Risk Management

What is Risk?

A risk is a potential problem – it might happen and it might not

Two characteristics of risk

- **Uncertainty** – the risk may or may not happen, that is, there are no 100% risks

- **Loss** – the risk becomes a reality and unwanted consequences or losses occur

Risk Categorization

1. Project risks
   - They threaten the project plan
   - If they become real, it is likely that the project schedule will slip and that costs will increase
   - Eg:- Requirements are not fixed
2. Technical risks
   - They threaten the quality and timeliness of the software to be produced
   - If they become real, implementation may become difficult or impossible
   - Eg:-Technology will not meet the expectation
3. Business risks
   1. They threaten the viability of the software to be built
   2. Eg:- Delivery Deadline will not meet

Risk Categorization

Sub-categories of Business risks

a) **Market risk** – building an excellent product or system that no one really wants
b) **Strategic risk** – building a product that **no longer fits** into the overall business strategy for the company
c) **Sales risk** – building a product that the sales force doesn't understand how to sell
d) **Management risk** – losing the support of senior management due to a change in focus or a change in people
e) **Budget risk** – losing budgetary or personnel commitment

Risk Strategies

- Reactive risk strategies

"Don't worry, I'll think of something“

Nothing is done about risks until something goes wrong

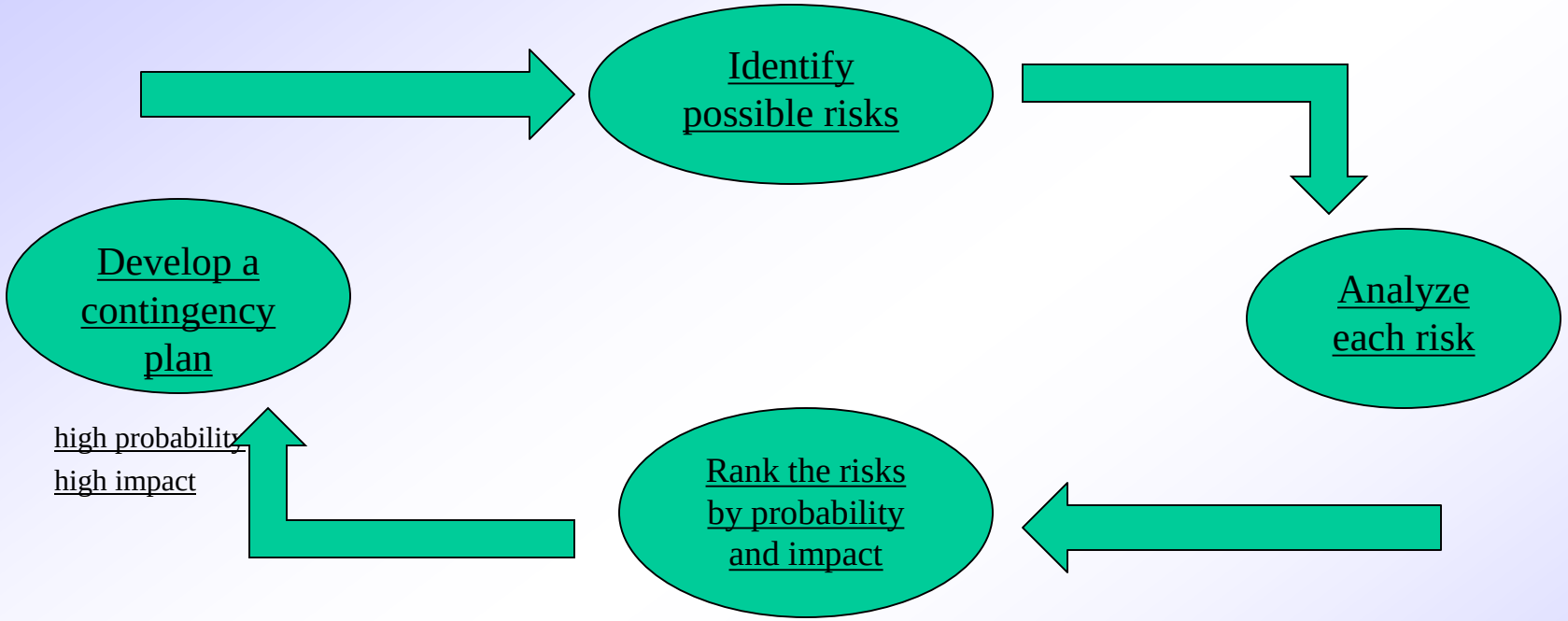
- The team then flies into action in an attempt to correct the problem rapidly (fire fighting approach)

- Proactive risk strategies
  - Primary objective is to avoid risk and to have a contingency plan in place to handle unavoidable risks in a controlled and effective manner

"Risk& Reward"

"Plan for the risk" to earn a "reward"

Steps for Risk Management



Impact may be

negligible,
marginal,
critical,
catastrophic


IDENTIFY
RISK

Background

Generic risks

- Risks that are a potential threat to every software project

Product-specific risks

- Risks that can be identified only by those a with a clear understanding of the technology, the people, and the environment that is specific to the software that is to be built
- This requires examination of the project plan and the statement of scope
- "What special characteristics of this product may threaten our project plan?"

