented a valuable asset. The action followed an earlier court ruling in the UK that had determined that receivers were legally entitled to exploit a customer's vulnerability for the benefit of creditors. Land Rover faced the very real possibility of having to shut down production of the Discovery until a temporary injunction was secured granting the car-maker a short term reprieve. The injunction allowed Land Rover to arrange for another supplier to acquire the failing business, averting the lay-off of 1400 Land Rover workers and many more amongst the car maker's network of suppliers.

That supply chain was actually at risk because of the failure of UPF's business, not directly due to a problem between the supplier and its automotive industry customers, but as a result of losses suffered by UPF in an unrelated but ill-starred foreign venture.

**Ecosystem Aware
Global Supply Chain Management**

When Your Contract Manufacturer becomes Your Competitor

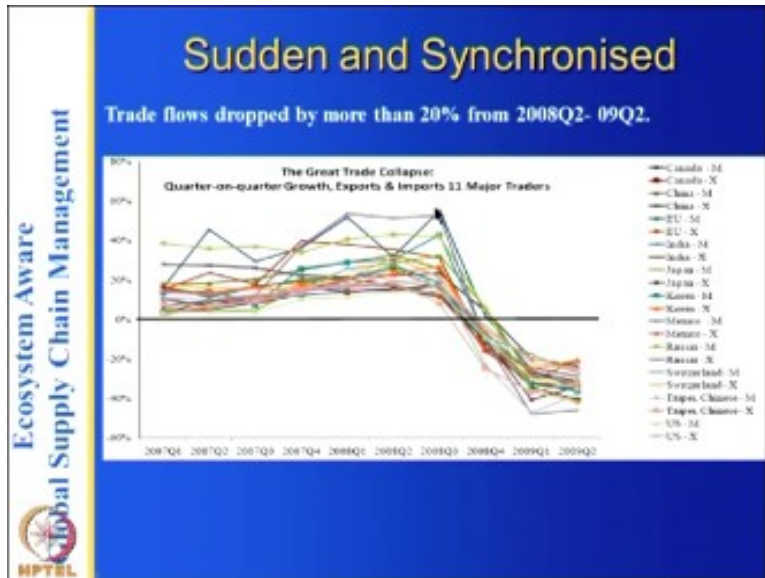
- PC maker *Lenovo* started out as a distributor of IBM and other companies; now it formed a joint venture with IBM and soon will make computers on its own.
- IBM created the personal computer industry. The company's name disappeared from PC industry
- *Shanghai Automotive Industry Corp. (SAIC)* started out manufacturing vehicles for Volkswagen and GM; now it's preparing to sell its own cars in China, Europe, and North America.

PC maker *Lenovo* started out as a distributor of equipment made by IBM and other companies; now it has formed a joint venture with IBM and will eventually affix its own logo to its computers. IBM essentially created the personal computer industry. It won't be long, however, before the company's nameplate disappears from PCs and IBM leaves the business, except for the joint venture it recently formed with PC maker *Lenovo*. *Shanghai Automotive Industry Corp.* (SAIC) started out manufacturing vehicles for Volkswagen and GM; now it's preparing to sell its own cars in China, Europe, and North America.

The double-edged relationships between OEMs and CMs.

- OEMs can reduce labor costs and free up capital by **outsourcing** the manufacturing to a CM and can then concentrate on value-adding activities : R & D, design, and marketing.
- An OEM that retains a CM may find itself immersed in a melodrama replete with
 - **Promiscuity** (Ambitious CM pursues liaisons with other OEMs)
 - **Infidelity** (Retailers and Distributors shift their business to CM)
 - **Betrayal** (CM transmits the IP to the rivals or uses it for itself).

The relationships between OEMs and their CMs are double-edged. An OEM can reduce its labor costs, free up capital, and improve worker productivity by outsourcing all the manufacturing of a product. The company can then concentrate on value-adding activities – R & D, product design, and marketing. An OEM that retains a CM may find itself immersed in a melodrama replete with Promiscuity (Ambitious CM pursues liaisons with other OEMs) Infidelity (Retailers and Distributors shift their business to CM) and Betrayal (CM transmits the IP to the rivals or uses it for itself).



The cause of the global crisis is clearly financial, but the global productive networks served both as transmission and amplification channels. There is now growing evidence that the financial crisis caused financial institutions to cut back in trade finance to exporting firms. Trade finance is not just letters of credits but guarantees, financing for shipping and insurance, temporary loans against the collateral of goods and loans for working capital etc. The costs of trade credits jumped up in 2008 and 2009 compared with 2007. In global chains trade finance is needed for longer periods of time. Credit crunch has affected trade finance and hence trade volumes in almost all the countries have declined sharply during the downturn.

