

**Indian Institute of Science  
Bangalore  
NPTEL  
National Programme on  
Technology Enhanced Learning**

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**Global Supply Chain Management**

**Lecture – 11**

**Supply Chain Risk –part 3**

**Prof .N. Viswanadham**

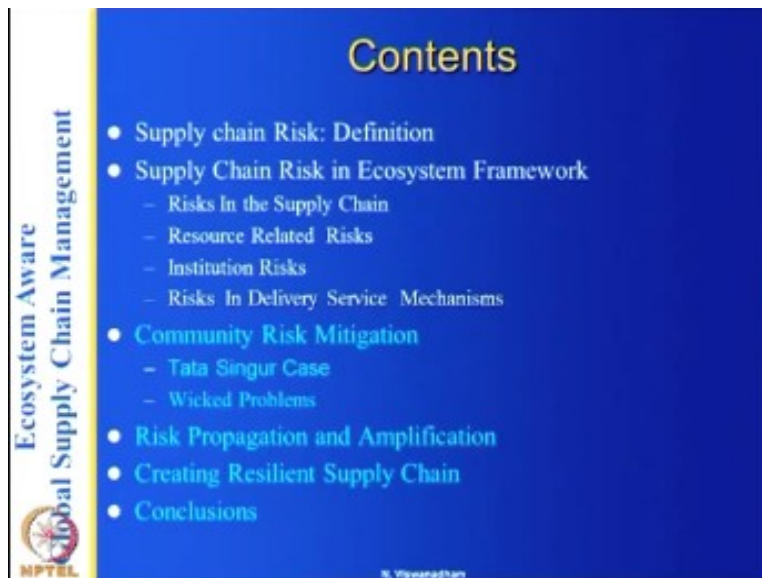
**Department of Computer Science and Automation**

**Indian Institute of Science**

**Bangalore**

Actually we are going to continue where we left on the supply chain risk.

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**Contents**

- Supply chain Risk: Definition
- Supply Chain Risk in Ecosystem Framework
  - Risks In the Supply Chain
  - Resource Related Risks
  - Institution Risks
  - Risks In Delivery Service Mechanisms
- Community Risk Mitigation
  - Tata Singur Case
  - Wicked Problems
- Risk Propagation and Amplification
- Creating Resilient Supply Chain
- Conclusions

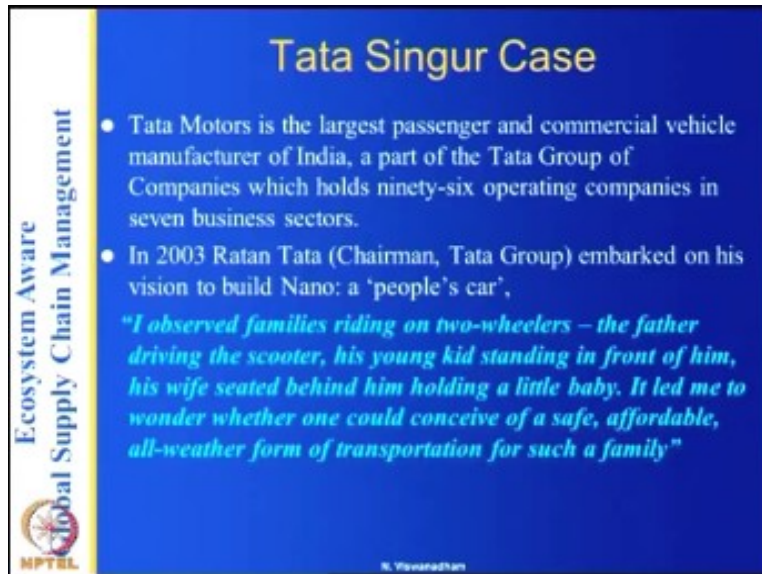
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Last two classes time we discussed the definition of a supply chain risk and also dealt with extensively all the risks that can arise in the supply chain: a resource related , institution based and risks in the delivery service mechanisms and given lots of examples. It is important to list all the risks that that happen or that influence the supply chain because unless you diagnose the fault you cannot rectify it. So it is very important that you know what are all the risks the supply chain faces so that you can try to mitigate the risks.

We are going to talk today about the risk mitigation strategies. The community risk is one of the biggest risks particularly in emerging markets like in India. I will take an example the Tata singur case. The Tatas had started an automobile plant for manufacture of Nano which is a 1 lakh car in West Bengal in place called Singur.