Risk Item Checklist (Risk Categories)

- **Product size** – risks associated with overall size of the software to be built
- **Business impact** – risks associated with constraints imposed by management or the marketplace
- **Customer characteristics** – risks associated with sophistication of the customer and the developer's ability to communicate with the customer in a timely manner
- **Process definition** – risks associated with the degree to which the software process has been defined and is followed
- **Development environment** – risks associated with availability and quality of the tools to be used to build the project
- **Technology to be built** – risks associated with complexity of the system to be built and the "newness" of the technology in the system
- **Staff size and experience** – risks associated with overall technical and project experience of the software engineers who will do the work

Questionnaire on Project Risk

(Questions are ordered by their relative importance to project success)

1) Have top software and customer managers formally committed to support the project?
2) Are end-users enthusiastically committed to the project and the system/product to be built?
3) Are requirements fully understood by the software engineering team and its customers?
4) Have customers been involved fully in the definition of requirements?
5) Do end-users have realistic expectations?
6) Is the project scope stable?

Questionnaire on Project Risk (continued)

7) Does the software engineering team have the right mix of skills?
8) Are project requirements stable?
9) Does the project team have experience with the technology to be implemented?
10) Is the number of people on the project team adequate to do the job?
11) Do all customer/user constituencies agree on the importance of the project and on the requirements for the system/product to be built?

Risk Components and Drivers

- The project manager identifies the risk drivers that affect the following **risk components**
  a) **Performance risk** - the degree of uncertainty that the product will meet its requirements and be fit for its intended use
  b) **Cost risk** - the degree of uncertainty that the project budget will be maintained
  c) **Support risk** - the degree of uncertainty that the resultant software will be easy to correct, adapt, and enhance
  d) **Schedule risk** - the degree of uncertainty that the project schedule will be maintained and that the product will be delivered on time

- The impact of each risk driver on the risk component is divided into one of **four impact levels**
  – **Negligible, marginal, critical, and catastrophic**

Components / Category		Performance	Support	Cost	Schedule
Catastrophic	1	Failure to meet the requirement would result in mission failure		Failure results in increased costs and schedule delays with expected values in excess of $500K	
	2	Significant degradation to nonachievement of technical performance	Nonresponsive or unsupportable software	Significant financial shortages, budget overrun likely	Unachievable IOC
Critical	1	Failure to meet the requirement would degrade system performance to a point where mission success is questionable		Failure results in operational delays and/or increased costs with expected value of $100K to $500K	
	2	Some reduction in technical performance	Minor delays in software modifications	Some shortage of financial resources, possible overruns	Possible slippage in IOC
Marginal	1	Failure to meet the requirement would result in degradation of secondary mission		Costs, impacts, and/or recoverable schedule slips with expected value of $1K to $100K	
	2	Minimal to small reduction in technical performance	Responsive software support	Sufficient financial resources	Realistic, achievable schedule
Negligible	1	Failure to meet the requirement would create inconvenience or nonoperational impact		Error results in minor cost and/or schedule impact with expected value of less than $1K	
	2	No reduction in technical performance	Easily supportable software	Possible budget underrun	Early achievable IOC

Note: [1] The potential consequence of undetected software errors or faults.
[2] The potential consequence if the desired outcome is not achieved.

Risk Projection (Estimation)

Background

- Risk projection (or estimation) attempts to **rate** each risk in two ways
  - The **probability** that the risk is real
  - The **consequence** of the problems associated with the risk, should it occur

Risk Projection/Estimation Steps

1) Establish a scale that reflects the perceived likelihood of a risk (e.g., 1-low, 10-high)
1) Delineate the consequences of the risk
2) Estimate the impact of the risk on the project and product
3) Note the overall accuracy of the risk projection so that there will be no misunderstandings

