UNIVERSITY OF WOLLONGONG IN DUBAI

ECTE250

ENGINEERING DESIGN AND MANAGEMENT 2

Winter 2025 / Spring 2025

Project Management V

Textbook and Readings

Textbook

- Project Management: the Managerial Process, 6th Edition, by Erik W Larson & Clifford F Gray, McGraw Hill
  - Chapter 7

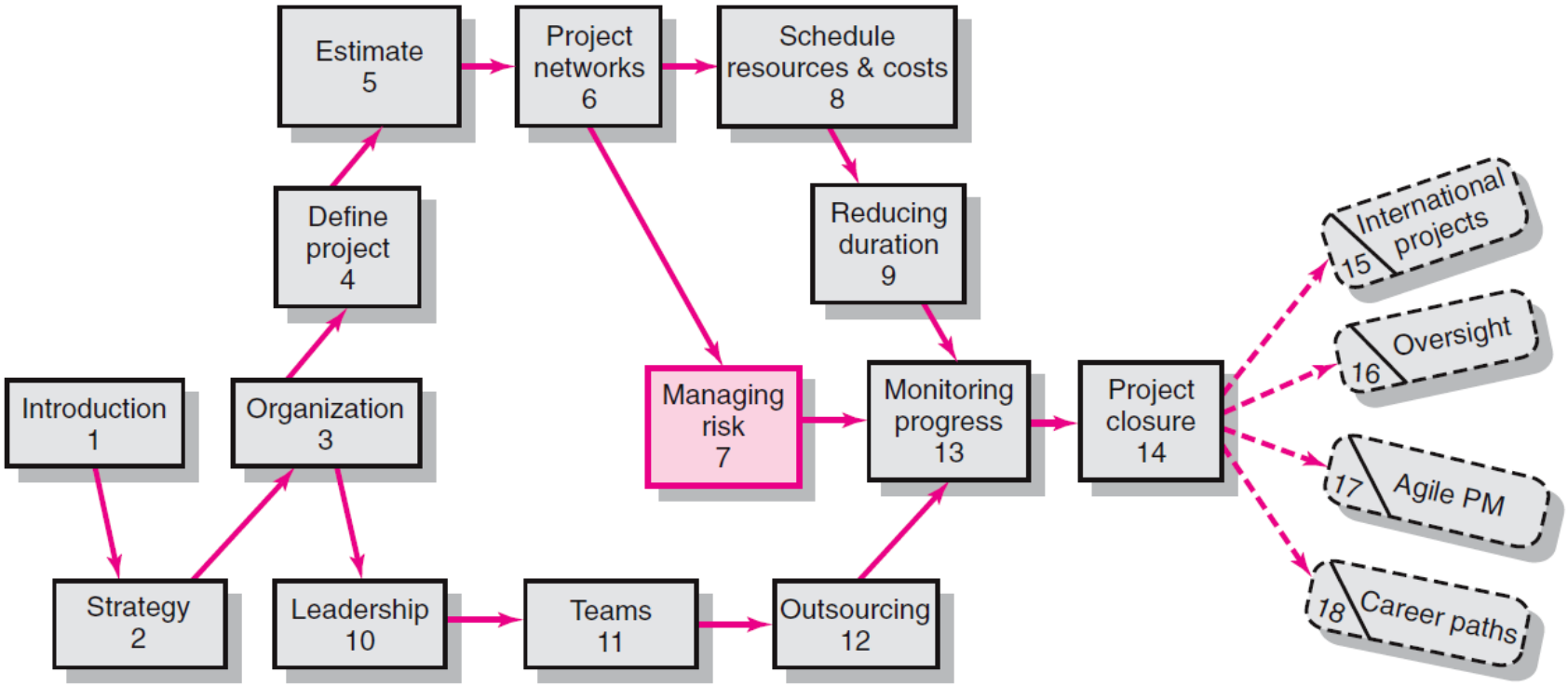
Acknowledgement

- Slides from Project Management: the Managerial Process, by Erik W Larson & Clifford F Gray