They have to move out because of the community risk. Such things like that happened several times in several cases. This is because of land acquisition; the land belongs to somebody who may be farmer and he does not want to sell it because if he want to wait till the prices real estate prices will go up.

Community risk lead to what is called wicked problem which are well difficult to solve has to be solved only through negotiations and so on.



The slide features a blue background with white text. On the left side, there is a vertical yellow bar containing the text 'Ecosystem Aware' and 'Global Supply Chain Management' in black, with the NPTEL logo below it. The main title 'Tata Singur Case' is centered at the top in white. Below the title, there are two bullet points in white text. The second bullet point is followed by a quote in red italicized text. At the bottom right, there is a small white text credit: 'N. Viswanathan'.

## Tata Singur Case

- Tata Motors is the largest passenger and commercial vehicle manufacturer of India, a part of the Tata Group of Companies which holds ninety-six operating companies in seven business sectors.
- In 2003 Ratan Tata (Chairman, Tata Group) embarked on his vision to build Nano: a 'people's car',  
*"I observed families riding on two-wheelers – the father driving the scooter, his young kid standing in front of him, his wife seated behind him holding a little baby. It led me to wonder whether one could conceive of a safe, affordable, all-weather form of transportation for such a family"*

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### Tata Singur case

Tata Motors is the largest passenger and commercial vehicle manufacturer of India and is a part of Tata group of companies and it holds 96 operating companies in seven business sectors. It is a very famous company in India. In 2003 Ratan Tata chairman Tata group embarked on evolution to build a Nano, a people's car.

*"I observed families riding on two-wheelers – the father driving the scooter, his young kid standing in front of him, his wife seated behind him holding a little baby. It led me to wonder whether one could conceive of a safe, affordable, all-weather form of transportation for such a family"*

He wanted to create a car for almost the same price as two-wheeler which is safe in all weathers. His mission was to have what is called 1 lakh car which is equivalent today to less than two thousand dollars.

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## West Bengal Govt. Won Tatas


- The state of West Bengal offered 997 acres of land: 647 acres was for the Nano plant, 290 acres for ancillary units and 60 acres for a Industrial Development Corporation.
- The farmers started agitations with the support of the opposition party of the time
- The state government, supported by a High Court ruling in January 2008, declared that the land had been legally acquired for public interest through the Land Acquisition Act, and urged all farmers to accept the compensation package offered by the state.
- Tata's started building the plant along with the partners

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The state of West Bengal offered 997 acres of land: 647 acres was for the Nano plant, 290 acres for ancillary units and 60 acres for a Industrial Development Corporation. The farmers started agitations with the support of the opposition party of the time The state government, supported by a High Court ruling in January 2008, declared that the land had been legally acquired for public interest through the Land Acquisition Act, and urged all farmers to accept the compensation package offered by the state. Tata's started building the plant along with the partners

The issue here is “there is a vision to have a low cost car for affordable by lower middle class families” and the state government wanted to have that plant so it can create jobs and will boost the employment potential and the economy of the state.

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## The Nano Project Planning

- The supply chain was meticulously planned in co-locating the vendors, auxiliary units and proximity of the plant to the Durgapur highway in Kalkota.
- The land acquisition procedure and social unrest was not seriously taken up by the Tata's and they relied on the Government of West Bengal to look into the land acquisition proceedings.
- They started construction of the plant and installation of the machinery to commence operations at the earliest.
- Their partners also built their facilities in Singur

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The supply chain was meticulously planned in co-locating the vendors, auxiliary units and proximity of the plant to the Durgapur highway in Kalkota. The land acquisition procedure and social unrest was not seriously taken up by the Tata's and they relied on the Government of West Bengal to look into the land acquisition proceedings. They started construction of the plant and installation of the machinery to commence operations at the earliest. Their partners also built their facilities in Singur. Money like rupees 50,000 Crores have been spent in making the plants and was supposed to be launched in a month.

