Supply Chain Risk – Part 3

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Community Risk Mitigation
Tata Singur Case
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”
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.
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.

The Nano was supposed to be launched in a month.
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.
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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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.
Wicked Problems
Social Complexity – Wicked Problems

- **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 stakeholders, 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**

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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.
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.
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.

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Examples of Wicked Problems

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

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Cyber Security
Cyber Risks

- Disruptions to supply chain flows caused by IT defects or damage
- Cyber attack
  - Exposure to malicious actors through remote exploitation of IT weaknesses
  - Exposure to malicious actors through the installation of corrupted or counterfeit IT
Recent Cyber attacks

- Hacktivist groups targeted businesses in recent cyber attacks by hacking, and defacing websites of businesses or government entities for purposes of political or policy protest.
- Hacktivist 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 industrial software 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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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
Ecosystem Aware Global Supply Chain Management

### Propagation of Partner Disruption

**Disruption**: 0.1

- **Customer unwilling to accept late delivery**: 0.4
  - **Cannot procure from market**: 0.1
    - **Don’t have Inventory**: 0.2
      - **Have Inventory**: 0.8
        - **Can procure from market**: 0.3
          - **Customer willing to accept late delivery**: 0.6
            - **Idle Mfg Cap sold, Supplies cancelled**: 50,000
            - **Idle Mfg Cap sold, Supplies not cancelled**: 100,000
            - **Idle Mfg Cap not sold, Supplies cancelled**: 120,000
            - **Idle Mfg Cap not sold, Supplies not cancelled**: 190,000
  - **Customer unwilling to accept late delivery**: 0.2
    - **Idle Mfg Cap sold, Supplies cancelled**: 50,000
    - **Idle Mfg Cap sold, Supplies not cancelled**: 100,000
    - **Idle Mfg Cap not sold, Supplies cancelled**: 120,000
    - **Idle Mfg Cap not sold, Supplies not cancelled**: 190,000

- **Don’t have Inventory**: 0.3
  - **Can procure from market**: 0.7
    - **Customer willing to accept late delivery**: 0.4
      - **Idle Mfg Cap sold, Supplies postponed**: 0
      - **Idle Mfg Cap sold, Supplies not postponed**: 20,000
    - **Idle Mfg Cap not sold, Supplies postponed**: 0
    - **Idle Mfg Cap not sold, Supplies not postponed**: 20,000

**Total values**:
- **10,000**
- **100,000**
- **40,000**
- **20,000**
Port Shut-down: Manufacturers response

Port Closure

Can continue supply to customer
- Can continue procurement from suppliers
- Additional Transport Cost
- Alternative routes available
  - Can move production to alternate location
  - Customer willing to wait
  - Plan to continue operations
  - Plan to discontinue operations
  - Cost of shut down

Cannot continue supply to customer
- Cannot continue procurement from suppliers
- Inventory not available
  - Inventory Available
  - Local/Alternate suppliers available
  - Customer unwilling to wait
  - Customer willing to wait
  - Plan to discontinue operations
  - Cost of shut down

- Additional cost of procurement
- Additional inventory cost
- Additional cost of transportation
- Additional Inventory Cost
- Customer unwilling to wait
- Customer willing to wait
- Cost of lost sales
- Cost of shut down
Creating Resilient Supply Chain
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.
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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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.
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

- 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.
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.
Dual Sourcing Example

- A medical devices company sources from a contract manufacturer in China at $100 a piece and sells at $400 each. Fixed costs, including marketing and channel setup, are estimated at $200 per device. Thus, the company expects a profit of: \( P_1 = 400 - 100 - 200 = 100 \) per device.

- The company estimates that there is a 1% probability that the Chinese supplier will be disrupted. In case of a disruption the company will have no sales but will still be burdened with the fixed costs. Taking this into account, the expected profit when using the Chinese supplier is: \( P_2 = 0.99(100) - 0.1(200) = 97 \) per device.

- A dual supply arrangement is made with a local supplier for 20% of the business at $150 each, with a guarantee to supply all of the company’s requirements should the need arise.

- If there is no disruption, the expected profit when using dual manufacturing will be: \( P_3 = 400 - (0.8*100 + 0.2*150) - 200 = 90 \) per device.

- If there is a disruption, the local manufacturer will supply the devices and the company’s profit will be: \( P_4 = 400 - 150 - 200 = 50 \) per device.

- Taking into account that in case of a disruption the company will be able to use the local supplier, the expected profit when operating with dual suppliers is: \( P_5 = 0.99*P_3 + 0.01*P_4 = 89.6 \) per device.

- Dual manufacturing will cost the company $7.4 per device (\( P_2 - P_5 \)) in expected profit. This is the insurance premium. The value of the insurance is that if a disruption does occur, the company will experience a profit of $50 instead of a loss of $200 per device.