Ch. 7

Managing Risk

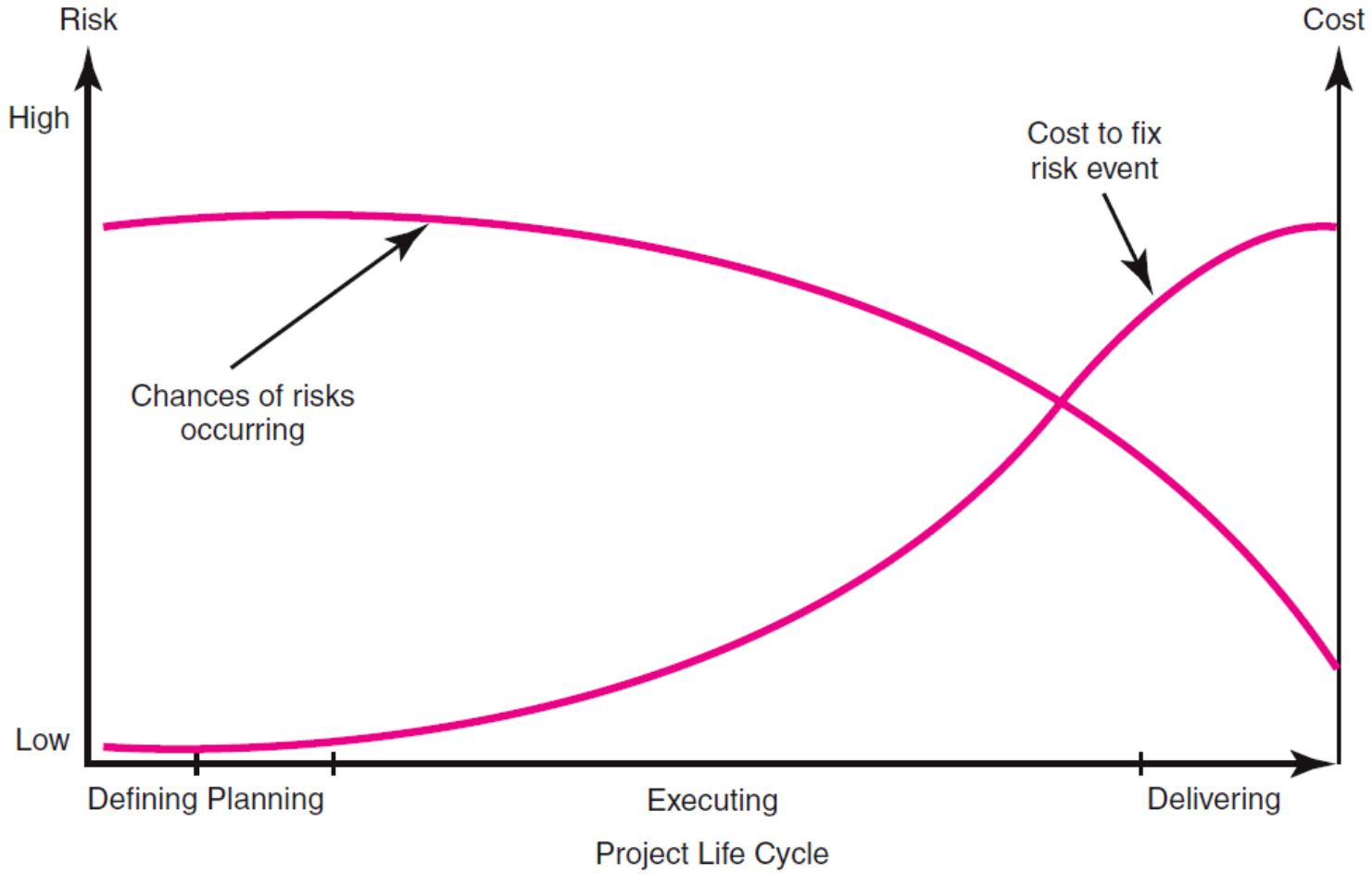
Where We Are Now



Risk Management Process

- Risk
  - Uncertain event or condition that if occurs has a positive or negative effect on project objectives.
- Risk Management
  - A proactive attempt to recognize and manage internal events and external threats that affect the likelihood of a project's success.
    - What can go wrong (risk event).
    - How to minimize the risk event's impact (consequences).
    - What can be done before an event occurs (anticipation).
    - What to do when an event occurs (contingency plans).