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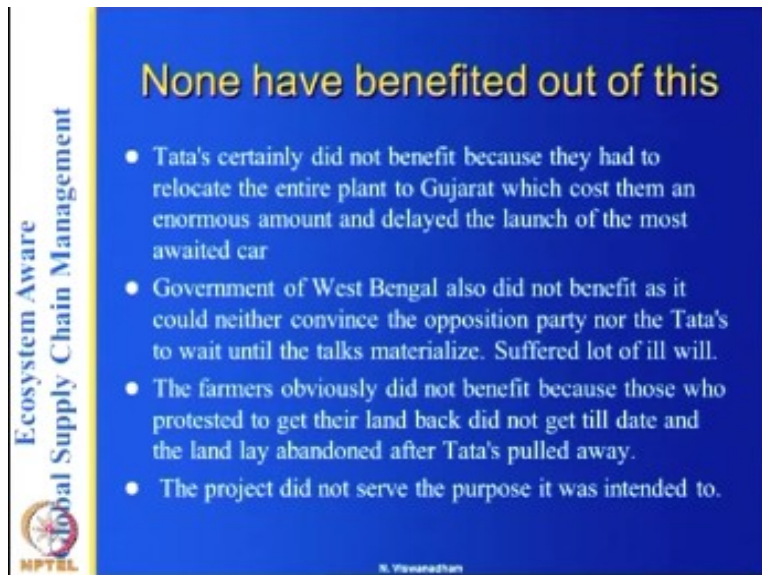
## Tata's leave Singur

- The agitations of farmers did not stop
- The spate of agitations intensified to such an extent that the inventory in the Nano plant was damaged, factory gates were not allowed to be opened, and employees of the Nano plant were assaulted.
- Several other state Governments offered sites.
- Worried about the prolonged agitations against the project and the security of its employees, Tata eventually pulled out of Singur to the state of Gujarat



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The Nano was supposed to be launched in a month Tata's leave Singur because of the agitations of farmers did not stop. The spate of agitations intensified to such an extent that the inventory in the Nano plant was damaged, factory gates were not allowed to be opened, and employees of the Nano plant were assaulted. Several other state Governments offered sites. Worried about the prolonged agitations against the project and the security of its employees, Tata's finally pulled out of Singur to the state of Gujarat



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### None have benefited out of this

- Tata's certainly did not benefit because they had to relocate the entire plant to Gujarat which cost them an enormous amount and delayed the launch of the most awaited car
- Government of West Bengal also did not benefit as it could neither convince the opposition party nor the Tata's to wait until the talks materialize. Suffered lot of ill will.
- The farmers obviously did not benefit because those who protested to get their land back did not get till date and the land lay abandoned after Tata's pulled away.
- The project did not serve the purpose it was intended to.

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None have benefited out of this. Tata's certainly did not benefit because they had to relocate the entire plant to Gujarat which cost them an enormous amount and delayed the launch of the most awaited car. Government of West Bengal also did not benefit as it could neither convince the opposition party nor the Tata's to wait until the talks materialize. Suffered lot of ill will because a lot of companies wanted to establish their base in Singur along with the Tatas once the Nano is successful. The New York Times headline says the world is waiting for Nano to come out. The farmers obviously did not benefit because those who protested to get their land back did not get till date and the land lay abandoned after Tata's pulled away. The project did not serve the purpose it was intended to.

**Questions that arise**

- Did this magnanimous project of global importance end up in a fiasco because of the negligence and underestimation of minute factors?
- Several MNCs who wanted to open shops in West Bengal have either postponed or abandoned their plans
- Lack of Talent and Negotiation skills is responsible for this debacle?
- **"Wicked problem"** is a phrase used in social planning to describe a problems of this type which are difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize.
- Because of complex interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other problems

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Lots of Questions that arise:

Did this magnanimous project of global importance end up in a fiasco because of the negligence and underestimation of minute factors? Several MNCs who wanted to open shops in West Bengal have either postponed or abandoned their plans. Lack of Talent and Negotiation skills is responsible for this debacle?

**"Wicked problem"** is a phrase used in social planning to describe a problem of this type which are difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. Because of complex interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other problems

Such problems in society having government on one side, the industry on another side, the people on the side, opposition parties on the fourth side and on the fifth side other states who are trying to your Tata set up their plant have five or six partners who are basically trying to get the problem solved in their way. Such problems are called wicked problems and they are difficult if not impossible to solve.

The kind of questions that arise: did this magnanimous project of global importance end up in a fiasco because of the negligence and underestimation of many factors. Lack of talent and negotiation skills is responsible for the problem? Several advanced companies who wanted to open shops in West Bengal have either postponed are abandoned their plans.

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## Characteristics of Wicked Problems

- The problem involves many stakeholders with different values and priorities.
- The problem is difficult to come to grips with and changes with every attempt to address it.
- There is no right answer to the problem.
- Every implementable solution to the problem has consequences.
- There is no definitive formulation of the problem.
- Every problem is essentially unique
- The problems has no precedence.

