

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 – 10

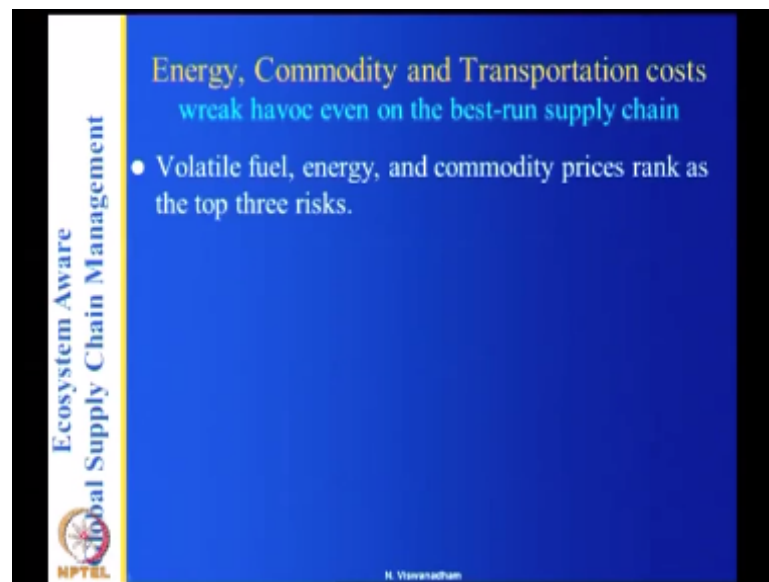
Supply Chain Risk – Part 2

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

Bangalore

So we have been talking about the supply chain race in the ecosystem element resources so in the resources are basically the natural human financial and industry clusters and so on so we have seen the resources uncertainties earlier but the energy commodity and transportation costs wreak havoc even in the Western supply chains so for example you have.

((Refer Slide Time: 00:51))



Volatile fuel energy and commodity prices ranked as the top three risk now the if you have mooches oil that has not gone 250 and gone down to 40 and now settled at 100 and there is a lot of fluctuations and similarly there is a power shortage which is happening and the commodity prices go up on now and then drop today is which are basically affecting the supply chains oil prices of course have reached \$115 many companies question.

Much of their globalization assumptions so with these fluctuations foreign exchange fluctuations commodity price fluctuations he said does it make sense to have globalization here from the logistics point of view so what are the cost of transporting the raw materials and how much are you saving by this outsourcing and globalization.

((Refer Slide Time: 01:56))

**Ecosystem Aware
Global Supply Chain Management**

NPTEL

**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.

H. V. Ramasubramanian

So these are some of the questions which are being asked now so there was the low cost labor.

(Refer Slide Time:

people are viewed as the best places to acquire goods and services so why are you going to China why are going to India for IT why are you going to Malaysia that is because they are the places where goods and services are cheap but company's assumed permanence of inexpensive labor and emphasize the impact of other costs so people thought that this labor is an expensive and it is going to remind so for decades but that did not happen the labor cost some increased both in India as well as in China and they what are the other costs that they said they take the raw material cost wanting trees.

But they have increased enormously transportation costs because the efficiencies of the transportation costs heavily have actually been decreased as we saw over the last decade but they started increasing because of the oil price increases and energy and made long-term contracts I had on all contracts between Brazil India and China or examples of this for example let's look at one example Brazil ships across the Pacific 17% of the iron ore that China uses to

make products for America's right so Brazil which is a South American country it ships semi iron an oil to China and China uses the tunnel to make products and send it back to America so when you add up the incremental transport energy inventory expenses for such a tragic meant China's labor cost advantage for places like Brazil or Mexico largely disappears in other words supposing this Brazil itself makes these products or Chinese company.

Actually puts installs a company in Brazil and ships directly to America then it will be lot cheaper your whole lot of product is moving in extra 10,000 miles without realizing significant change savings now there is 10,000 miles which is it means there are lot of gases there a lot of oil that is being used which is a natural which is in short supply so if you take all these factors into account then does it mean that this kind of thing makes sense.

((Refer Slide Time: 04:41))

**Ecosystem Aware
Global Supply Chain Management**

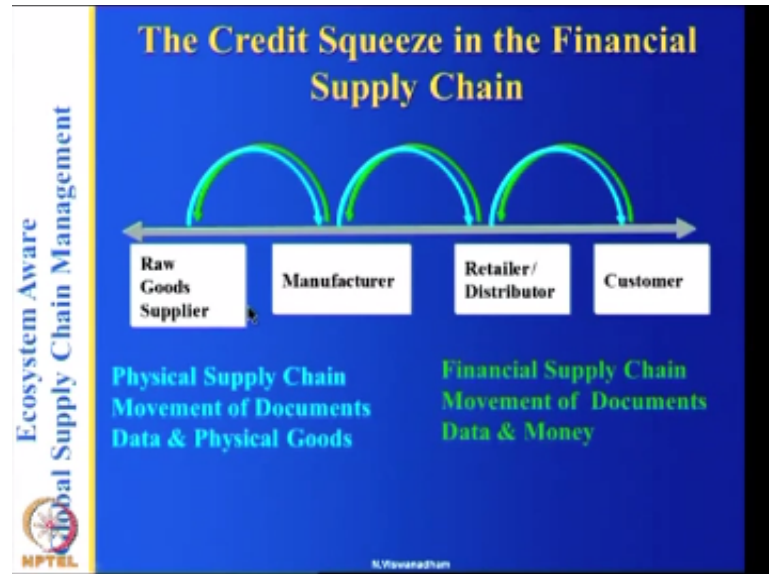
Low-cost labor: Think hemispherically

- LCCs are viewed as best places to acquire goods & services
- Companies assumed permanence of inexpensive labor and underemphasized the impact of other costs : raw materials, transportation, and energy & made long-term contracts.
 - Iron ore contracts between Brazil, India and China
- Brazil ships across the Pacific, 17% of the iron ore that China uses to make products for Americas
 - When you add up the incremental transport, energy, and inventory expenses for such trans-shipment, China's labor cost advantage over places like Brazil or Mexico largely disappears.
 - A whole lot of product is moving an extra 10,000 miles without realizing significant savings.

NPTEL 07042008 R. Viswanathan

So the credit squeezes in the financial supply chain for example.

((Refer Slide Time: 04:47))



In the financial supply chain for example as we said before the goods move in the forward direction where are they the finances move into being in the reverse direction supposing there is credit squeeze at this yet I take the customer is who goes to a bank for credit he doesn't get the credit that mean then he cannot buy once he cannot buy the retailer has no business that means he cancelled the order from the distributor cancels from the manufacturer and manufacturer cancels the raw goods suppliers good suppliers.

And so on so this there the financial this one here it basically goes back and it affects both the logistics providers who transport these goods across all this and also the raw material suppliers here now the logistics this blue lines are the ones that show that affect the trade so that's what we saw the trade gets affected and so on but supposing there is the LC credit squeeze a south the LC that means this karat Co this financial flow cannot happen so the goods cannot move so that is also it is affected here so they both the financial. And physical supply chains or interrelated.

I had this now this shows the bird flu outbreaks in the world.

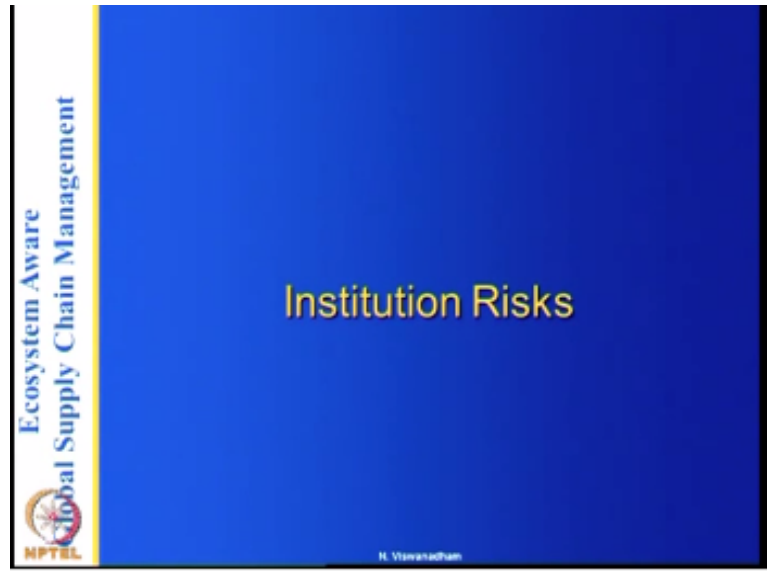
(Refer Slide Time: 06:18)



This was this is a source in 2000 2006 so the red ones are the ones where they bought flow out countries with outbreaks and also countries with outbreaks including human cases yes is the red ones and so you can see the whole of Asia Pacific got affected by that and once the bird flu effects what about the birds and it gets to the human.

