

# **Chapter 8**

## **An Introduction to Operational Risk Management**

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### **Operations Management**

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# Agenda

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- **What is risk?**
- What is risk Management and why is it important?
- Risk management: A source of competitive advantage?
- Different types of risk
- Risk management steps

# What is risk?

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- ◆ Risk has been defined differently in different contexts
- ◆ Intuitively we refer to risk as:
  - Unpleasant things that might happen
- ◆ Risk occur because we do not know what will happen in the future

# What is risk?

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## ◆ More formal definitions:

- The uncertainty concerning the occurrence of a loss
- The chance that an uncertain event can harm an organization.
- The expected loss  
= (probability of loss) × (loss value)
- Insurance industry: The relative variation of actual loss from expected loss  
= [(actual loss) – (expected loss)] / (expected loss)

# What is risk?

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Example:

- ◆ A property insurer has 10,000 houses insured over a long period.
- ◆ On average one percent or 100 houses burn each year.
- ◆ Assume that on average each house is worth \$500,000.

What is the risk according to each definition?

# What is risk?

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- ◆ The nature of risk in the first two definitions is probability.
- ◆ The nature of risk in the 3<sup>rd</sup> definitions is loss (monitory value).
- ◆ The nature of risk in the 4<sup>th</sup> definition is relative loss
- ◆ In this class we do not limit ourselves to any particular definition.
- ◆ We should be able to understand the risk definition used in any discussion from the context.

# Agenda

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- What is risk?
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# Why risk management?

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- ◆ Risk management teaches us how to deal with the uncertainties in the business world, and to prevent or mitigate the potential losses.
  - We will see that risk management can play a more important role !
- ◆ The importance of risk management depends on the level of uncertainty a business faces.
- ◆ Crucial question:
  - What is the uncertainty trend? Is it going to increase in the business world or decrease?



# Trend of increasing uncertainty

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- ◆ Factors that make the business world a more uncertain environment:
  - Faster pace of changes
  - Increasing complexity
  - Globalization
  - Multi-polar global order
  - Increasingly interconnected risks
- ◆ What factors help stabilize the unpredictable business world?

# Trend of increasing uncertainty

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- ◆ Empowered by easier communication and flow of information and knowledge, everything changes **faster** than before:
  - Technologies
  - Products and their uses
  - Business models
  - Customer preferences
  - Political powers
  - ...

# Trend of increasing uncertainty

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- ◆ **Complexity**, in general, increases risk.
- ◆ A complex system is a system that cannot be explained by breaking it down into its component parts.
- ◆ New technologies facilitate more complicated business processes and practices.
- ◆ The higher level of complexity in processes and practices makes it more difficult to see different types of risks.
- ◆ One of the root causes of the financial system collapse in 2007 is debated to be the fact that the complexity of financial products outgrew our ability to assess the real risks involved in those products.

# Trend of increasing uncertainty

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- ◆ Effect of **globalization** on business uncertainties
  - Major disruptions are rare in any given location. Yet, the major disruptions that happen all over the globe are not rare.
  - Globalization trend means businesses around the world are more and more interlinked.
  - A disruption in any place spreads quickly to many more places in other parts of the world.
  - A business is hardly safe from a major disruption that happens elsewhere around the globe.

# Trend of increasing uncertainty

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- ◆ The emergence of new economic powers, are signs of a trend toward a **multi-polar** world order.
- ◆ When we have a greater number of influential powers around the globe, we can expect more unexpected events to happen due to the interaction and rivalry between these powers.

# Trend of increasing uncertainty

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- ◆ In addition to globalization trend which facilitates the quick spread of any local disruption, the increasing **interconnection** of different types of risks makes the matter even worse.
- ◆ Different categories of business risks are not independent of each other.
- ◆ One type of risk might evolve into other risk categories.

# Branches of Risk Management

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## ◆ Financial Risk Management

- Is being taught in a different course
- RM was originally studied in finance

## ◆ Insurance

- Insurance is all about RM

## ◆ Project Risk Management

- Important application: RM in product development

## ◆ Operational Risk Management

# Operational Risk Management

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## ◆ What do we mean by operations?

- Business operations are those ongoing activities that an organization perform to produce value for its stakeholders.
- Operations are recurring activities and consist of processes.
- Operations are contrasted with projects in which activities are being done for a limited number of times until the goals of the project are achieved (limited time and scope).



# Operational Risk Management

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## ◆ Main operations in a manufacturing company

- Procuring
- Manufacturing or processing
- Warehousing
- Shipping
- Providing services (during and after sales)
- Handling returns
- ...