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*Social complexity* is a function of the number and diversity of players involved in a project with strong and accurate opinions of their own. The conflicting views among various stake holders, lead to no acceptable solution causing projects not to take off or fail. The problems in which Social complexity is coupled with fragmentation over decision making are called **wicked problems**

### Characteristics of Wicked Problems

The problem involves many stakeholders with different values and priorities. The problem is difficult to come to grips with and changes with every attempt to address it. There is no right answer to the problem.

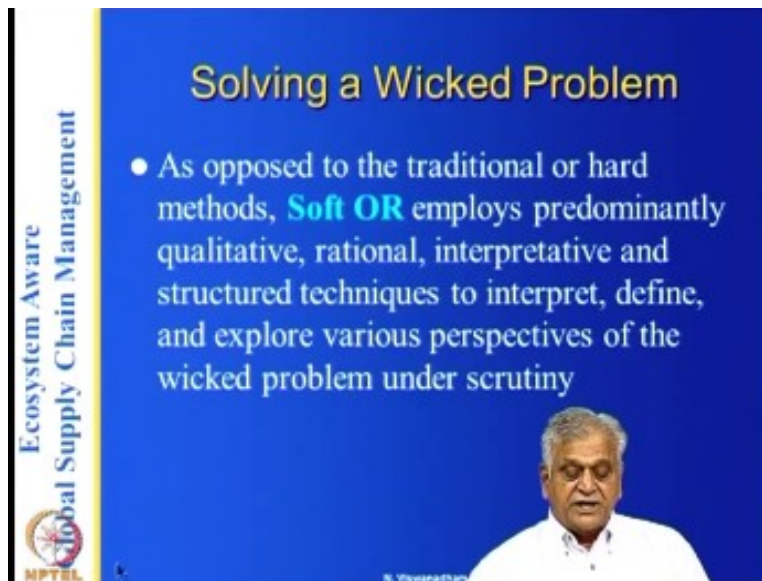
Every implementable solution to the problem has consequences. There is no definitive formulation of the problem. Every problem is essentially unique. The problems has no precedence.

The problem involves many stakeholders with different values and priorities the problem is difficult to come to grips with and changes with every attempt to address it now I do not know whether the West Bengal or they Tata recognize that they were it was a wicked problem and it was a failure of negotiation skills because it is very difficult to say they think that you know this is this is a straightforward problem somebody did not agree so we moved out and so on but on the other hand there is a community loss here in other words for the Year Tatas have spent.



There is no right answer to the problem. Everybody is right and every implementable solution to the problem has consequences. There is no definitive formulation to the problem, in other words, you cannot solve this as an optimization problem. They are extra hard problems and every problem is essentially unique and has no precedence.

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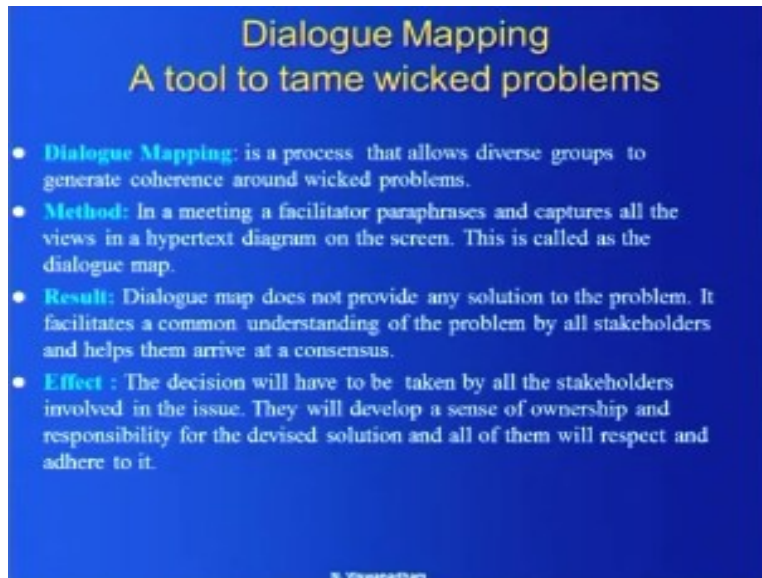
The slide features a blue background with the title "Solving a Wicked Problem" in yellow text at the top. A vertical yellow bar on the left contains the text "Ecosystem Aware Global Supply Chain Management" and the NPTEL logo. A single bullet point in white text describes the "Soft OR" approach. In the bottom right corner, there is a small video feed of a man with grey hair wearing a white shirt, with the name "N. Viswanathan" written below it.