The Risk Event Graph



Risk Management's Benefits

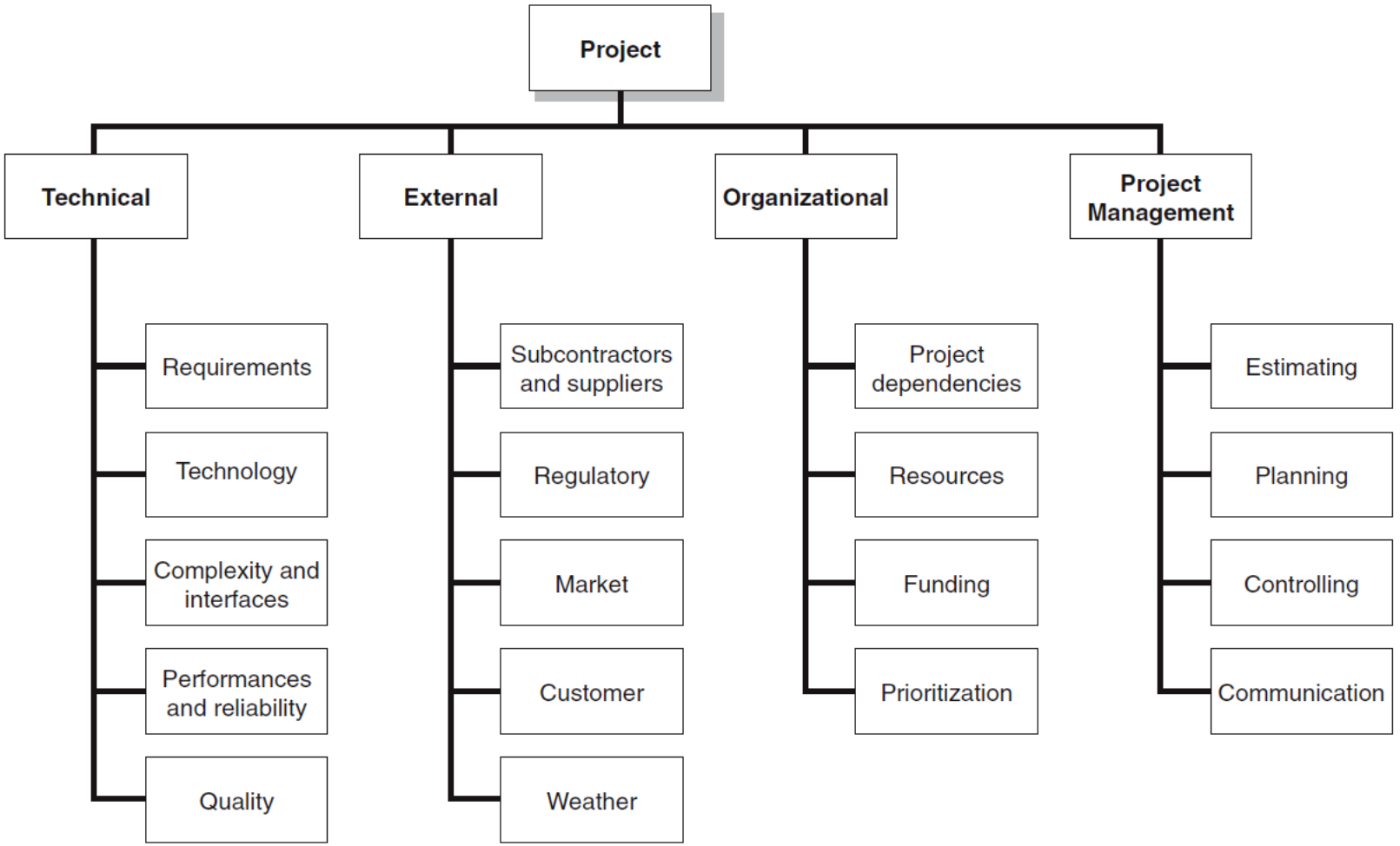
- A proactive rather than reactive approach.
- Reduces surprises and negative consequences.
- Prepares the project manager to take advantage of appropriate risks.
- Provides better control over the future.
- Improves chances of reaching project performance objectives within budget and on time.