Contents of a Risk Table

- A risk table provides a project manager with a simple technique for risk projection
- It consists of five columns
  - Risk Summary – short description of the risk
  - Risk Category – one of seven risk categories
  - Probability – estimation of risk occurrence based on group input
  - Impact – (1) catastrophic (2) critical (3) marginal (4) negligible
  - RMMM – Pointer to a paragraph in the Risk Mitigation, Monitoring, and Management Plan

Risk Summary	Risk Category	Probability	Impact (1-4)	RMMM

Developing a Risk Table

- List all risks in the first column (by way of the help of the risk item checklists)
- Mark the category of each risk
- Estimate the probability of each risk occurring
- Assess the impact of each risk based on an averaging of the four risk components to determine an overall impact value
- Sort the rows by probability and impact in descending order
- Draw a horizontal **cutoff line** in the table that indicates the risks that will be given further attention

Risks	Category	Probability	Impact	RMMM
Size estimate may be significantly low	PS	60%	2	
Larger number of users than planned	PS	30%	3	
Less reuse than planned	PS	70%	2	
End-users resist system	BU	40%	3	
Delivery deadline will be tightened	BU	50%	2	
Funding will be lost	CU	40%	1	
Customer will change requirements	PS	80%	2	
Technology will not meet expectations	TE	30%	1	
Lack of training on tools	DE	80%	3	
Staff inexperienced	ST	30%	2	
Staff turnover will be high	ST	60%	2	
•				
•				
•				

Impact values:
1—catastrophic
2—critical
3—marginal
4—negligible

The overall **risk exposure** formula is RE = P x C

- P = the probability of occurrence for a risk
- C = the cost to the project should the risk actually occur

Example

P = 80% probability that 18 of 60 software components will have to be developed

C = Total cost of developing 18 components is $25,000

RE = .80 x $25,000 = $20,000

Risk Mitigation, Monitoring, and Management (RMMM)

RMMM

- An effective strategy for dealing with risk must consider three issues
  (Note: these are not mutually exclusive)
  - Risk mitigation (i.e., avoidance)
  - Risk monitoring
  - Risk management and contingency planning
- **Risk mitigation (avoidance) is the primary strategy and is achieved through a plan**
  - Example: Risk of high staff turnover

RMMM

Strategy for Reducing Staff Turnover

- Meet with current staff to determine causes for turnover (e.g., poor working conditions, low pay, competitive job market)
- Mitigate those causes that are under our control before the project starts
- Once the project commences, assume turnover will occur and develop techniques to ensure continuity when people leave
- Organize project teams so that information about each development activity is widely dispersed
- Define documentation standards and establish mechanisms to ensure that documents are developed in a timely manner
- Conduct peer reviews of all work (so that more than one person is "up to speed")
- Assign a backup staff member for every critical technologist

RMMM

- During **risk monitoring**, the project manager monitors factors that may provide an indication of whether a risk is becoming more or less likely
- **Risk management** and contingency planning assume that mitigation efforts have failed and that the risk has become a reality

Risk information sheet			
Risk ID: P02-4-32	Date: 5/9/02	Prob: 80%	Impact: high

Description:
Only 70 percent of the software components scheduled for reuse will, in fact, be integrated into the application. The remaining functionality will have to be custom developed.

Refinement/context:
Subcondition 1: Certain reusable components were developed by a third party with no knowledge of internal design standards.
Subcondition 2: The design standard for component interfaces has not been solidified and may not conform to certain existing reusable components.
Subcondition 3: Certain reusable components have been implemented in a language that is not supported on the target environment.

Mitigation/monitoring:
1. Contact third party to determine conformance with design standards.
2. Press for interface standards completion; consider component structure when deciding on interface protocol.
3. Check to determine number of components in subcondition 3 category; check to determine if language support can be acquired.

Management/contingency plan/trigger:
RE computed to be $20,200. Allocate this amount within project contingency cost. Develop revised schedule assuming that 18 additional components will have to be custom built; allocate staff accordingly.
Trigger: Mitigation steps unproductive as of 7/1/02

Current status:
5/12/02: Mitigation steps initiated.

Originator: D. Gagne	Assigned: B. Laster


PROCESS
OBJECTIVE
SOLUTION
INDEX
EVENT
BUSINESS
STRATEGY
IDENTIFICATION
COST
EVALUATION
TREATMENT
SCOPE
ANALYSIS
PROBABILITY
RETENTION
METHOD
RISK
OPPORTUNITY
RESOURCE
UNCERTAIN
AVOIDANCE
CONTEXT
SHARING
REDUCTION
KNOWLEDGE
PROJECT
PRIORITIZATION
IMPACT
MONITOR
PLAN
IMPLEMENTATION
ASSESSMENT
MANAGEMENT
STANDARD
CONTROL

THANKS !