**Solving a Wicked Problem**

- As opposed to the traditional or hard methods, **Soft OR** employs predominantly qualitative, rational, interpretative and structured techniques to interpret, define, and explore various perspectives of the wicked problem under scrutiny

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## Dialogue Mapping A tool to tame wicked problems

**Dialogue Mapping:** is a process that allows diverse groups to generate coherence around wicked problems. **Method:** In a meeting a facilitator paraphrases and captures all the views in a hypertext diagram on the screen. This is called as the dialogue map. **Result:** Dialogue map does not provide any solution to the problem. It facilitates a common understanding of the problem by all stakeholders and helps them arrive at a consensus. **Effect :** The decision will have to be taken by all the stakeholders involved in the issue. They will develop a sense of ownership and responsibility for the devised solution and all of them will respect and adhere to it.

There are several ways of solving these wicked problems for example a government can bring a law saying that it is allotted and any actions that other by anybody does is illegal and they are liable for prosecution. That is an authoritative way of solving it. This is done in several countries and several places if it is possible to do that.

But there is another way of doing and is called a collaborative networking. You talk to all parties and have a dialogue and convince them. Saying that they will give jobs to some of the people in the farmers sons daughters who are who are employable. Dialogue mapping this is a tool that to tame the wicked problems. You are solving in a collaborative networking fashion the problem.

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## Examples of Wicked Problems

- Environmental degradation
- Terrorism
- Poverty
- Global warming
- Long term social planning
- Organizational planning

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### Examples of Wicked Problems

Terrorism

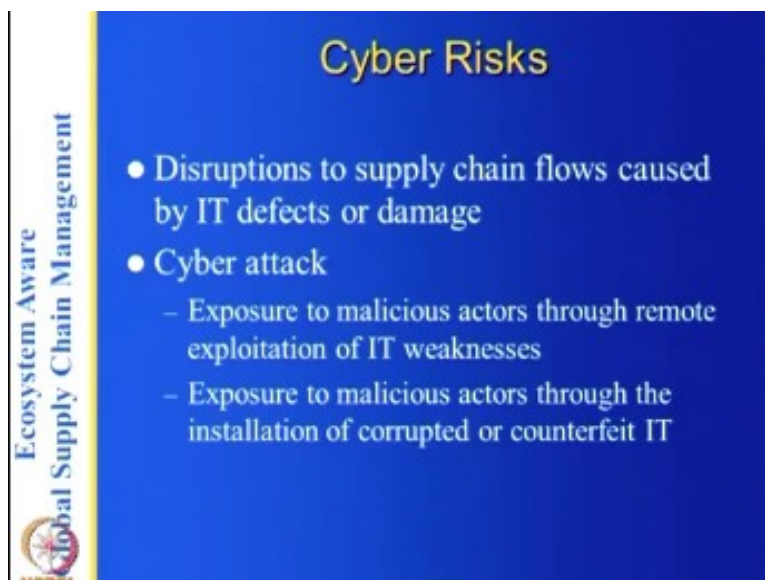
Poverty; Global warming, Environmental degradation

Long term social planning; Organizational planning

Cyber Security; Cyber Risks



Supply chains are highly connected and allows efficient flow of the goods, information and finance .The internet plays a very big role in connecting the information and the finances. The connectedness also brings risk and one of the risks that have been discovered in the last few years is what is called cyber risks i.e. disruptions to supply chain flows caused by IT attacks. It is important to mitigate the cyber risks and it is called cyber security



Disruptions to supply chain flows caused by IT defects or damage. Cyber attacks are

Exposure to malicious actors through remote exploitation of IT weaknesses; Exposure to malicious actors through the installation of corrupted or counterfeit IT, etc.

There are several ways in which this can be done. It has become very common to hack the e-mail accounts, the financial accounts etc. there are also attempts to bring down the power plants etc.

**Recent Cyber attacks**

- Hactivist groups targeted businesses in recent cyber attacks by hacking, and defacing websites of businesses or government entities for purposes of political or policy protest.
- Hactivist also conduct distributed denial of service (DDoS) attacks .i.e. Making a machine or network resource such as banks, credit card payment gateways, etc connected to Internet unavailable to its intended users
- **Stuxnet** is a computer worm discovered in June 2010 attack of nuclear facilities.
- Stuxnet spreads indiscriminately via Microsoft Windows and spies on and subverts Siemens supervisory control and data acquisition (SCADA) systems, an industrialsoftware and equipment that are configured to control and monitor specific industrial processes including the PLC.
- Stuxnet infects PLCs by subverting the Step-7 software application that is used to reprogram these devices.