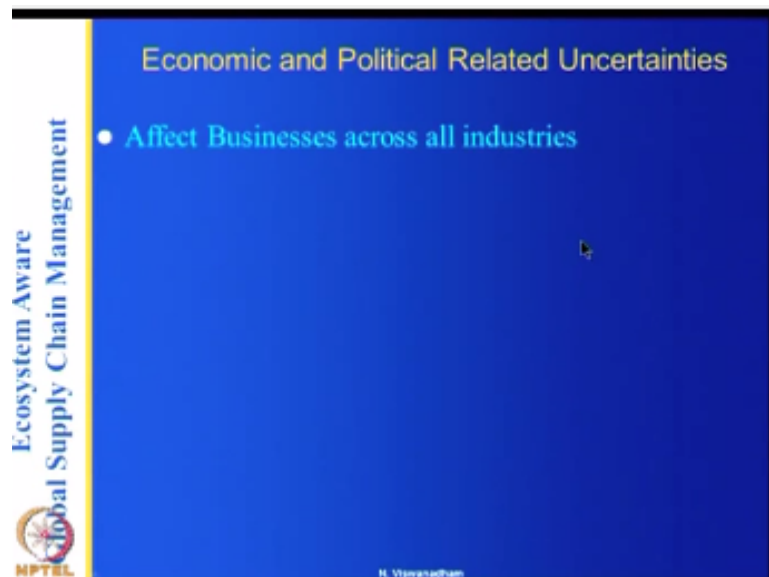
So basically they have to destroy the birds and I will just create a lot of problems in terms of the meat supply and so on because it's the raw material for a lot of meat products and that gets affected so we the resources which is the way out which is the natural which is the raw material for the food products that is affected here. So we have seen - this one is a supply chain a second one is the resource risk.

((Refer Slide Time: 07:20))



Let us look at what are the risks were the institutions. This economic and political related uncertainties.

((Refer Slide Time: 07:29))



Affect business across all industries economic slowdown country policies and ratings you know you have all these kind of ratings by the agencies foreign exchange interest rates so if a foreign exchange you know if the US dollar becomes stronger then it becomes good for the countries all the companies which are in the in the Asia-Pacific but if the US dollar goes down and it becomes bad there so there is a foreign exchange fluctuations effect and also the political country-to-country relationship changes in the governments.

They are all affected and government policy changes price controls free trade zones free trade agreements inadequate public services nationalization barriers to link repatriation this is one of the things that can affect a company supposing a foreign company comes into a country another country and whatever profits are there the profits have can it can I take back to his original headquarters sometimes the answer is no there are security related issues like terrorist attacks.

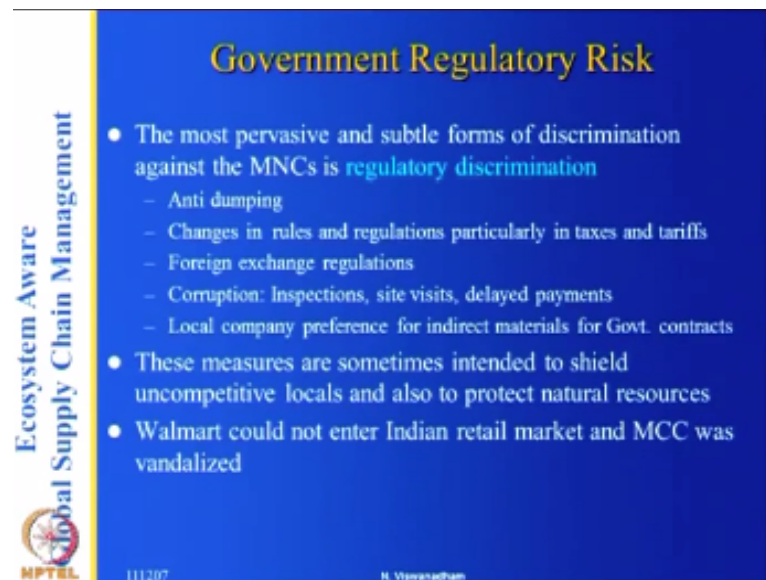
And where the countries protect the company the government's protectionist behavior country is hiking duty sickness trade agreements textile quotas abolish and by us and you in January 2004 you know what happened was there of the WTO agreement abolishing textile quotas so the Chinese companies were sent a lot of their ships on January 1st 2004 there was lot of shipments from China they approached shipment textile shipments which were waiting at the US and EU ports because I had no quota restrictions and at that time they have basically brought the voluntary this one and then they won they be both the you and USA they countered this using at adopting legislation.

And so on and they wanted China to have voluntary control voluntary restriction export restrictions so auto companies Malaysia has this after is Asia-Pacific trade agreements and Malaysia has a say as a car company and under this auto components needs to be freely exported across all these countries but Malaysia said because it's country company is getting affected they refuse this so anti dumping is another protectionist behavior because it is import that affects the local companies the company government.

Can stop the important of the country it can stop saying that it cannot be permitted inside the country for because it is affecting the local companies the government regulatory risk is the most pervasive on subtle forms of discrimination against multinational companies its regulated is to me at the dumping changes and rules and regulations particularly in taxes and tariffs foreign exchange regulations corruption inspection site visits delayed payments local company

preferences foreign direct material dealt with the government contracts these measures are sometimes indebted to seal the uncompetitive locals and also to protect natural resources Wal-Mart could not enter Indian retail market and I am say she was vandalized so basically these are some of these issues because the garments are want to protect their populations and that is where this rose those help.

((Refer Slide Time: 11:40))



**Ecosystem Aware
Global Supply Chain Management**

Government Regulatory Risk

- The most pervasive and subtle forms of discrimination against the MNCs is **regulatory discrimination**
 - Anti dumping
 - Changes in 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
- Walmart could not enter Indian retail market and MCC was vandalized

NPTEL 111207 H. Viswanathan

And of course one should look at the patent laws.

((Refer Slide Time: 11:44))

Patent Laws

- Before 2005, India protected only process patents—not product patents—for drugs.
 - Indian companies can produce the drug if the chemical synthesis of the manufacturing process differed from the patented one.

270208 N. Viswanathan

Before 2005 India protected only product process patents not product patents for pharmaceutical drugs now that is a difference between product patented process better process patent is the process by which you manufacture a particular drug whether the product patent is final content of the product so this Indian companies can produce the drug if the chemical synthesis or the manufacturing process differed from the patented one so this is this is the this is where I think the manufacturing acumens counts.

So you can you can take a patented drug and he invent the manufacturing process and manufacture this one manufacture the same drug and market it and but Ranbaxy a set of sophisticated laboratories with hundreds of world-class chemists and also invested in state of art factory synthesize drugs that were going off the patent so there were several drugs which are going off the patents so they wanted to re-engineer the whole processes and so on.

So typically it is a manufacturing a command so what people wanted to do is they know what it contains they know how they the other fellows are doing the manufacture maybe they are doing under contract manufacturing so once it was after of the patent and they wanted to synthesize new drugs by combining two or three drugs then and use the process patent two to become basically a top line manufacturers.

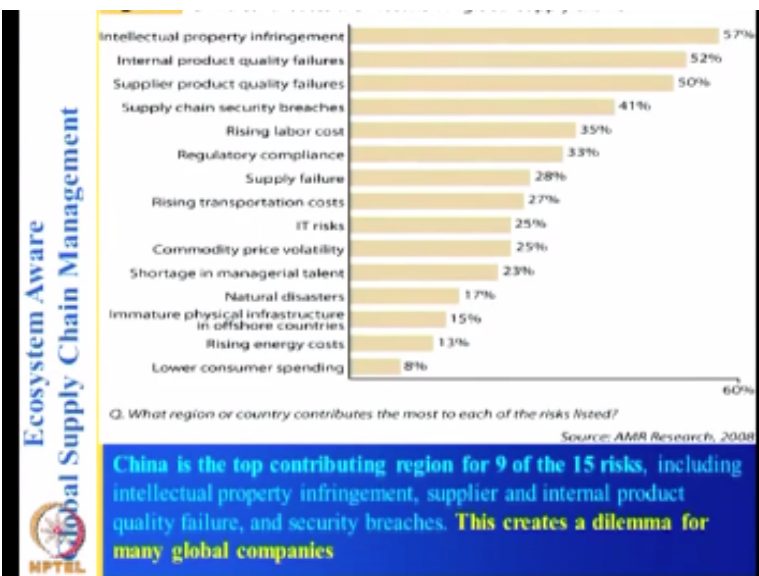
((Refer Slide Time: 13; 42))

Patent Laws

- Before 2005, India protected only process patents—not product patents—for drugs.
 - Indian companies can produce the drug if the chemical synthesis of the manufacturing process differed from the patented one.
- Ranbaxy has set up sophisticated laboratories with hundreds of world-class chemists and also invested in state-of-the-art factories to synthesize drugs that were going off patent.