The Risk Management Process

Managing Risk

- Step 1: Risk Identification
  - Generate a **list** of possible risks through brainstorming (core team and stakeholders), problem identification and risk profiling.
    - Focus on events rather than objectives
    - Use critical thinking
    - Macro risks first, then specific events
    - Use WBS (and different teams) to develop RBS (risk breakdown structure) or Risk Profile (list of questions) – project specific.

The Risk Breakdown Structure (RBS)



Partial Risk Profile for Product Development Project

Technical Requirements

Are the requirements stable?

Design

Does the design depend on unrealistic or optimistic assumptions?

Testing

Will testing equipment be available when needed?

Development

Is the development process supported by a compatible set of procedures, methods, and tools?

Schedule

Is the schedule dependent upon the completion of other projects?

Budget

How reliable are the cost estimates?

Quality

Are quality considerations built into the design?

Management

Do people know who has authority for what?

Work Environment

Do people work cooperatively across functional boundaries?

Staffing

Is staff inexperienced or understaffed?

Customer

Does the customer understand what it will take to complete the project?

Contractors

Are there any ambiguities in contractor task definitions?

Historical Records can be useful as well

Managing Risk

- Step 2: Risk Assessment
  - Not all risk from the list (step 1) deserve attention:
    - Scenario analysis for event **probability** and **impact**
  - Use a tool to prioritize risk to be addressed
    - Risk assessment matrix
    - Failure Mode and Effects Analysis (FMEA)
    - Probability analysis
      - Decision trees, NPV, and PERT
    - Semi-quantitative scenario analysis

Defined Conditions for Impact Scales of a Risk on Major Project Objectives (Examples for negative impacts only)

Relative or Numerical Scale					
Project Objective	1 Very Low	2 Low	3 Moderate	4 High	5 Very High
Cost	Insignificant cost increase	< 10% cost increase	10–20% cost increase	20–40% cost increase	> 40% cost increase
Time	Insignificant time increase	< 5% time increase	5–10% time increase	10–20% time increase	> 20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless

Risk Assessment Form

Example Major OS Upgrade in Company PCs

Risk Event	Likelihood	Impact	Detection Difficulty	When
Interface problems	4	4	4	Conversion
System freezing	2	5	5	Start-up
User backlash	4	3	3	Postinstallation
Hardware malfunctioning	1	5	5	Installation