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Also hacking and defacing websites of businesses and government entities for purposes of political and policy reasons is also very common. This is becoming like cyber warfare between countries. Disabling your aircrafts, disabling your nuclear power plants, disabling your power plant operations is very common nowadays since these are all standardized to control equipment which are accessible.



In a connected world, risks propagate across network and often they could be amplified to serious risks.

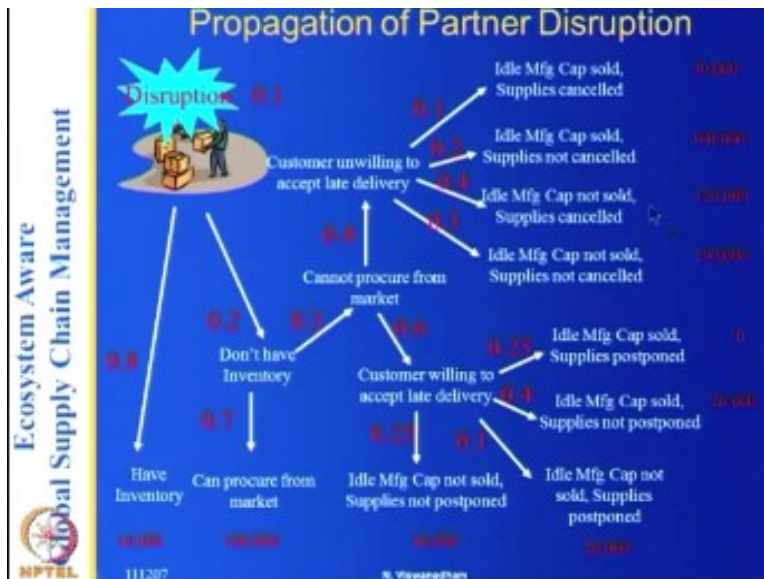
## Risk Propagation and Amplification

- 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



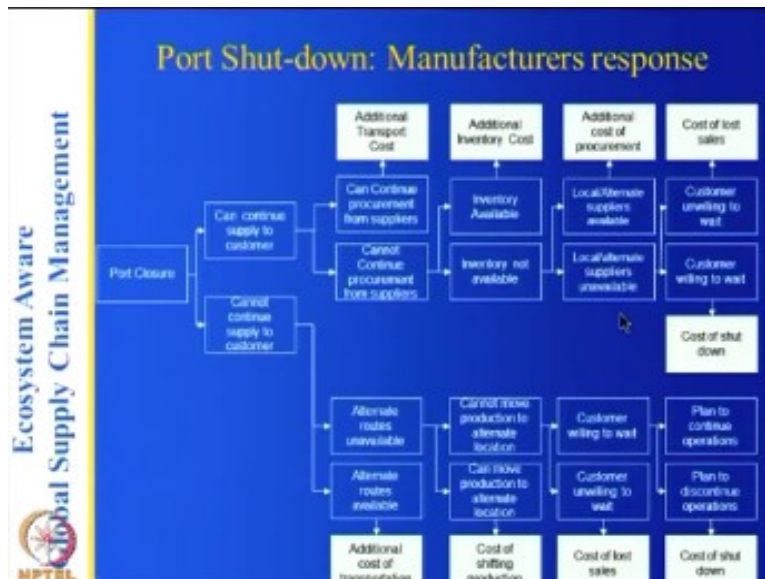
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In a globalized world the risk for the supply chain could come from three other very important factors which are often ignored. The supply chains have the property of Connectedness on a global scale. Also the competitiveness is highly concentrated with so called big players across industries. Most supply chain have hierarchical organizational structure. Response to risks i.e. to mitigate them by corrective action may be slow



Let us look at a particular diagram supposing there is a supplier from you are sourcing and there is a fire in his factory. You sometimes you keep inventory. Sometimes you do not have inventory if you are a lean, JIT and so on. If you do not have inventory, you try to procure from the market. Most probably you may get it. If it is not a very critical component which is specially made for you, if it is a general component like a processor or a power supply, you can always be able to access it. Sometimes you may not be able to get it so on.

What we are trying to do here is to develop a decision flow diagram. Once a disruption of course if you map like this then you know how to mitigate the risks and how the risk flows in the inside of your system.