## ◆ What are potential risks in these operations?

# Agenda

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- Quick review
- What is risk?
- What is risk Management and why is it important?
- **Risk management: A source of competitive advantage?**
- Different types of risk
- Risk management steps

# Risk can be more than a threat

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- Traditional risk management mentality:
  - We use risk management techniques to avoid or mitigate losses due to the risks which threaten our business
- Modern view of risk management:
  - A proper implementation of risk management can provide you with a competitive advantage

# Risk can be more than a threat

- What is the similarity between the evolution of supply chain management and risk management?

The View Point	Logistics / Supply Chain Management	Risk Management
An inevitable cost to pay	Just pay for transportation, inventory, ...	Pay the cost when a harmful event happens
A cost that can be minimized	Find innovative ways to minimize the logistics cost	Use risk management to minimize the costs of unexpected events
A potential source of competitive advantage	Use the supply chain design to gain competitive advantage	Use your abilities to deal with risk as a competitive advantage

# Risk can be more than a threat

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- There are four ways in which a proper risk management can be turned into a competitive advantage.
  1. Excelling in everyday performance
  2. Serve while others cannot
  3. Seeking riskier businesses
  4. Building a resilient image

# Risk can be more than a threat

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1. A company which is ready to deal with disruptive risks:
  - is more agile
  - has more decisive managers and empowered employees
  - communicates well, both internally and externally
  - has more streamlined processes
  - ...

Such a company can compete more effectively and in a more sustainable way

# Risk can be more than a threat

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2. Disasters hit everybody. Those who can better avoid the disasters or recover faster than the others, are winners of the market
  - The case of Nokia and Ericson
3. There are higher potential profits in riskier venues.
  - When you can handle risks better than your competitors, you can enter riskier ventures with higher potential profits
  - More valuable treasures can be found in more dangerous waters
4. Creating a resilient image

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# Vulnerability

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- ◆ The first step of risk management:
  - Identify the firm's **vulnerability**

## Definition:

- ◆ A firm's vulnerability to a disruptive event:
  - A combination of the **likelihood** of a disruption and its potential **severity** (loss).

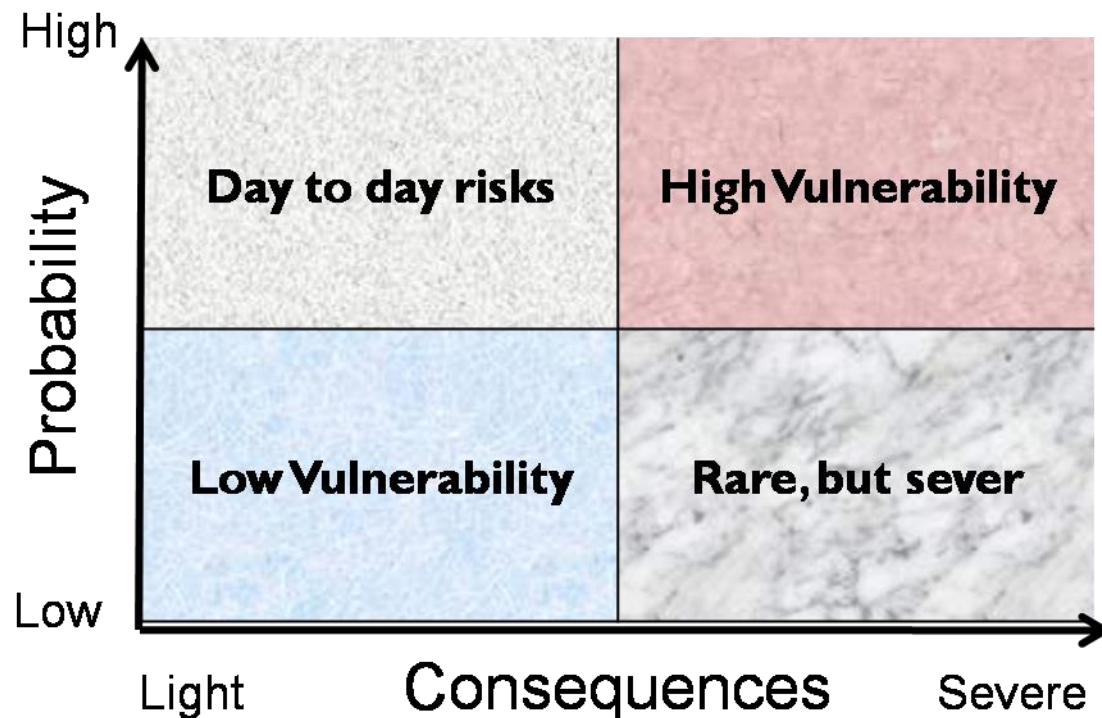
# Vulnerability

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- ◆ Companies assess their vulnerability by answering these questions:
  1. What can go wrong?
  2. What is the likelihood of that happening?
  3. What are the consequences (loss) if it happens?
  