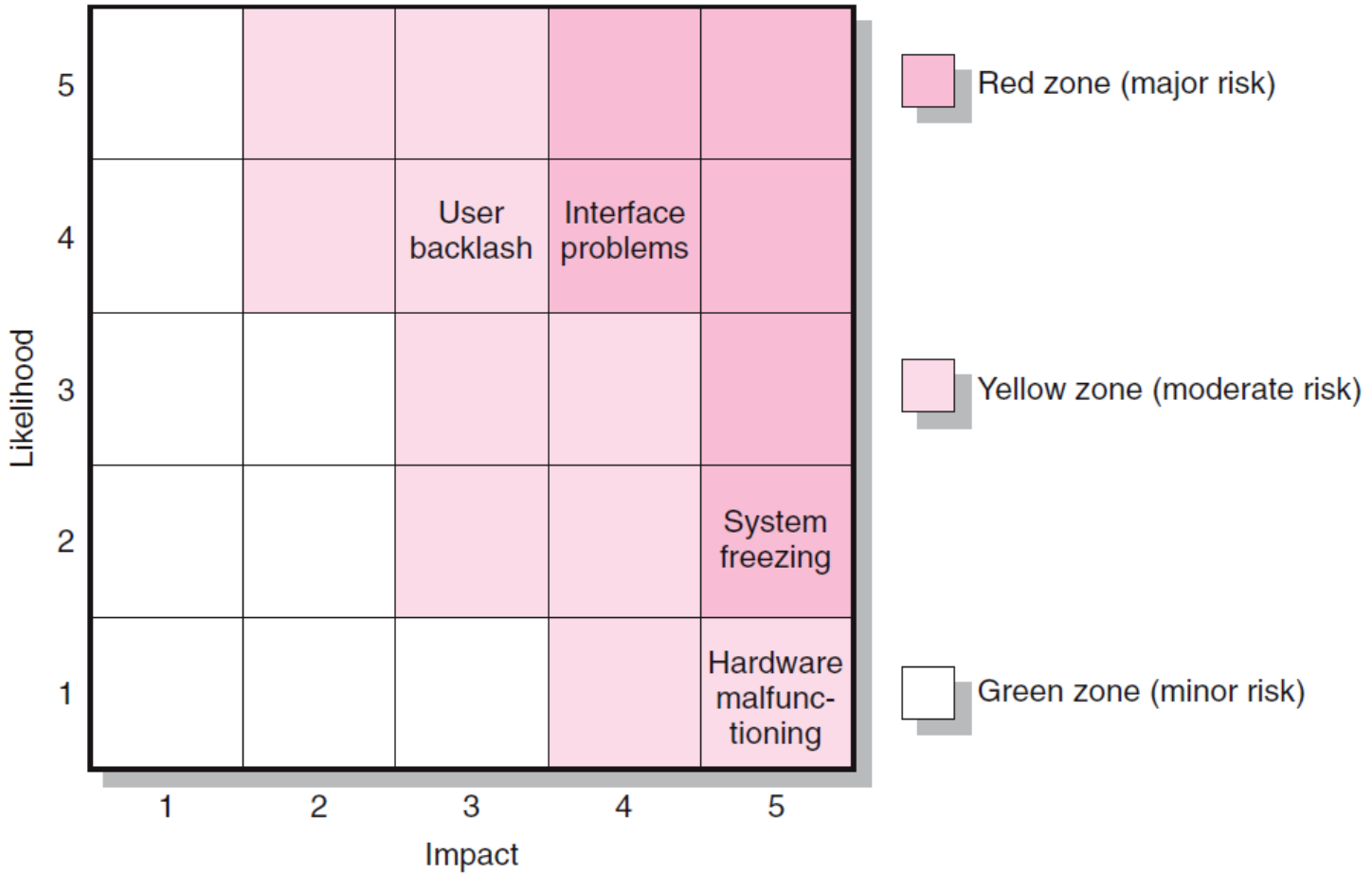
Failure Mode and Effects Analysis (FMEA)

Impact × Probability × Detection = Risk Value

Risk Severity Matrix

Failure Mode and Effects Analysis (FMEA)

Impact × Probability × Detection = Risk Value



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Priority on Impact than Likelihood

Managing Risk (cont'd)

- Step 3: Risk Response Development
  - Mitigating Risk
    - Reducing the likelihood (preferred) an adverse event will occur (testing and prototyping).
    - Reducing impact of adverse event.
  - Avoiding Risk
    - Changing the project plan to eliminate the risk or condition.
  - Transferring Risk
    - Paying a premium to pass the risk to another party (fixed-price contract, insurance).
    - Requiring Build-Own-Operate-Transfer (BOOT) provisions.
  - Retaining Risk
    - Making a conscious decision to accept the risk and have a contingency plan.

Contingency Planning

- Contingency Plan
  - An alternative plan that will be used if a possible foreseen risk event actually occurs.
    - what/where/when to execute if the risk event happens.
  - A plan of actions that will reduce or mitigate the negative impact (consequences) of a risk event.
- Risks of Not Having a Contingency Plan
  - Having no plan may slow managerial response.
  - Decisions made under pressure can be potentially dangerous and costly.