What happened here?

((Refer Slide Time: 13:43))



In this patent class was that if you look at after 2005 the product patent is drug in maelstrom discovery now when you are discovering drugs there are two things one is you are trying to find a new drug and that finding a new drug is a risky proposition you have to do a lot of research and ultimately you may not be able to find one now even if you find one you have to go through clinical trials and get the certifications from various governments.

And so on and that takes time so usually these things take years and years like a 10 to 15 years to do market particularly bring a drug to the market but on the other hand if there is a drug that is there already which is just protected you can always manufacture that it is only manufacturing which is a low skilled job so you can see the differences between the product patented process made in the product patent it involves drug tests clinical trials and bringing it to the market later.

Whereas if it is a process patent you are imitating somebody it is replicating the whole process and if you have a manufacturing process you can manufacture those districts for example this HIV drugs ten or fifteen drugs has been combined into one and then that was a very famous drug without Indian manufacturers have done so it is possible that this patent laws can affect the company's very badly in fact they did affect the company's very badly because research the product patent means that brought discovery this complex highly risky proposition.

It is time taking and to recover all the money that you have spent it takes a lot of time so that's where people have to be careful which whether you are talking of product patent or Cross has made it you can say for example this is a your source from 2008 here more research what are the kinds of risks that accompany particular company faces say you can see that intellectual property infringement internal product quality failures.

Supplier product quality failures supply chain security breaches raising labor costs regulatory competitive compliance supply failure rise in transportation costs IT risk commodity price volatility shortage of managerial talent natural disasters immature or physical infrastructure and also in offshore countries rising energy costs lower consumer spending I think we have covered all this or not III this one you can see in this particular slide will show you why a.m. our survey that intellectual property infringement it was high in terms of the risk when global supply chain and of course the security breaches also is 41% shortage of managerial talent is 23% and you can find out that all that is that we discussed so far there and particularly lower consumer risk is only 8% rising energy costs natural disasters.

All the things that we have discussed so far or exists and also you can find of course this is only for China I will show you for other countries as well China has the top contributing region for 9 out of 15 lists including intellectual property supplier and internal product quality failure security breaches this creates dilemma former companies I will show you the diagram here.

Regions that contribute the most to each Supply Chain Risk: US and China for different risks; China for quality and supply failures

	U.S.	Canada	LA	China	India	Other AP	MEA	EJC Europe	W. Europe	Not a risk in any region
Regulatory compliance	22%	1%	5%	34%	8%	6%	5%	2%	8%	10%
Supplier product quality failures	4%	0%	8%	55%	3%	6%	8%	4%	1%	12%
Supply failure	11%	0%	8%	27%	11%	11%	14%	3%	3%	13%
Internal product quality failures	6%	2%	7%	47%	7%	5%	8%	4%	2%	13%
IP infringement	4%	2%	2%	53%	6%	4%	4%	3%	1%	16%
Immature physical infr.	3%	1%	10%	18%	15%	15%	17%	3%	1%	17%
Volatile labor cost	20%	4%	9%	20%	6%	4%	4%	5%	8%	20%
Lower consumer spend	47%	2%	7%	5%	5%	2%	6%	5%	2%	20%
Volatile transp. costs	14%	1%	5%	20%	7%	11%	11%	4%	7%	20%
Volatile energy costs	31%	2%	7%	11%	4%	5%	8%	8%	5%	20%
Commodity price volatility	22%	3%	9%	17%	6%	8%	6%	4%	6%	21%
Shortage in regnt talent	7%	2%	10%	20%	4%	12%	14%	5%	1%	26%
SC security breaches	4%	2%	8%	32%	6%	8%	11%	4%	0%	26%
Natural disasters	12%	1%	5%	21%	5%	22%	3%	2%	0%	30%
	9%	1%	2%	26%	11%	6%	8%	5%	0%	32%

What region or country contributes the most to each of the risks listed?

NPT AMR Research

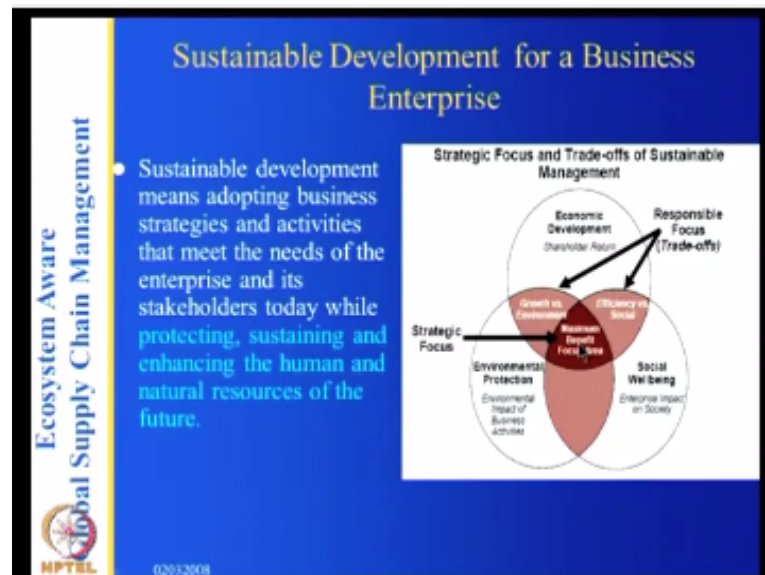
© 2008 AMR Research, Inc. Page 1

For example all these risks are here and here are the countries for example US Canada Latin America and then China India and so on so you can find that that US has regulatory compliance issues of 22 percent and China has 34 percent whereas India has only 8 percent and supplier product quality failures are high in China and low in India and similarly volatile energy costs the 31 percent very high in the US and it is less both in India and China.

And so this basically is this one from my research again in 2008 so you can find that both countries US China India and others they each contribute to the various kinds of supply chain risk and this particular table shows you that no country is an exception and it also shows that a variety of all before the supply chain this one of course there they did not know about my supply chain ecosystem framework but you can map all these into the ecosystem framework and find out which one is important in this.

So there is another one that is important.

((Refer Slide Time: 19:33))



Nowadays is the sustainability or basically the GHG gases the carbon footprint and so on so it's sustainability there are three things that that are important here one is the economic development the social well-being and the environmental protection so the economic development government are concerned about the economic development so they want to create industries they want to create jobs for other people and also the social well-being.

Without many most jobs then of course there is the it is better and then the retail is better and all the products and everything goes well and so on so there is a social well-being is important and it is dependent on the enterprise impact on society an enterprise impact is basically depends on the economic development but economic development can create environmental disasters so you have to basically trade this is a triple bottom line that people talk about you have to trade between the economic development environmental protection.

As well as the social well-being now supposing you create in the Himalayas in a north of India for economic development of that region some factories say auto factories it is social well-being of that region which is backward and people get jobs and so on but the environment get this one because the all the components have to go to that place and also the finished goods

like the automobiles have to come to the rest of the country creating more of carbon footprints so you can see that it is always conflicting but there is a conflict between economic development social well-being as well as the environmental protection so sustainable development is adopting business strategies and activities that meet the needs of the enterprise and stakeholders of today while protecting sustaining and enhancing the human and natural resources of the future .

So how much you could do it and this is the this is an issue before most of the governments and so for that what people do is some people say electric car some people say you know gas-fired engines and so basically people are trying to try to balance out between the economic development as well as the environment disaster and social well-being. So there are community risks for example.

((Refer Slide Time: 22:34))



The slide is titled "Community risk In India" in yellow text on a blue background. On the left side, there is a vertical banner with the text "Ecosystem Aware Global Supply Chain Management" and the NPTEL logo. The main content is a bulleted list of locations and companies:

- Tata Singur
- Nandigram
- Vedanta mining –Orissa
- Posco in Orissa
- Goa SEZ
- MCC Bangalore
- Reliance fresh banned in several states

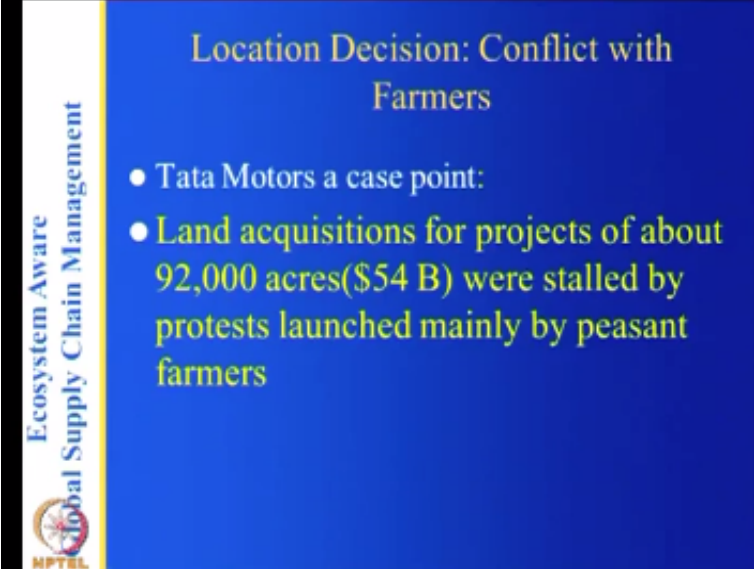
At the bottom left of the slide, it says "1112107" and at the bottom right, it says "H. Viswanathan".