- ◆ In its simplest form (sometimes too simple), vulnerability can be measured with the **expected loss**.

# Vulnerability Categories

- ◆ We can categorize harmful events based on:
  - The probability of happening
  - Their impact (severity)



# Vulnerability Categories

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- ◆ High probability, low impact harmful events are the type of risks that we deal with on a day to day basis:
  - An error in demand forecast;
  - Machine breakdowns;
  - Supplier delays;
  - ...
- ◆ High probability, high impact harmful events are rare. If such events exist in a business, they usually create a high level of awareness and firms are well prepared for them.

# Vulnerability Categories

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- ◆ Low probability, low impact harmful events can be ignored. They are rare and if they happen they can be handled in ad hoc way.
- ◆ Low probability, high impact harmful events are the most problematic ones.
  - People tend to forget or ignore them;
  - When happen, they can be disastrous;
  - Globalization results in “high frequency of low probability events”;
  - This type of events is the focus of this class;

# Risk dimensions?

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## ◆ Frequency:

- Frequent, Rare

## ◆ Source:

- Natural, Accidental, Intentional, Economical, Regulations, Pandemics, political.

## ◆ Scope:

- Local vs. global

## ◆ Duration:

- Short term loss vs. long term (permanent)

# Risk dimensions?

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## ◆ Scale:

- Limited loss vs. life threatening damages

## ◆ Supply chain view:

- Disruption in supply side, demand side or internal

## ◆ Interconnectivity:

- Linked vs. isolated risks

## ◆ Rewarded vs. Unrewarded

# Vulnerability Map

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- ◆ GM's concentric vulnerability map:
  - Financial
    - » Macro economic factors, exchange rate fluctuations, ...
  - Strategic
    - » Competition, public concerns, ...
  - Hazard
    - » Random disruptions, intentional disruptions
  - Operations
    - » Mainly supply chain activities



# Concentric Vulnerability Map – General Motors Example



Source: "The Resilient Enterprise" by Yossi Sheffi

# How to Map Vulnerability?

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- ◆ Vulnerability assessment starts with collecting data from across the organization.
- ◆ It needs a collaboration from all functional units in the organization.
- ◆ The vulnerability map should consider the entire supply chain not just the immediate suppliers and customers.
- ◆ We can map disruptions according to:
  - Financial, strategic, hazard, operations (GM)
  - Intentional, accidental, natural, pandemics, ...
  - Regions (for very extended supply chains)

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# Business Continuity Report Format

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## ◆ Executive summary

### 1. Introduction and general information

### 2. Risk Management

- a. Risk Assessment
- b. Measures for preventing or reducing the probability of disasters
- c. Measures for mitigating the severity of the disasters
- d. Risk control options

### 3. Business impact analysis (BIA)

### 4. Business continuity plan (BCP)

### 5. Conclusions and Takeaways

# Risk Assessment or Vulnerability Mapping

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1. Identify the **threats**
2. Identify the **probability** of each threat
3. Identify the **consequences** of each threat
4. Identify the **impacts** of each consequence
5. Estimate the **risks** of each impact
6. Create prioritized **lists** of threats and consequences according to their total impacts

# Risk Related Parameters

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◆ **Threat Source:** The source of a harmful event

- » Earthquake
- » Labor strike
- » Fire
- » ...

◆ **Threat Event:** What happens to a business as the result of a materialized threat (what the business directly feels)

- » Loss of physical assets
- » Production disruption
- » Loss of labor accessibility
- » ...

