RISK MANAGEMENT

CHAN S. PARK, "CONTEMPORARY ENGINEERING ECONOMICS", 4TH EDITION, PEARSON PRENTICE HALL, 2007.

INTRODUCTION

What is Risks?

What is Risk Management?

Risk Management Steps

- Plan Risk Management
- Identify Risks
- Analyze Risks
- Plan Risk Responses
- Monitor and Control Risks

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WHAT IS

RISK?

RISK APPETITE?

RISK TOLERANCE?

RISK MANAGEMENT?

Risk management can be defined as the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realizations of positive risks

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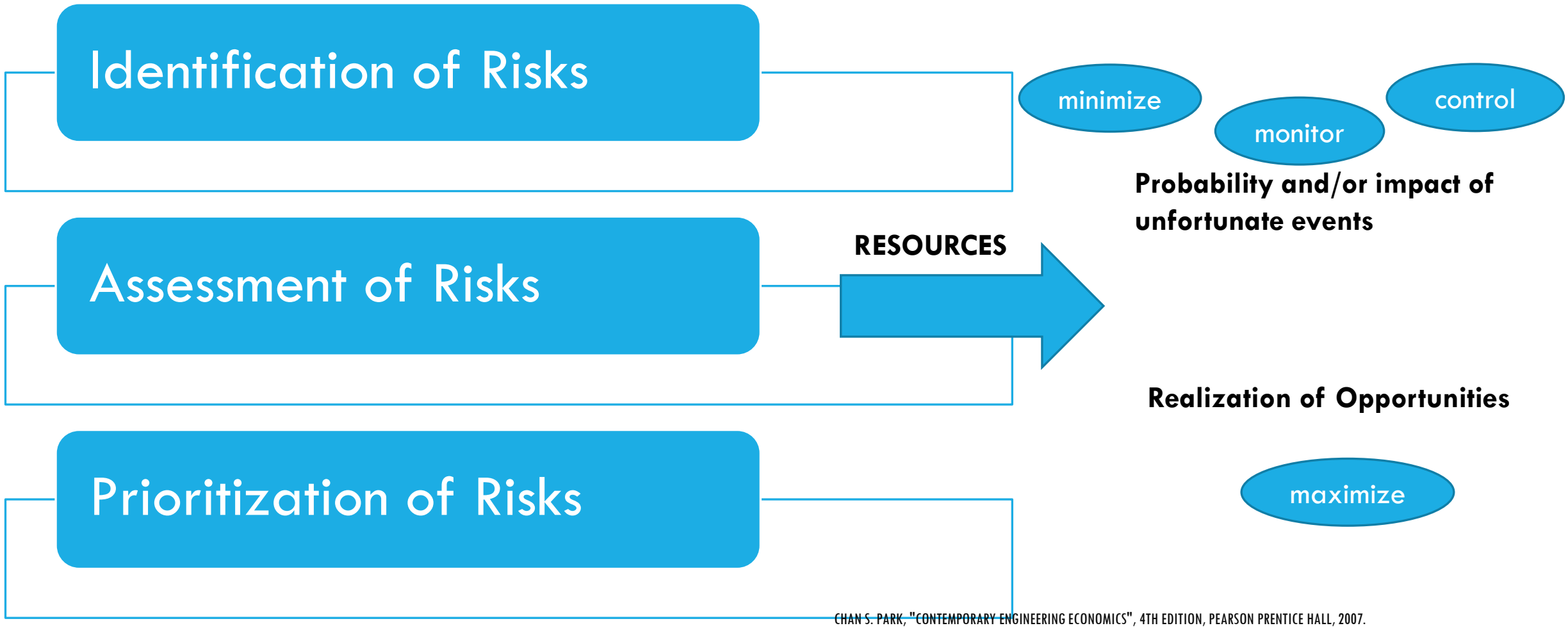
RISK MANAGEMENT



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RISK MANAGEMENT PRINCIPLE

- Create value
- Be an integral part of organization's processes
- Be a part of decision making processes
- Be systematic and structured
- Be transparent
- Be responsive to change
- Be capable of continual improvement and enhancement
- Continually-periodically re-assess

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RISK MANAGEMENT PROCESS

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PLAN RISK MANAGEMENT

- Specifies the management intent, systems and procedures required
- Provide definitions of various risk related terms, roles and responsibilities related to risks, tools and templates
- In a way it specifies how the next four steps in risk management are executed

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IDENTIFY RISKS

- It is the key step in actual management of risks
- Identifying potential risks, their root causes and its consequences
- Group effort- subject matter experts from various groups
- Common tool – brainstorming
- No identified risks will be evaluated or criticized
- Other tools Ishikawa diagram, flow diagram, SWOT analysis

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ANALYZE RISKS

- Limited Resources – there for analyze and prioritize risks
- Some may need Action Plan and few others may require Periodic Monitoring
- It is the process of quantifying the risk events
- Risk analysis – Qualitative or Quantitative
- Qualitative – Subjective- quick and easy to perform (ex. Probability and impact matrix)
- Quantitative is detailed analysis and is not required for all (ex. Expected monetary value analysis, Monte Carlo analysis, Decision trees.