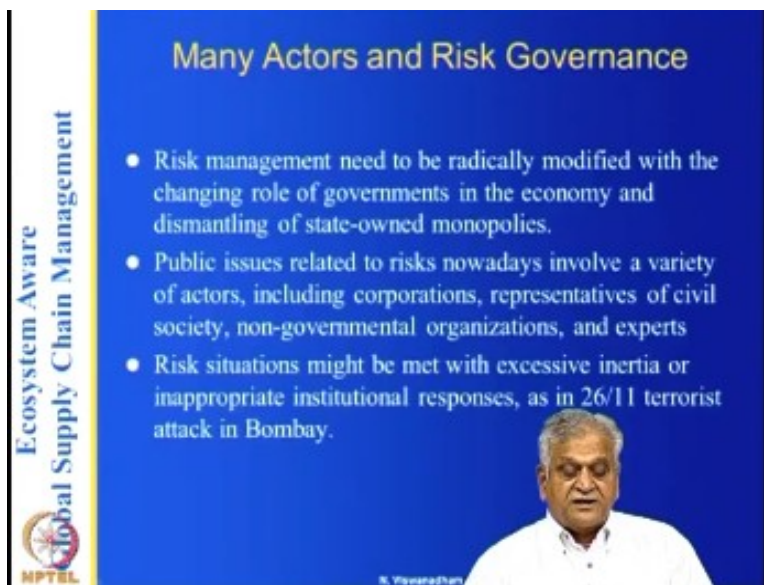
If port is shut down, because of thunder storm or labor strike, ships cannot be uploaded or downloaded they have to be diverted to some other place or the shipments.





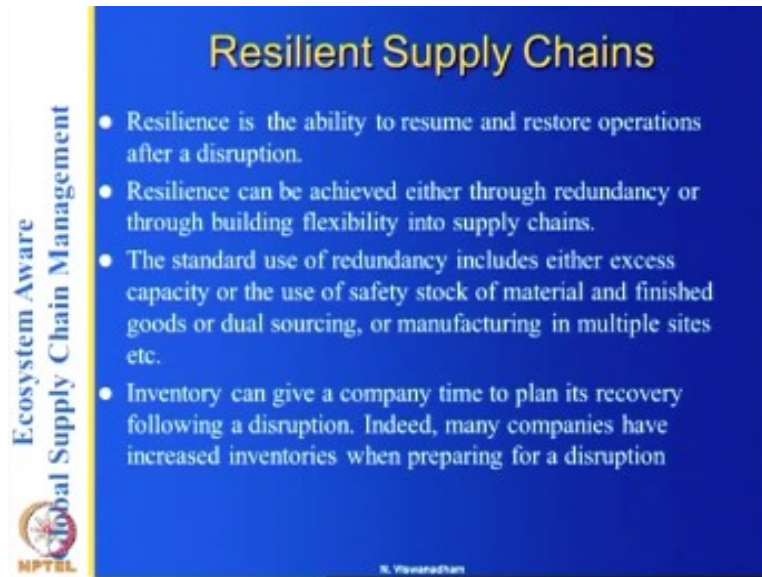
How do you create a resilient supply chain based on all the knowledge that we presented here.

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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.



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## Resilient Supply Chains

- Resilience is the ability to resume and restore operations after a disruption.
- Resilience can be achieved either through redundancy or through building flexibility into supply chains.
- The standard use of redundancy includes either excess capacity or the use of safety stock of material and finished goods or dual sourcing, or manufacturing in multiple sites etc.
- Inventory can give a company time to plan its recovery following a disruption. Indeed, many companies have increased inventories when preparing for a disruption

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## Flexibility for Resilience

- To build in flexibility for resilience, companies must involve many facets of supply chain design by:
  - Developing the ability to move production among plants , use interchangeable and generic parts in many products, and cross-train employees
  - Designing products and processes for maximum postponement of as many operations and decisions as possible in the supply chain.
- Firms that rely on global shipments should build decision support that can advise on
  - Shifting delivery routes to different checkpoints if need be based on the information at border crossing.
  - Shifting from one mode of transportation such as air freight to a backup routes by another mode.
  - In turn, these steps may raise costs and affect production lead times and inventory levels.

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Both flexibility as well as the redundancy cost money. There are ways in which you can create a resilient supply chain it is going to be cost money. You want your system to operate in spite of failures in the other network elements.