In India there are several companies got affected because of the community risk and social groups? Tata Xingu in West Bengal this is a company that established in Signore in West Bengal they taught us have put the Nano which is the an innovation in itself it is a 1 lakhs car that is \$2,500 at 40 rupees a taller and that basically has created a lot of problems and taught us had to finally move out and last lot of money because the hell establish the factories and their suppliers our partners also established their factories and finally they could not get the permissions of the

farmers who own the lands to sell the land to taught us and so they have to leave and it is the Vedanta mining in Orissa was going Orissa and a gram oh I see Jets and MCC in Bangalore reliance flash banned in several states and so on so basically the reliance fresh is a it is a retailer selling fresh groceries but it is banned because it is going again as the hawkers it is going again as the Karana shops small players who are basically selling these things in the streets so for several teary similar to these several reasons the community.

Risk happens and people have to be careful in terms of when particularly in when it is affecting a small players and also it is affecting the land has that needs to be procured from farmers so one has to be extremely careful the risk of the community risk is very high and this is what is what happened in all this cases MCC is a the Metro cash-and-carry which is a wholesaler they have established a presence in Bangalore India but there were vandalized rescue effort that still exists in India which several. Other places but they had several properties in problems in the beginning. So notation decision conflict with the farmers.

((Refer Slide Time: 25:17))



The slide features a blue background with a vertical white bar on the left containing the text 'Ecosystem Aware' and 'Global Supply Chain Management' along with an NPTEL logo. The main title 'Location Decision: Conflict with Farmers' is in yellow. Two bullet points in yellow text follow: 'Tata Motors a case point:' and 'Land acquisitions for projects of about 92,000 acres(\$54 B) were stalled by protests launched mainly by peasant farmers'.

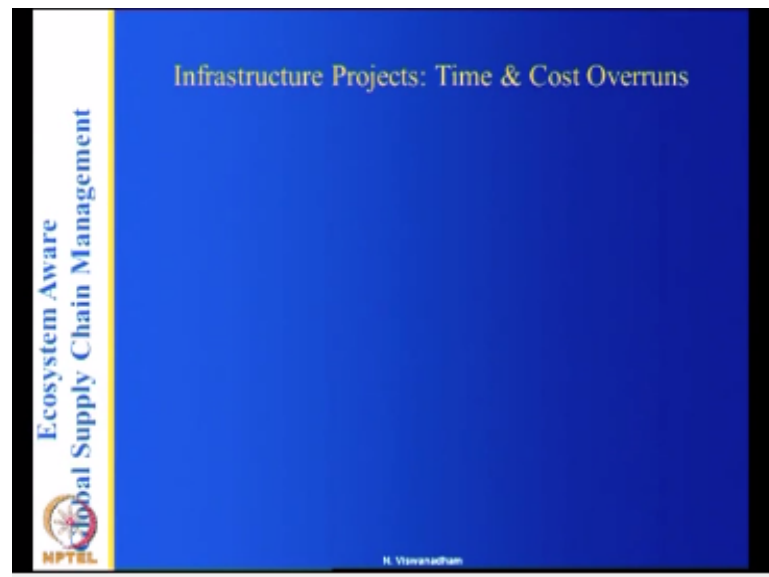
Location Decision: Conflict with Farmers

- Tata Motors a case point:
- Land acquisitions for projects of about 92,000 acres(\$54 B) were stalled by protests launched mainly by peasant farmers

This is a prairie point where people I was saying that people have to be careful they say they taught us in good case where in the totem land acquisition of I mean thousand acres 9,000 acres was stalled by protests launched mainly by the peasant farmers so they got they have acquired

600 acres and the last 4,000 was stalled and they have to basically move out of this one there are lot of infrastructure projects. There are time and cost overruns.

((Refer Slide Time: 25:52))



Delays and cost overruns have significant impact you know there for example they right the roads the railroads the metros the flyovers all this basically have significant impact and people have to wait for the provision of public goods and services longer limits the growth potential and reduces the competitiveness of the economy if you want to build an airport and it takes 10 years to do it.

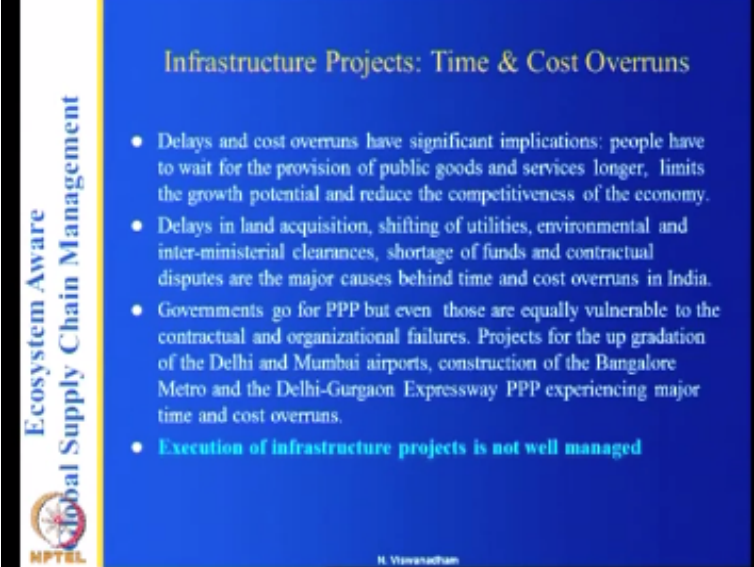
Then to that extent you know delaying the economic prosperity delays and land acquisition shifting of utilities environmentally inter-ministerial clearances shortage of funds and contractual disputes or major causes behind time and cost to overruns in India governments go for PPP is private public-private partnership but even those who are equally vulnerable to contractual and organizational failures.

Although the government is a partner but still projects with top gradation of Delhi and Mumbai airports construction of Bangalore Metro and Delhi Gorgon Express me PPP is experiencing

major time and cost overruns but they have experienced nature Custom wall runs so execution of infrastructure projects is not well managed so in other words when you are designing as an infrastructure project and once the project is stretched this one the first thing is a coalition of all the resources including the land and taking agreement of all the people who are selling the land and so on but if you start the business before even acquisition of resources.

Then you get into the delays so basically this the whole project should start into execution only after the land acquisition and other things or their permissions are there and so on so that's where the problem comes in terms of course the government of India is trying to make rules to count of these things.

((Refer Slide Time: 28:08))



The slide features a blue background with a vertical sidebar on the left. The sidebar contains the text 'Ecosystem Aware' and 'Global Supply Chain Management' in white, with the NPTEL logo at the bottom. The main content area has a title 'Infrastructure Projects: Time & Cost Overruns' in yellow. Below the title, there are four bullet points in white text. The last bullet point is highlighted in red. At the bottom right of the slide, the name 'H. Viswanathan' is written in small white text.

Infrastructure Projects: Time & Cost Overruns

- Delays and cost overruns have significant implications: people have to wait for the provision of public goods and services longer, limits the growth potential and reduce the competitiveness of the economy.
- Delays in land acquisition, shifting of utilities, environmental and inter-ministerial clearances, shortage of funds and contractual disputes are the major causes behind time and cost overruns in India.
- Governments go for PPP but even those are equally vulnerable to the contractual and organizational failures. Projects for the up gradation of the Delhi and Mumbai airports, construction of the Bangalore Metro and the Delhi-Gurgaon Expressway PPP experiencing major time and cost overruns.
- **Execution of infrastructure projects is not well managed**

H. Viswanathan

So also there is the issue of terrorism.

((Refer Slide Time: 28:21))

The Changed Nature of War

- In the 20th century the world was confronted by adversaries who were stationary, observable, and conventional. The enemies' weapons of choice were tanks, planes, bombs, ships, and so on; and an individual soldier was not a significant threat to any nation's security.