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PROBABILITY AND IMPACT MATRIX

Qualitative analysis tool.

Two aspects **1)** Probability the risk will happen **2)** Potential impact if the risk happens

Risk Score = Probability x Impact

Organization creates guidelines for example

9- Very High – Risk event expected to occur

7- High – Risk event more likely to occur

5- Probable – Risk may or may not occur

3- Low – Less likely to occur

1- Very low – Not expected to occur

Risk may impact- cost, schedule, scope, quality

Fig 1- Sample Impact Table

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RISK RESPONSE

Negative Risk	Positive Risk
Avoid	Exploit
Mitigate	Enhance
Transfer	Share
Accept	Accept

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METHODS OF DESCRIBING PROJECT RISKS

We may analyze project risk by first determining the uncertainty inherent in a project's cash flows.

Simple informal judgements to complex economic and statistical quantities.

1. ***Sensitivity Analysis***
2. ***Breakeven Analysis***
3. ***Scenario Analysis***
4. Probability Techniques – Monte Carlo Simulations and Decision Trees
5. Other approaches of Modelling and Simulations

[1] HANS. PARK, "CONTEMPORARY ENGINEERING ECONOMICS", 4TH EDITION, PEARSON PRENTICE HALL, 2007.

SENSITIVITY ANALYSIS

- Get glean a sense of possible outcomes of investment
- Effect on NPW for variations in the input variables (ex. Revenues, operating costs, salvage value etc.)
- How much NPW will change for a given change in input variable.

Results may imply

- *Some items may have greater influence on final results,*
- *In some cases most significant item may be identified*

For example: 1) Sales volume is always critical or

2) Find items that has significant influence – can be subjected to scrutiny ("What-if" analysis).

It Begins with **Base Case Analysis**

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BREAK-EVEN ANALYSIS (BEA)

- In sensitivity we asks How serious the effect of lower revenues or higher costs
- Sometimes managers may prefer how much sales can decrease below forecast before the project begins to loose money.
- BEA is a technique for studying the effect of variations in output on a firms NPW or other measures.

Here,

- PW of cash flows as a function of unknown variable 'x'.

$$\text{PW of cash inflows} = f(x)_1; \text{ PW of cash outflows} = f(x)_2$$

$$\text{Break-even value (x) implies } f(x)_1 = f(x)_2$$

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SCENARIO ANALYSIS

Sensitivity and Break-even has limitations- Difficult to specify precisely the relationship between particular variable and NPW.

Interdependencies between variables and its effect on NPW is different.

For example Operating costs constant we may vary unit sales for ease in analysis but actual behavior?

Scenario analysis is a technique that **considers the sensitivity of NPW** both to changes in key variables to the **range of likely values.**

For example two extreme case (Worst case scenario and Best case scenario)

EXAMPLE – FOR BREAK-EVEN ANALYSIS

PW of Cash Inflows = PW of Cash Outflows

	0	1	2	3	4	5
Cash inflow:						
Net salvage						37,389
Revenue:						
$X(1 - 0.4)(\$50)$		$30X$	$30X$	$30X$	$30X$	$30X$
Depreciation credit						
0.4 (depreciation)		7,145	12,245	8,745	6,245	2,230
Cash outflow:						
Investment	−125,000					
Variable cost:						
$-X(1 - 0.4)(\$15)$		$-9X$	$-9X$	$-9X$	$-9X$	$-9X$
Fixed cost:						
$-(1 - 0.4)(\$10,000)$		−6,000	−6,000	−6,000	−6,000	−6,000

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EXAMPLES

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PW (15%) Inflows = **(PW of after tax net revenue) + (PW of net salvage value) + (PW of tax savings for depreciation)**

= 30X (P/A, 15%, 5) + 37389 (P/F, 15%, 5) + 7145 (P/F, 15%, 1) + 12245 (P/F, 15%, 2) + 8745 (P/F, 15%, 3) + 6245 (P/F, 15%, 4) + 2230 (P/F, 15%, 5)