People blame the supply chain for this because the supply chain is connected and it is synchronized so this drop happens is also synchronized because any cancellation happens across the globe from one place to the other. The synchronization was due to the connectivity of global supply chains that reacted just in time to the collapse in the demand.

**Ecosystem Aware
Global Supply Chain Management**

SCNs act as Risk Transmitters & Amplifiers

THE PRICE OF DISASTER (http://www.fishbase.org/abstract/2011/abstract/20110311/abstract/20110311001)

Country	Price of Disaster
JAPAN (MAR 2011)	\$139.9L/DR
THAILAND (2011)	\$12.9L/DR
NEW ZEALAND (APR 2011)	\$2.9L/DR
UNITED STATES (2011)	\$1.9L/DR
AUSTRALIA (2011)	\$1.9L/DR

- 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.

NPTEL

The supply chains act as risk transmitters and amplifiers. The big point is if the all your suppliers, their suppliers as well as the manufacturers and the distributors are co-located in one country either in India, United States or China. Then if a disaster strikes everybody goes. If on the other hand, the disaster doesn't strike all countries and it strikes some countries, you are not fully affected. The supply chain acts as risk transmitters and amplifiers. one economy is affected by the other because of the interconnectivity of the supply chain. If you want to make your supply chain more efficient, make them more connected with more supply chain visibility and so on. Then it so happens that you are basically more prone to more risk

**Ecosystem Aware
Global Supply Chain Management**

Resource Related Risks

NPTEL

N. Viswanathan

Ecosystem Aware
Global Supply Chain Management

Resource Uncertainties

- Resource Uncertainties
 - **Employee** related: communicable disease, strikes, attrition
 - **Behavioral uncertainty**: Opportunistic behavior by CEO, managers, and other staff
 - **Industry input** related such as power shortages, Spare part unavailability
 - **Input materials**: Raw material shortages, Quality problems, Mad cow disease, Chicken flu, Oil price
 - **Foreign exchange** fluctuations
- Resource Management Issues
 - **Skills shortage**
 - **Producer services** such as accounting, management consulting, advertising, venture funding etc.

M. Viswanathan

Resource Uncertainties can be various types. There are several resources including Human, Financial, input materials and power water etc. **Employee** related can be communicable diseases, labor strikes and attrition. The flues and diseases reduces the number of working hours drastically and the employee productivity also comes down. **Behavioral uncertainty of Seniors such as** Opportunistic behavior by CEO, managers, and other staff; **Industry input** related risks such as power shortages, Spare part unavailability; **Input materials**: Raw material shortages, Quality problems, Mad cow disease, Chicken flu, Oil price and **Foreign exchange** fluctuations are possible risks

There can be Resource Management Issues such as Skills shortage ; Producer services such as accounting, management consulting, advertising, venture funding etc.; Energy, Commodity and Transportation costs wreak havoc even on the best-run supply chains. These issues are faced by all countries and that need to be managed very carefully because the manpower particularly with good managerial capabilities is important to for risk management

**Ecosystem Aware
Global Supply Chain Management**

Energy, Commodity and Transportation costs wreak havoc even on the best-run supply chain

- Volatile fuel, energy, and commodity prices rank as the top three risks.
- Oil prices reached highs of around \$150 barrel, reached lows \$ 34 a barrel and now at \$ 100.
- Many companies questioned much of their globalization assumptions: chasing low material and labor costs in countries like China with little concern about the cost of transporting raw materials, components & finished goods to and from these countries.

N. Viswanathan

Volatile fuel, energy, and commodity prices rank as the top three risks. Oil prices reached highs of around \$150 barrel, reached lows \$ 34 a barrel and now at \$ 100. Many companies question much of their globalization assumptions: chasing low material and labor costs in countries like China with little concern about the cost of transporting raw materials, components & finished goods to and from these countries. The Transportation or the transaction costs are not just the unit cost alone, in includes the cost of transportation, the cost of taxes and other things including those of the risk and management coordination costs.

**Ecosystem Aware
Global Supply Chain Management**

Low-cost labor: Think hemispherically

07042008 N. Viswanathan

I said what I will stop here and then continue later in next lecture.

Programme Assistance

Guruprakash P

Dipali K Salokhe

Technical Supervision

B K A N Singh

Gururaj Kadloor

Indian Institute of Science

Bangalore