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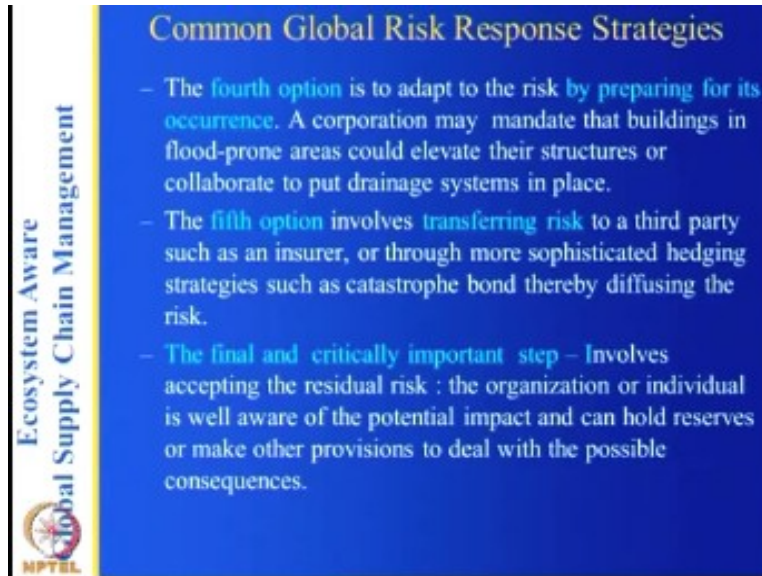
### Common Global Risk Response Strategies

- Six broad, non-exclusive strategies for a Government, Corporation Or Individual to reduce overall risk exposure
  - The first option is to seek to avoid the risk wherever possible.
  - The second option is to mitigate the risk directly – to attempt to reduce the impact or likelihood of the risk at source. Dual sourcing, Keeping inventory are examples
  - The third option is uncertainty reduction through Collaborative efforts by sharing data, risk related information and in preparing supply chain continuity plans such as Long term contracts, Common board members, Personnel flows ( JIT II)

## Common Global Risk Response Strategies

Six broad, non-exclusive strategies for a Government, Corporation Or Individual to reduce overall risk exposure

1. Seek to avoid the risk wherever possible.
2. Mitigate the risk directly – to attempt to reduce the impact or likelihood of the risk at source. Dual sourcing, Keeping inventory are examples
3. Reduce Uncertainty through Collaborative efforts by sharing data, risk related information and in preparing supply chain continuity plans such as Long term contracts, Common board members, Personnel flows ( JIT II)




**Common Global Risk Response Strategies**

- The fourth option is to adapt to the risk by preparing for its occurrence. A corporation may mandate that buildings in flood-prone areas could elevate their structures or collaborate to put drainage systems in place.
- The fifth option involves transferring risk to a third party such as an insurer, or through more sophisticated hedging strategies such as catastrophe bond thereby diffusing the risk.
- The final and critically important step – Involves accepting the residual risk : the organization or individual is well aware of the potential impact and can hold reserves or make other provisions to deal with the possible consequences.

The next three options are as follows


4. Adapt to the risk by preparing for its occurrence. A corporation may mandate that buildings in flood-prone areas could elevate their structures or collaborate to put drainage systems in place.
5. Transfer the risk to a third party such as an insurer, or through more sophisticated hedging strategies such as catastrophe bond thereby diffusing the risk.
6. The final and critically important step – Involves accepting the residual risk : the organization or individual is well aware of the potential impact and can hold reserves or make other provisions to deal with the possible consequences.

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## Conclusions

- Design of Resilient supply chains is an important topic and should focus on specific vertical.
- No supply chain strategy will eliminate risk, nor should it as the cost would be too high.
- The managers can excel in identifying, quantifying, and preparing for the new realities of risk.
- Determining whether greater resilience is worth the extra cost is part of the new management function.



Design of Resilient supply chains is an important topic and should focus on specific vertical. The conclusions that one gets are different for oil and gas from electronics or from auto. No supply chain strategy will eliminate risk, nor should it as the cost would be too high. It is like saying that no humans should not get a disease. The managers can excel in identifying, quantifying, and preparing for the new realities of risk. Determining whether greater resilience is worth the extra cost is part of the new management function.

The supply chains are getting leaner and global and are basically more risk prone since there is several partners who are creating the risk from government to social groups to the ports to the companies and the terrorists etc. In addition there is community risk or cyber risk etc. Risk identification and also later to mitigate this supply chain risk is a very important topic that is attracting the attention of people nowadays.

### **Programme Assistance**

Guruprakash P

Dipali K Salokhe

### **Technical Supervision**

B K A N Singh  
Gururaj Kadloor

**Indian Institute of Science**  
**Bangalore**