Risk Response Matrix

Risk Event	Response	Contingency Plan	Trigger	Who Is Responsible
Interface problems	Mitigate: Test prototype	Work around until help comes	Not solved within 24 hours	Nils
System freezing	Mitigate: Test prototype	Reinstall OS	Still frozen after one hour	Emmylou
User backlash	Mitigate: Prototype demonstration	Increase staff support	Call from top management	Eddie
Equipment malfunctions	Mitigate: Select reliable vendor Transfer: Warranty	Order replacement	Equipment fails	Jim

Risk and Contingency Planning

- Technical Risks
  - Can cause project to shut down.
  - Backup strategies if chosen technology fails.
  - Assessing whether technical uncertainties can be resolved.
- Schedule Risks
  - Use of slack increases the risk of a late project finish.
  - Imposed duration dates (absolute project finish date)
  - Use contingency funds to “crash” (expedite) the project to get it back on track (i.e. handle a shortened project duration).

Risk and Contingency Planning (cont'd)

- Costs Risks
  - Prices may change (upwards) during long projects, accurate estimation is essential (inflation on individual items).
  - Time/cost dependency links: costs increase when problems take longer to solve than expected.
  - Price protection risks (a rise in input costs) increase if the duration of a project is increased.
- Funding Risks
  - Changes in the supply of funds for the project can dramatically affect the likelihood of implementation or successful completion of a project.

Opportunity Management Tactics

- Focus on what can go right, i.e. an **Opportunity** (event with positive impact)
  - Speed up, drop prices, increase profit, etc..
- Exploit
  - Seeking to eliminate the uncertainty associated with an opportunity to ensure that it definitely happens.
- Share
  - Allocating some or all of the ownership of an opportunity to another party who is best able to capture the opportunity for the benefit of the project.
- Enhance
  - Taking action to increase the probability and/or the positive impact of an opportunity.
- Accept
  - Being willing to take advantage of an opportunity if it occurs, but not taking action to pursue it.

Contingency Funding and Time Buffers

- Contingency Funds
  - Funds to cover project risks, both identified and unknown.
    - Size of funds reflects overall risk of a project (1 to 10% if similar to past projects, 20 to 60% in high tech projects)
  - Budget reserves
    - Are linked to the identified risks, associated with specific work packages or project segments.
  - Management reserves
    - Are large funds to be used to cover major unforeseen risks (e.g., change in project scope), applied to the total project.
- Time Buffers
  - Amounts of time used to compensate for unplanned delays in the project schedule. Time is added to:
    - Severe risk, merge, noncritical, and scarce resource activities

Contingency Fund Estimate ($000s)

Activity	Budget Baseline	Budget Reserve	Project Budget
Design	$500	$15	$515
Code	900	80	980
Test	20	2	22
Subtotal	$1,420	$97	$1,517
Management reserve	—	—	50
Total	$1,420	$97	$1,567

Managing Risk (cont'd)

- Steps 1 to 3 outcomes integrated in risk register

- Step 4: Risk Response Control
  - PM monitors project progress and risk
  - PM establish an environment in which is comfortable to raise concerns and admit mistakes
  - Document responsibilities (who is responsible to identify risks)
  - The entire project team must be vigilant!
  - Risk assessment is part of the working agenda

Managing Risk (cont'd)

- Step 4: Risk Response Control
  - Risk control
    - Execution of the risk response strategy
    - Monitoring of triggering events
    - Initiating contingency plans
    - Watching for new risks
  - Establishing a Change Management System
    - Monitoring, tracking, and reporting risk
    - Fostering an open organization environment
    - Repeating risk identification/assessment exercises
    - Assigning and documenting responsibility for managing risk

Change Management Control

- All project detail will not materialize as expected/planned

- Sources of Change
  1. Project scope changes (customer request)
  2. Implementation of contingency plans (risk)
  3. Improvement changes (team)

Change Control System Process

1. Identify proposed changes.
2. List expected effects of proposed changes on schedule and budget.
3. Review, evaluate, and approve or disapprove of changes formally.
4. Negotiate and resolve conflicts of change, condition, and cost.
5. Communicate changes to parties affected.
6. Assign responsibility for implementing change.
7. Adjust master schedule and budget.
8. Track all changes that are to be implemented

The Change Control Process

Benefits of a Change Control System

1. Inconsequential changes are discouraged by the formal process.
2. Costs of changes are maintained in a log.
3. Integrity of the WBS and performance measures is maintained.
4. Allocation and use of budget and management reserve funds are tracked.
5. Responsibility for implementation is clarified.
6. Effect of changes is visible to all parties involved.
7. Implementation of change is monitored.
8. Scope changes will be quickly reflected in baseline and performance measures.