= 100.5650X + $44,490

PW (15%) Outflows = **(PW of Capital Expenditure) + (PW of after-tax expenses)**

= 125,000 + (9X + 6000) (P/A, 15%, 5)

= **30.1694X + $145,113**

Now Equate for X,

X = **1,430 units.**

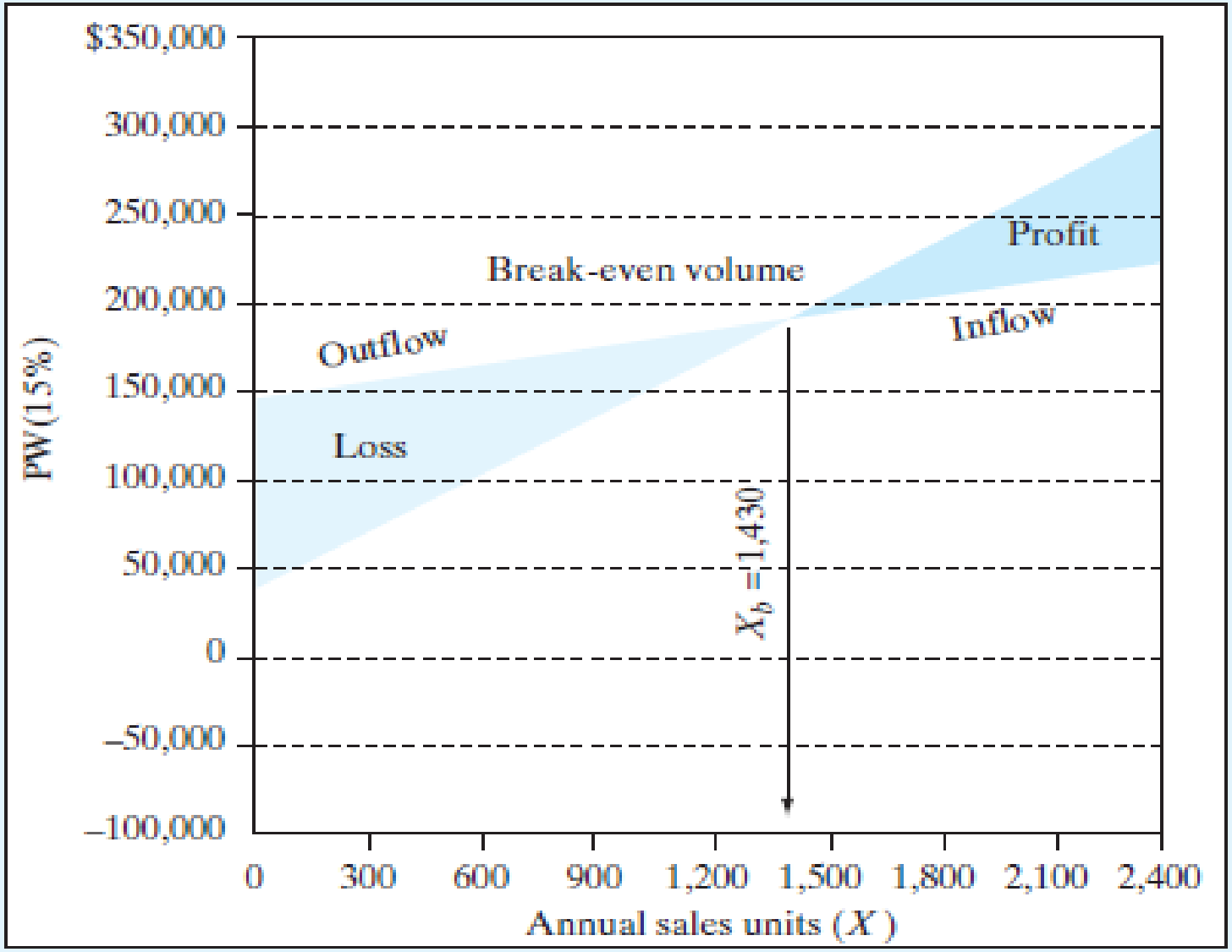

Figure 12.2 Break-even analysis based on net cash flow

SCENARIO ANALYSIS

Variable Considered	Worst-Case Scenario	Most-Likely-Case Scenario	Best-Case Scenario
Unit demand	1,600	2,000	2,400
Unit price ($)	48	50	53
Variable cost ($)	17	15	12
Fixed cost ($)	11,000	10,000	8,000
Salvage value ($)	30,000	40,000	50,000
PW(15%)	−$5,856	$40,169	$104,295

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THANK YOU!!!

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