Ecosystem Aware
Global Supply Chain Management
NPTEL

N.Vijayaradhani 25

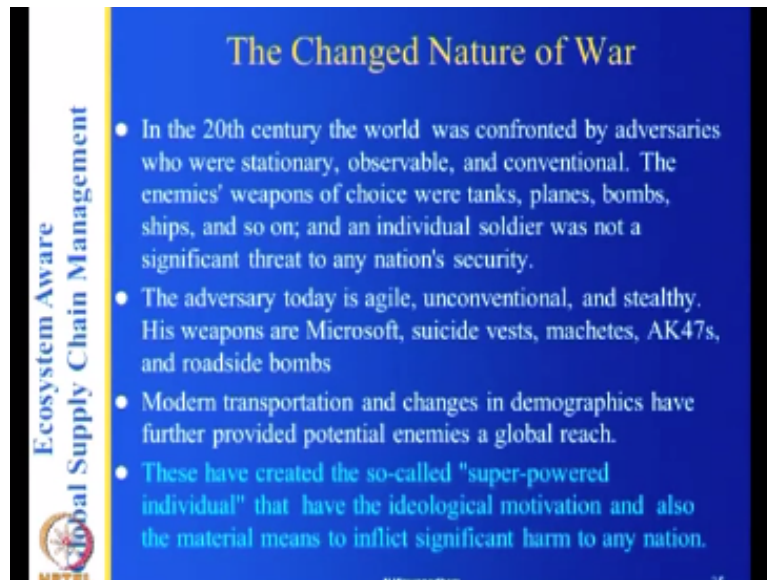
This is affecting the supply chains a lot in the twentieth century. The world was confronted by adversaries who are stationary observable and conventional earlier means war means what war means there are armies and people after another they have guns air war ship war or land war and so on the enemies of weapons of choice which were attacked planes Bombs , Ships and so on and an individual soldier was not a significant threat to another national security so it is the army and it is the equipment that it has it was what was counting yesterday but today it is not today is just different the adversary today's as I will unconventional and stealthy the weapons are Microsoft suicide vests matches match at ease Aker forty sevens and roadside bombs.

So how do you counter that if you have a container in a ship and if somebody puts a bomb in the ship so they explode at the when it reaches the destination port then how do you find that particular thing out so it is not it is not an issue of you have a big army you have tanks planes and then you go declare war and Unco Ignace people but it is basically very unconventional and it is a single human being who is planting a bomb and so on so that is the kind of thing that is happening nowadays modern transportation image and changes in demographics have further provided potential enemies in global reach.

So these created so-called super-powered individual that have ideological motivation and also the material means to inflict significant harm to any nation so the this particular thing of this one is creating a piracy it is also creating problems of security in your transportation so what this actually means is you have to put each container you have to check not only for the material this one and you have to also material for other things which are basically can affect

either during the transport or after the transport at the port destination for bombs explosives and other kinds of things so this is one of the things that is being added as security measure the transport security to basically look at check your containers for there is the homeland security in the United States which basically worries about the tragedy the security of the transport they goods.

((Refer Slide Time: 31:26))



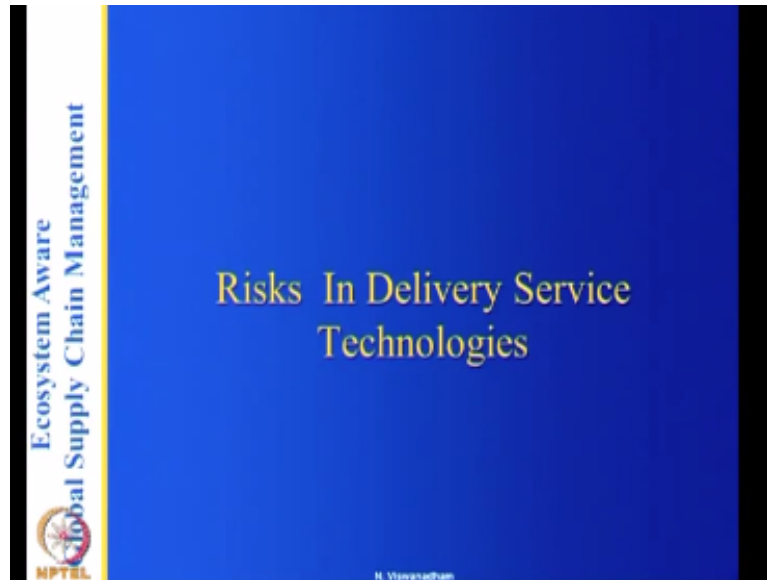
The slide features a vertical sidebar on the left with the text "Ecosystem Aware" and "Global Supply Chain Management" next to a globe icon. The main content area has a blue background with the title "The Changed Nature of War" in yellow. Below the title, there is a bulleted list of four points.

Ecosystem Aware
Global Supply Chain Management

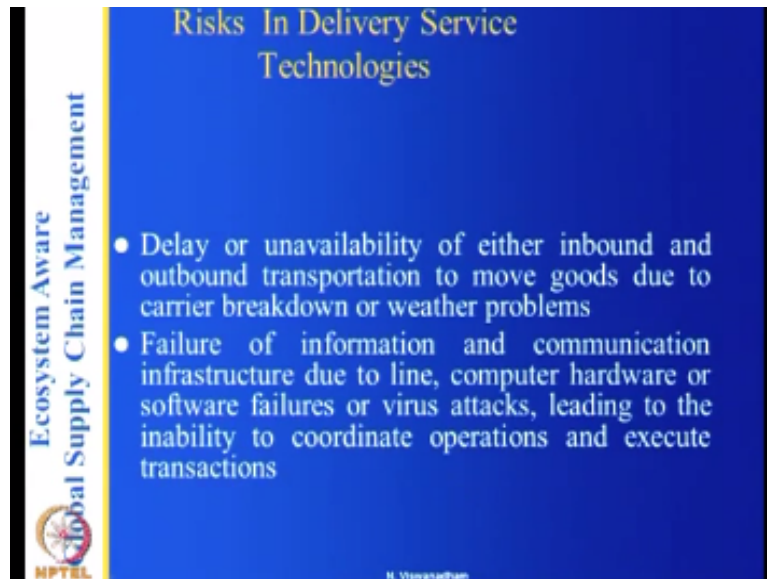
The Changed Nature of War

- In the 20th century the world was confronted by adversaries who were stationary, observable, and conventional. The enemies' weapons of choice were tanks, planes, bombs, ships, and so on; and an individual soldier was not a significant threat to any nation's security.
- The adversary today is agile, unconventional, and stealthy. His weapons are Microsoft, suicide vests, machetes, AK47s, and roadside bombs
- Modern transportation and changes in demographics have further provided potential enemies a global reach.
- These have created the so-called "super-powered individual" that have the ideological motivation and also the material means to inflict significant harm to any nation.

((Refer Slide Time: 31:27))

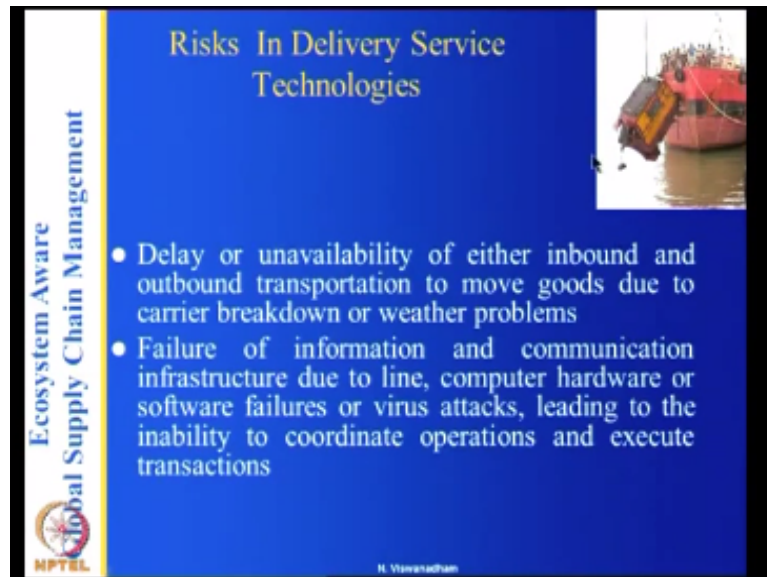


So what are the risks and a delivery service?



Delay or unavailability of either inbound or outbound transportation to move Goods do to carry and breakdown or other problems? I mean that is a very common problem that risk that one faces failure of information and communication infrastructure due to line computer hardware or software failures or yr8 attacks leading to inability to coordinate operations and execute transactions that is another one I eighty and of course this is you can see in the picture.

((Refer Slide Time: 32:01))



The slide features a blue background with a yellow vertical bar on the left. The yellow bar contains the text 'Ecosystem Aware' and 'Global Supply Chain Management' in blue, with the NPTEL logo at the bottom. The main title 'Risks In Delivery Service Technologies' is in yellow at the top right. A small photo of a red ship is in the top right corner. The main content is a bulleted list of risks in white text.