Sample Change Request Form

Project name *Irish/Chinese culture exchange*
Project sponsor *Irish embassy*
Request number *12*
Date *June 6, 2xxx*
Originator *Jennifer McDonald*
Change requested by *Chinese culture office*

Description of requested change

1. *Request river dancers to replace small Irish dance group.*
2. *Request one combination dance with river dancers and China ballet group.*

Reason for change

River dancers will enhance stature of event. The group is well known and loved by Chinese people.

Areas of impact of proposed change–describe each on separate sheet

☒ Scope ☒ Cost ☐ Other _____
☐ Schedule ☐ Risk

Disposition	Priority	Funding Source
☐ Approve	☐ Emergency	☐ Mgmt. reserve
☒ Approve as amended	☒ Urgent	☐ Budget reserve
☐ Disapprove	☐ Low	☒ Customer
☐ Deferred		☐ Other

Sign-off Approvals

Project manager *William O'Mally* Date *June 12, 2xxx*
Project sponsor *Kenneth Thompson* Date *June 13, 2xxx*
Project customer *Hong Lee* Date *June 18, 2xxx*
Other _____ Date _____

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Change Request Log

Owner Requested Change Status Report—Open Items — **Osu—Weatherford**

Rc#	Description	Reference Document	Dates		Amount	Status	Comments
			Date Rec'd	Date Submit			
51	Sewer work offset				–188,129	OPEN	FUNDING FROM OTHER SOURCE
52	Stainless Plates at restroom Shower Valves	ASI 56	1/5/2008	3/30/2008	9,308	APPROVED	
53	Waterproofing Options	ASI 77	1/13/2008		169,386	OPEN	
54	Change Electrical floor box spec change	RFI 113	12/5/2008	3/29/2008	2,544	SUBMIT	
55	VE Option for Style and rail doors	Door samples	1/14/2008		–20,000	ROM	
56	Pressure Wash C tower	Owner request	3/15/2008	3/30/2008	14,861	SUBMIT	
57	Fire Lite glass in stairs	Owner request			8,000	QUOTE	ROM BASED ON FIRELITE NT
58	Cyber Café added tele/OFOI equipment	ASI 65	1/30/2008	3/29/2008	4,628	APPROVED	
59	Additional Dampers in C wing	ASI 68	2/4/2008	3/29/2008	1,085	SUBMIT	
60	Revise Corridor ceilings	ASI 72	2/13/2008	3/31/2008	–3,755	SUBMIT	

OPEN—Requires estimate
ROM—Rough order magnitde
QUOTE—Subcontractor quotes

SUBMIT—RC letter submitted
APPROVED—RC letter approved
REVISE—RC letter to be reviewed

ASI—Architect's supplemental instructions
RFI—Request for information

Key Terms

Avoiding risk

Budget reserve

Change management system

Contingency plan

Management reserve

Mitigating risk

Opportunity

Risk

Risk breakdown structure (RBS)

Risk register

Risk profile

Risk severity matrix

Scenario analysis

Sharing risk

Time buffer

Transferring risk

Design

John Maeda on Design, Business, and Inclusion

- From LinkedIN LEARNING
- https://www.linkedin.com/learning/john-maeda-on-design-business-and-inclusion/welcome

- https://www.lynda.com/Business-Skills-tutorials/Defining-design/543904/574440-4.html
- https://www.ted.com/talks/john_maeda_how_art_technology_and_design_inform_creative_leaders#t-921899
- https://www.ted.com/talks/john_maeda_on_the_simple_life#t-143462

Design For Changing Behavior

- https://en.wikipedia.org/wiki/Design_for_behaviour_change

- The Fun Theory
  - https://www.youtube.com/watch?v=SByymar3bds
  - https://www.youtube.com/watch?v=qRgWttqFKu8
  - https://www.youtube.com/watch?v=bHLgSfxz6bQ
  - https://www.youtube.com/watch?v=zCt_MzsnlUk