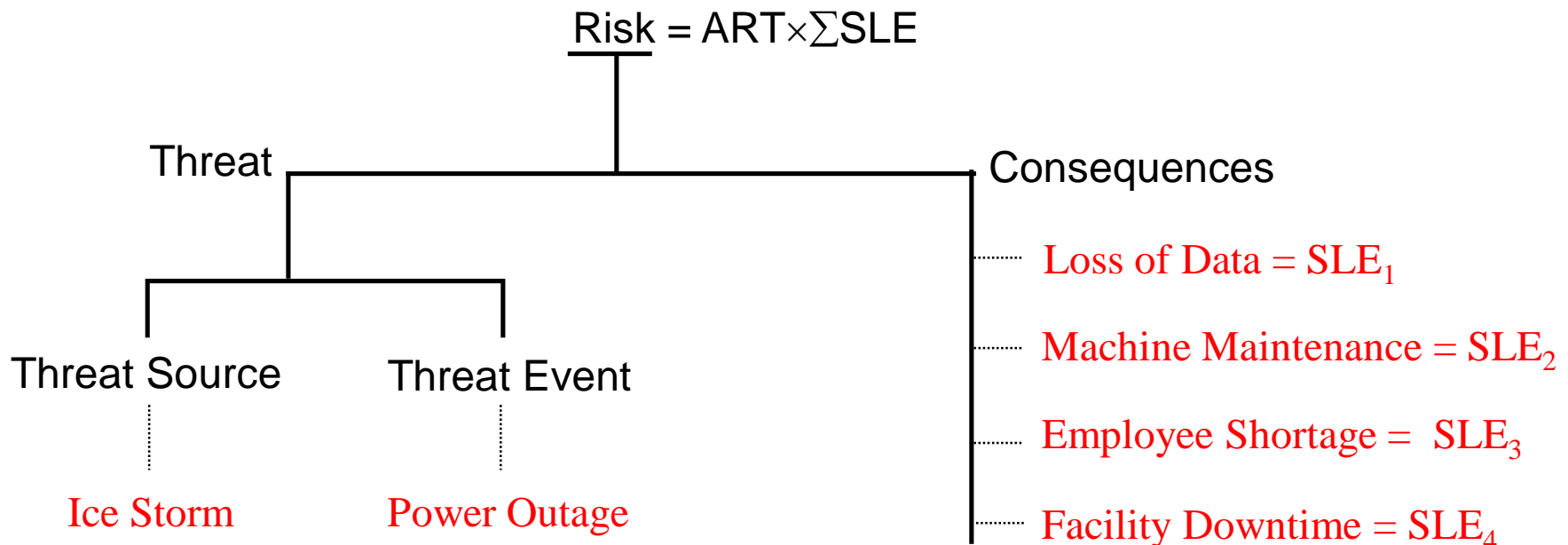
◆ **Consequence:** The negative impact on the business which can be quantified as a monetary loss

- » Loss of revenue
- » Loss of marker share
- » Penalties for late delivery

» ...

# Term Project Report Format

We should calculate risk values for different pairs of: (Threat Source, Threat Event).



## Threat:

Annualized Rate of Threat = ART

## Consequence:

Single Loss Expectancy = SLE

# Risk Assessment Steps:

## Estimating risks and prioritizing threats

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- ◆ For each threat calculate the Annualized Impact Expectancy (AIE). That is,

$$AIE = ART * SIE$$

- ART: Annualized Rate of Threat occurrence
- SIE: Single Impact Expectancy

- ◆ Create prioritized lists of
  - Threats according to their total AIE for all possible consequences and impacts.
  - Consequences according to their total AIE for all possible impacts
    - » One consequence could be the result of more than one threat



# Risk Related Parameters

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- ◆ Each threat can lead to multiple consequences
- ◆ Each consequence can lead to multiple impacts
- ◆ The data collection for each step should be designed. You should be clear about
  - The source of data
    - » Internal personnel, outside experts, past events, ...
  - The reliability of data
    - » Error measures
  - The necessary updating frequency

# Risk Assessment Steps: Threats

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- ◆ Use different risk classifications to create a list of possible threats
  - » Geographical
  - » Accidental, Intentional, Natural, Pandemics, Regulations, Product Malfunctioning, Economical
  - » Financial, Hazardous, Strategic, Operations (GM)
  - » Supply Side, Internal Operations, Customer Side (supply chain view)
  - » ...
- ◆ Sometime you have to distinguish between different levels of a threat
  - » Strong, medium, or mild earthquake
  - » ...

# Risk Assessment Steps: Probabilities of threats

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- ◆ Decide about the assessment method:
  - Quantitative (absolute)
  - Qualitative (relative)
  
- ◆ The probabilities should be evaluated for the same time horizon
  - Annually for example
    - » ART: Annualized Rate of Threat occurrence

# Risk Assessment Steps: Consequences and Impacts

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- ◆ When we want to plan to reduce the probabilities we focus on threats.
- ◆ When we want to plan for impact mitigation or fast recovery, we mostly focus on consequences
- ◆ When you evaluate the monetary values of impacts, you should consider the system as it is. That is, without any investment to
  - prevent or reduce the probability of threats
  - reduce the severity consequences or impacts
  - expedite the recovery process

# Risk management (simplified) steps:

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1. Identifying potential harmful events, their impacts, and their probability of happening
  2. Preventing or reducing the probability of harmful events happening
  3. Reducing the impact of harmful events
  4. Transferring the risk to another party (insurance)
  5. Planning to quickly and efficiently recover from the harmful events
  6. Continuously reviewing the above steps
- The organization's culture and risk-behavior have a great impact on all of these steps