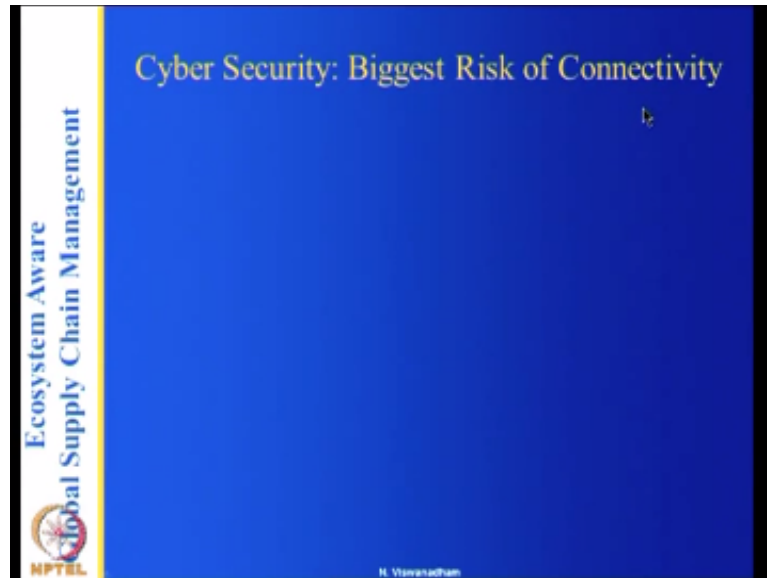
Risks In Delivery Service Technologies

- Delay or unavailability of either inbound and outbound transportation to move goods due to carrier breakdown or weather problems
- Failure of information and communication infrastructure due to line, computer hardware or software failures or virus attacks, leading to the inability to coordinate operations and execute transactions

NPTEL H. Viswanathan

That you can say while transporting the whole thing fell into the sea and it takes time to rescue this container cyber security is one other connectivity.

((Refer Slide Time: 32:14))



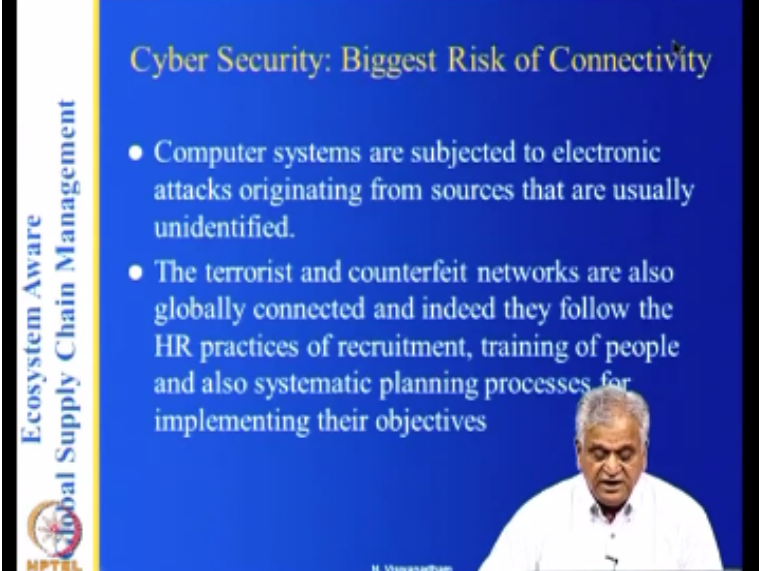
I think this is one of the modern problems of interconnectivity which is a cyber security cyber security is basically where computer systems are subjected to an electronic attacks originating from sources not are usually an idea and identified you know somebody if you have a nuclear reactor or if you have your factory control room control tower that control tower the computer system which gradually controls all your transportation to in and out of the factory from your suppliers and your accounts everything that could be hacked and sometimes it can be misdirected in stuff they saying that the supply should go to Europe.

You can say it has to go to Hong Kong or it has to go to USA and so on so basically this is a much more this vulnerability is much more than a physical vulnerability because it can tamper with the information the terrorists on counter net networks are also globally connected cultivate is a big problem in autumn in pharmaceuticals it is about 40% count this one in food products yes there is counterfeit products are also there so they are also globally connected.

If you know if you were container has an RFID drag tag to track it well not only you can track it even the terrorists can track it so that is where the problem is and indeed they follow the HR principles of recruitment training people and also systematic planning processes for implementing their objectives so you can you can see what happens at the airports and same things happen at the seaports in terms of checking the flight for any kind of unsecured material inside the containers or in the ships.

So that is basically taking a big thing and also the cyber security this has happened in recent times that the hackers are able to get into the control systems or control towers as they are called the and their effect they bring down the computer systems which basically bring down the entire manufacturing or the entire network so this is one thing that one has to be careful and get the one hunt this one.

((Refer Slide Time: 35:02))



The slide features a blue background with white and yellow text. On the left, a vertical banner reads 'Ecosystem Aware Global Supply Chain Management' with the 'HPTCL' logo below it. The main title 'Cyber Security: Biggest Risk of Connectivity' is in yellow. Two bullet points are listed in white. A man in a white shirt is visible in the bottom right corner, and his name 'H. Viswanathan' is printed below him.

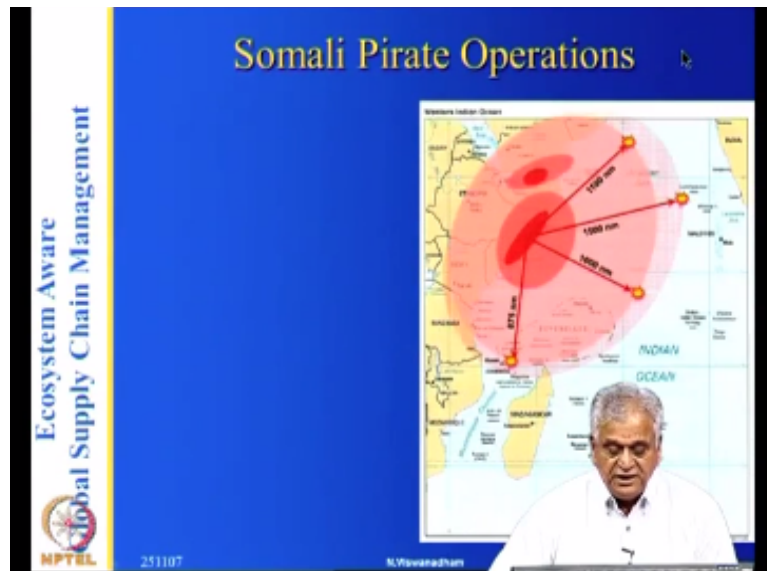
Cyber Security: Biggest Risk of Connectivity

- 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

H. Viswanathan

Because there are the Somali pirate operations.

(Refer Slide Time: 35:07)

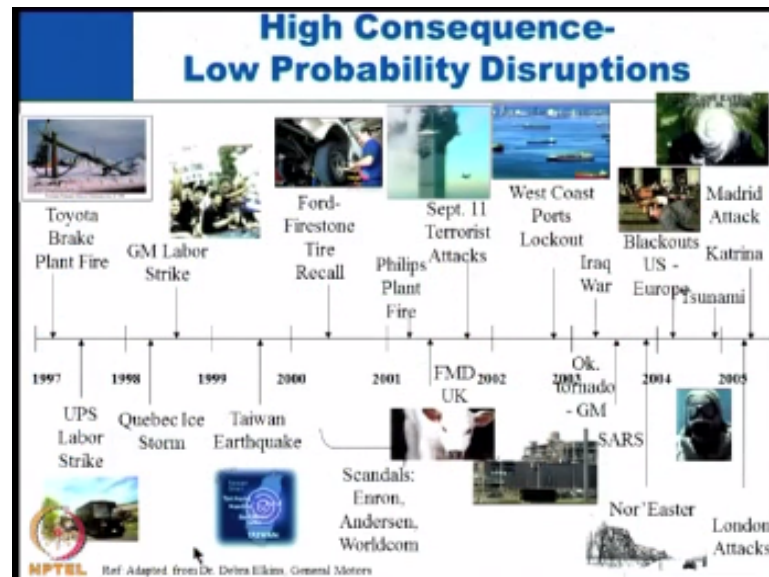


So air pirates have expanded from 2006 to 10 in other words. This is we talked yesterday about the Suez Canal and the Panama Canal in the Suez canal where the Indian Ocean the Cape of Good Hope that which avoids which saves about 8,000 kilometers the Pirates have started their operations and they are increasing their range pirates have expanded when the years 2006 to 10 and many of the world's most powerful lobbies are involved and now what is happening is it you just do not ship their products and to save the ship from the piracy.

Then you have to have warships behind them our basically they are cooperating USU India Malaysia, Indonesia and South Africa, these Navy's powerful navies are cooperating to guard their ships and the Japanese and South Koreans send worship so product ships carrying costs it is still cheaper than the question is why not go way up? The Cape of Good Hope and the question is it is still cheaper and convenient to pay higher insurance fees and take risk being attacked by pirates then incur the extra cost of diverting the vessels around the Cape of Good Hope.

Well if the diverter arrive Cape of Good Hope the pirates or pirates also can move to Cape of Good Hope but these are Somali pirates but there could be pirates which are coming from the Cape of Good Hope and so on so the issue is these operations of the piracy in the seas in the high seas has become a big issue and this is like the same issue that we talked about like cyber security and also the security of in the in the delivery technologies. So these are becoming very big issues in the delivery of global supply chains.


((Refer Slide Time: 37:16))



So one thing one should remember is that high consequence low probability disruptions happen across the supply chain once your supply chain is global then there could be a supplier disruption somewhere in China or it could be one of the trucks that is coming from the supplier to the manufacturer can right now or there could be a cyber attack on one of your distributors this one which is cancelling the order - or this one.

So since you are basically distributed all over the globe anything that affects any part of the globe. Whether it is a thunderstorm whether it is a terrorist attack where ax t whether it is a truck failure it affects your supply chain so high consequence low probability disruptions happen all over the globe and in your supply chain becomes highly vulnerable because of that.

((Refer Slide Time: 38:20))



Ecosystem Aware
Global Supply Chain Management

Risk Propagation and Amplification

- In a globalized world the risk for the supply chain could come from three other very important factors which are often ignored.
 - Connectedness on a global scale
 - Large scale concentration for competitive efficiency
 - Lack of governance structures for fast response

M. Viswanathan

So the other thing that happens is the risk propagation and amplification in a globalized world the risk for the supply chain could come from three other very important factors which are often ignored one is connectedness on a global scale lastly is concentration of competitive efficiency lack of governance structures. For rod so what you are saying is you will say that okay there are concentration of clusters in a particular place.

Let it be Vietnam let it be China let it be in this year in a particular region and you try to put all your eggs in that basket and you strike the source from that but if something happens to that cluster then all your production gets affected all your supply chain gets affected so large-scale concentration for competitive efficiency why did we have clusters we were talking about the clusters as a resources where customs.

Were created to basically have efficiency to have all the community of the vertical at one place so that they can share information they can share in a business and also the other issues connected with collaboration but there is also a danger of the entire cluster get at getting affected either by shortage of power or cyber attacks or by natural calamities or whatever so that is where the other thing the other thing is the connector the connectedness on a global scale either the connectedness.

On a global scale for goods my transportation there could be piracy effect by information there could be cyber security effects but the flows there could be a global there could be a financial

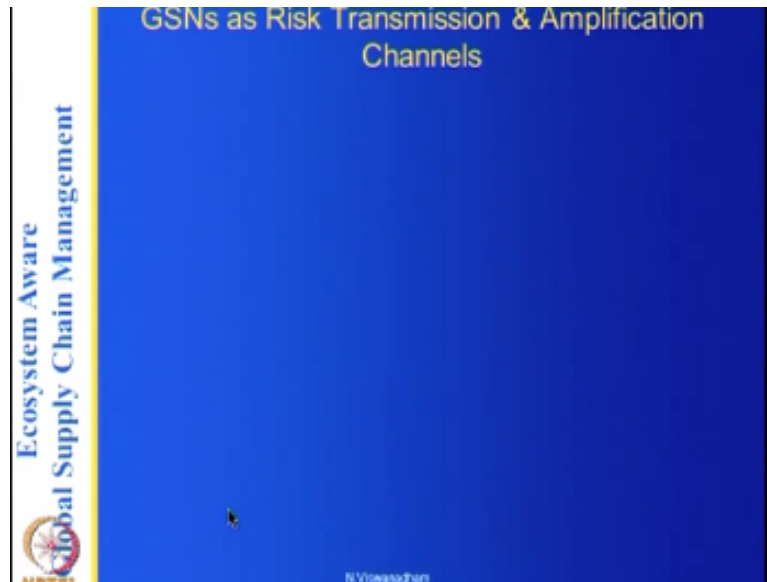
crisis so for all the three flows things can happen connecting because of the connectedness and the risk at one part of the supply chain trash gets transmitted to the other parts of this and also they finally there is one thing but people know all these things happen then there are no governance structures there are no organization structure this one motivation to get these things and fast in other words can you detect a particular failure happening early well bank failures or financial failures don't happen overnight people have signals in terms.

when you observe for the country's economy or they bear the company's economy or whatever is happening there it's possible to detect but people just ignore the warning signals so is it possible to have a governing structure where you take all these inputs and things can happen of course but all of a sudden even if they happen and outside and some kind of mitigating action can be taken and so on so connectedness large-scale concentration lack of governance structures are the three things these are basically the managerial issues.

These are not physical things that happen and one can try to correct this in other words instead of concentration in a particular geographical location which is affected by natural disasters or Wars or something it is possible to basically shift these concentrations to two or three places and so on similarly getting a governance structure and doing some research depending on your company your vertical to find out what like what we are doing today yes to find out all the risks that are possible but people say oh if they are all there.

Is if you list all there is there are thousands of them how do you correct for them well if we do not list all of them and if one of them strikes which you thought it is unimportant then what would you do you will go down so it is important to find out it is like you know in the human body all the diseases it can come to any part of your body and so and it is important to diagnose the propriety season take care.


(Refer Slide Time: 42:55)



So GSNs or global supply chains has risk transmission. And amplifier channels for example we already saw this particular thing credit crunch that affected trade finance and prices for letter of credit have increased from 2008 and 2009 and preference to source from domestic suppliers during short downturn because of trust of financial problems and greater fraction its policies and so on so this is what we have already seen like the trade decline. As well as the synchronous collapse of trade collapse in the one.

((Refer Slide Time: 43:38))

Ecosystem Aware
Global Supply Chain Management



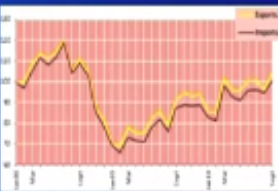

GSNs as Risk Transmission & Amplification Channels

Credit crunch affects trade finance and hence trade volumes.

- Prices for letters of credit increased in 2008 and 2009 & trade-related loans were charged higher interest rates
- Preference to source from domestic suppliers during downturns because of trust or financing problems & greater protectionist policies

Global supply chains that reacted "just in time" to the collapse in demand resulting in synchronized fall in trade volumes from all countries.

- A sharper decline of firms' inventories
- Greater protectionist policies
- A larger decline in trade of goods, which make up 70% of world trade





N. Viswanadham

So what is happening here is it is systems of systems and systemic risk.

((Refer Slide Time: 43:46))

Ecosystem Aware
Global Supply Chain Management



Systems of Systems and Systemic Risks

N. Viswanadham


It is not just a risk meaning it is not a component value and it is not a machine failure it is not a water-pipe discount getting disconnected or it is not a power failure or it is not a labor strike

here network of industries of critical infrastructures electricity transport communications have features of connectedness large size and loose governance structures those governance in a sense they are basically independent companies and they are all come together to supply and they do not have nobody has a hierarchical authority in this these are systems of systems and their subjective system a crests.

Which means that entire system can fail connectedness makes individuals and organizations accessible over distance on the positive side victims of disaster are easier to reach because of the connectedness and emergency rescuers can organized more efficiently using satellites wireless based monitoring and warning systems and on the negative side.

Connectedness connected ness multiplies the channels through which accidents decisions malevolent actions can propagate natural disasters at one end of the planet can have substantial economic and financial impact on the other epidemics spread more rapidly due to international travel and trade and to design right so basically this so-called connectedness of individuals or organizations. Its need not have to be basically in terms of the supply chains it becomes systems of systems failures and it will the system acts risk.

((Refer Slide Time: 45:39))



Ecosystem Aware
Global Supply Chain Management

Clustering & Concentration

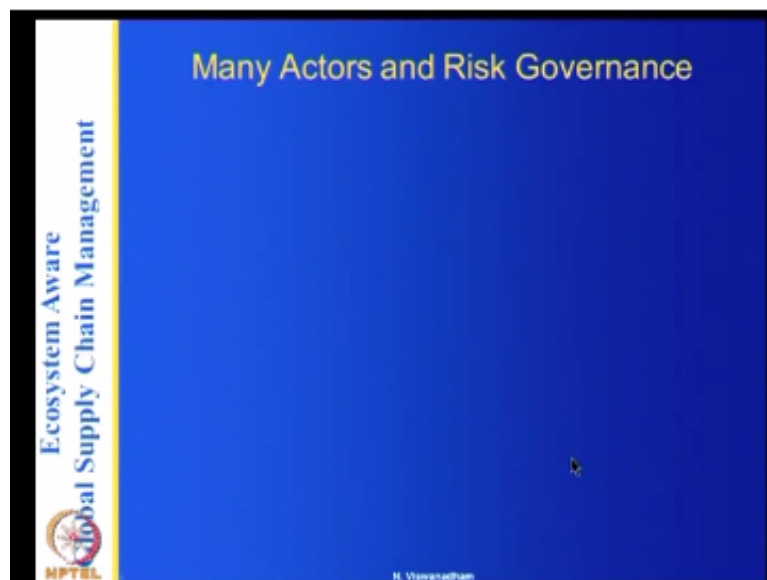
- Global pressures in some industries encouraged the search for efficiency through larger scale and a high degree of concentration as in for *e.g.* super-aero planes and gigantic dam projects, Giant firms such as DHL, Flextronics etc. mergers and acquisitions, and geographical concentration (*e.g.* *low cost manufacturing in China, IT clusters in India, Auto or pharma Industrial clusters*).

H. Vasanadham

And clustering and concentration is global pressures in some industries encourage search for efficiency through large-scale and high degree of concentration super aero planes gigantic dam projects giant firms in DHL Flextronics mergers acquisitions and geographical concentration low-cost manufacturing in China IT clusters in India Auto Parma industry clusters and so on damage due to an accident is hired for a concentration rather than separate owners in separate locations bird flu effect in China.

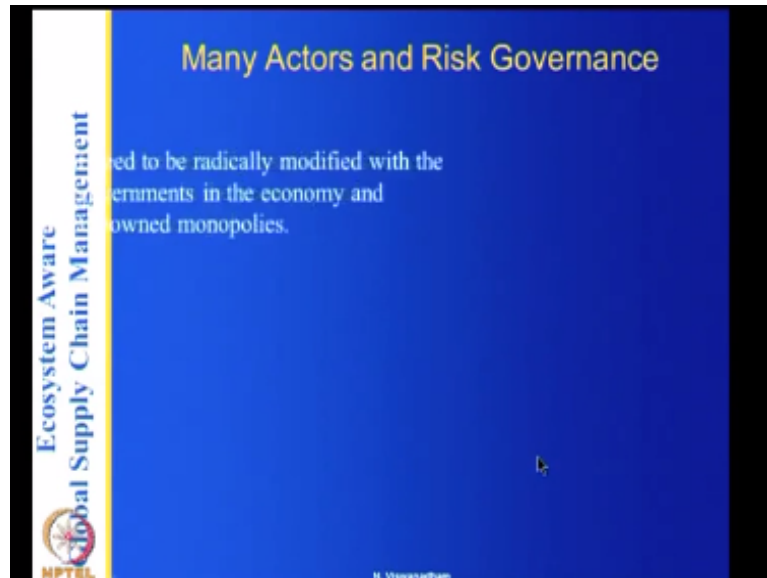
In the early years of this decade so you can see that the so-called positive aspects of supply chains like clustering has negative effects.

((Refer Slide Time: 46:25))



Many actors and risk governance.

((Refer Slide Time: 46:27))

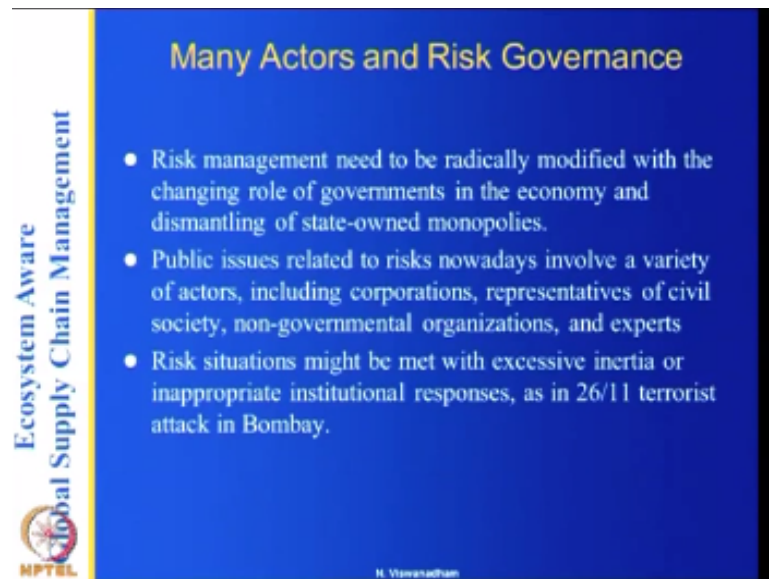


So risk management needs to be radically defined with changing role of governments in the economy and dismantling of state-owned monopolies now earlier in earlier times all the most of this like hey lights the information technology companies like telecommunications and the transport companies they were all one very government but they are all dismantled and they are getting privatized and what happens to the risk management in this public relation issues related to this nowadays involve variety of actors.

Who are those actors corporations representatives of civil society non-government organizations and experts risk situations might be met with excessive inertia and inappropriate institutional response as in 2011 more attack in Bombay so what happened in 26 November 26 and Bombay was that a group of terrorists have come into a hotel and they killed several people and they occupied the entire hotel and the whole Indian Army.

Is outside whole of India is outside there only five or six terrorists inside but they could not do anything they could to protect the residents of the hotel and so on so basically it is a it is an inappropriate institution response and an excessive inertia and so on there are several reasons for what happened there but such situations. You need to be met with care and so on so there these many actors and the risk governance.

((Refer Slide Time: 48:21))



Many Actors and Risk Governance

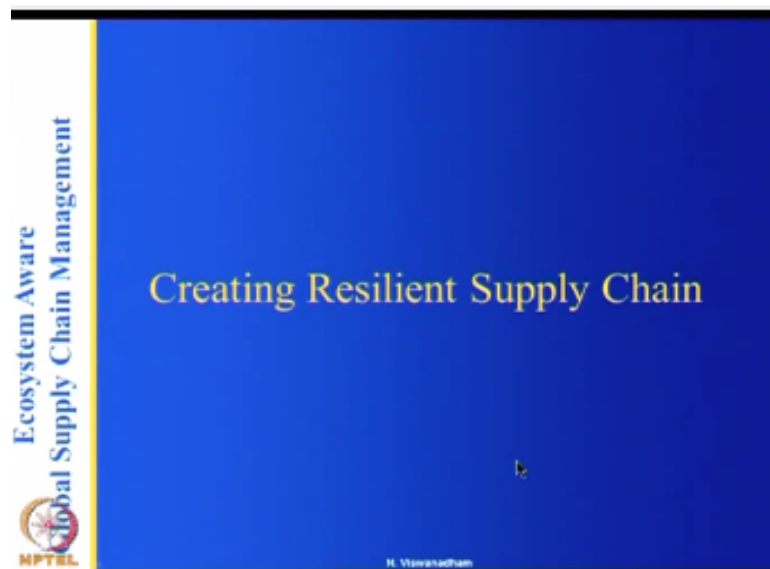
- Risk management need to be radically modified with the changing role of governments in the economy and dismantling of state-owned monopolies.
- Public issues related to risks nowadays involve a variety of actors, including corporations, representatives of civil society, non-governmental organizations, and experts
- Risk situations might be met with excessive inertia or inappropriate institutional responses, as in 26/11 terrorist attack in Bombay.

**Ecosystem Aware
Global Supply Chain Management**
NPTEL

H. Viswanathan

And the issue then will be what how do you create a risk resilient supply chain.

((Refer Slide Time: 48:29))



Creating Resilient Supply Chain

**Ecosystem Aware
Global Supply Chain Management**
NPTEL

H. Viswanathan

So before we go into dance let us summarize what we are talking in terms of the risk what we did in this sum so far is we have taken the four elements of the ecosystem the supply chain the

resources the institutions and the delivery mechanisms and we talked about all the kinds of risks that happen and everywhere we have emphasized two or three facts one is there is the concentration of these clusters and second thing is they are all highly connected either through people to organizations or through governments through trade agreements and so on a third one is these are all loosely coupled systems it is an independent and there are several players and there is no organization structure.

That connects between them so that basically makes things difficult so if you want to have risk mitigation strategies and have a governance create a resilient supply chain what is a resilient supply chain it is very difficult to create a risk proof supply chain not it is desirable it's not desirable to create because it is going to be highly expensive and it is almost impossible this is like finding a human being who will not will not die that is not happen.

So but how do you detect the risk minimize the effect of the risk and create mechanisms for resilience in a global supply chain now you have one thing is to stop globalization have local supply chains well if that is so then there could be risks in the local supply chains as well because nobody is aware was to risk it can happen anywhere it happen in China it can happen in the U.S. it can happen anywhere in the world or also it can happen to any organization to any vertical so it's important to create resilient supply chains non globalization is not an issue or not an answer to this so what we do is next is to talk briefly about how to create resilient supply chains that in the next class.

Programme Assistance

Guruprakash P

Dipali K Salokhe

Technical Supervision

B K A N Singh

Gururaj Kadloor

Indian Institute of Science

Bangalore