



# THE HARD PATH FOR THE TECHNOLOGICAL TRANSFORMATION

05 May– 12 May 2023

«Basic Project Management»

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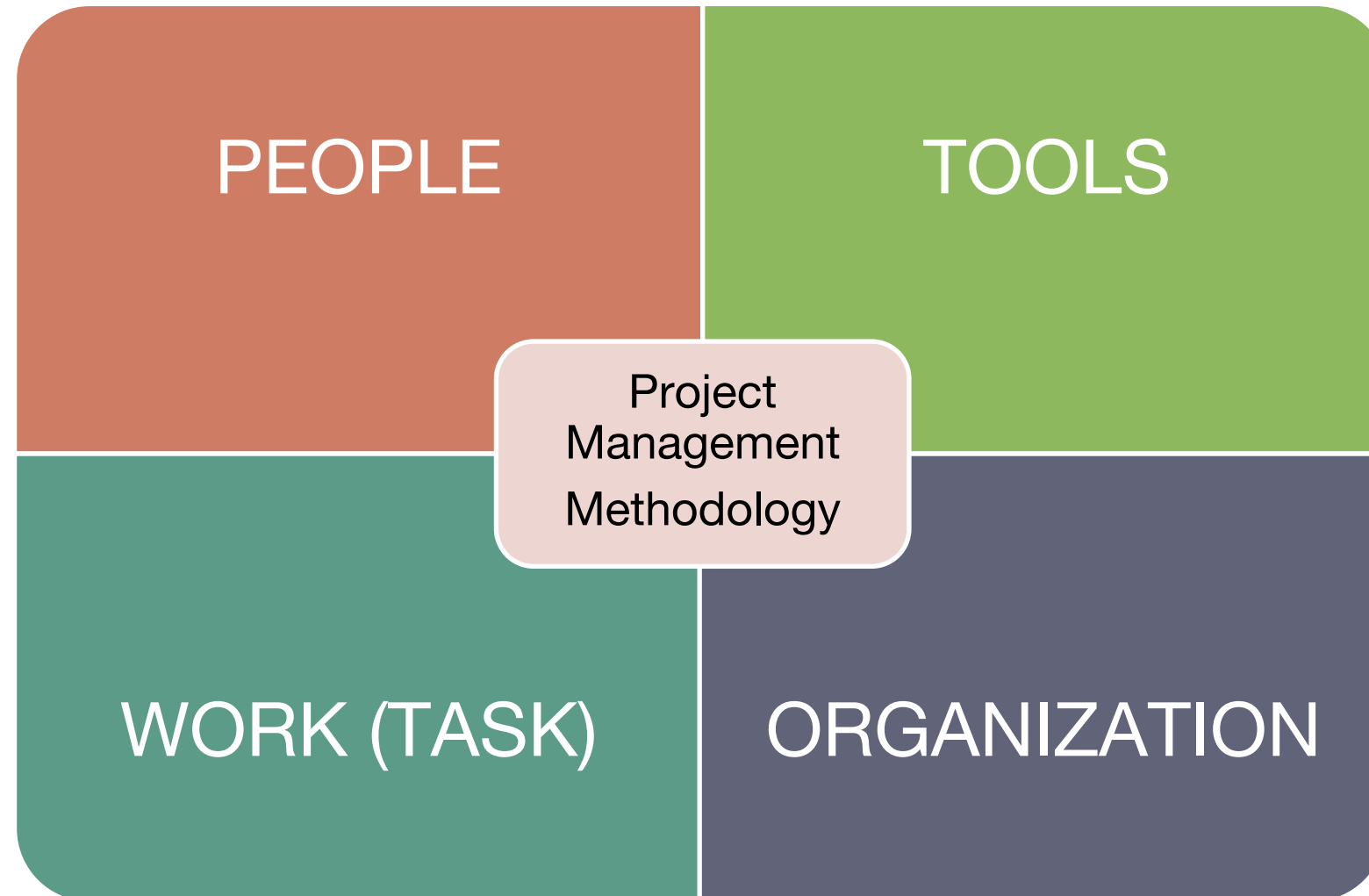
# MODULE OVERVIEW

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# PROJECT MANAGEMENT METHODOLOGY

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# What is a **Project** ?

# USEFUL DEFINITIONS

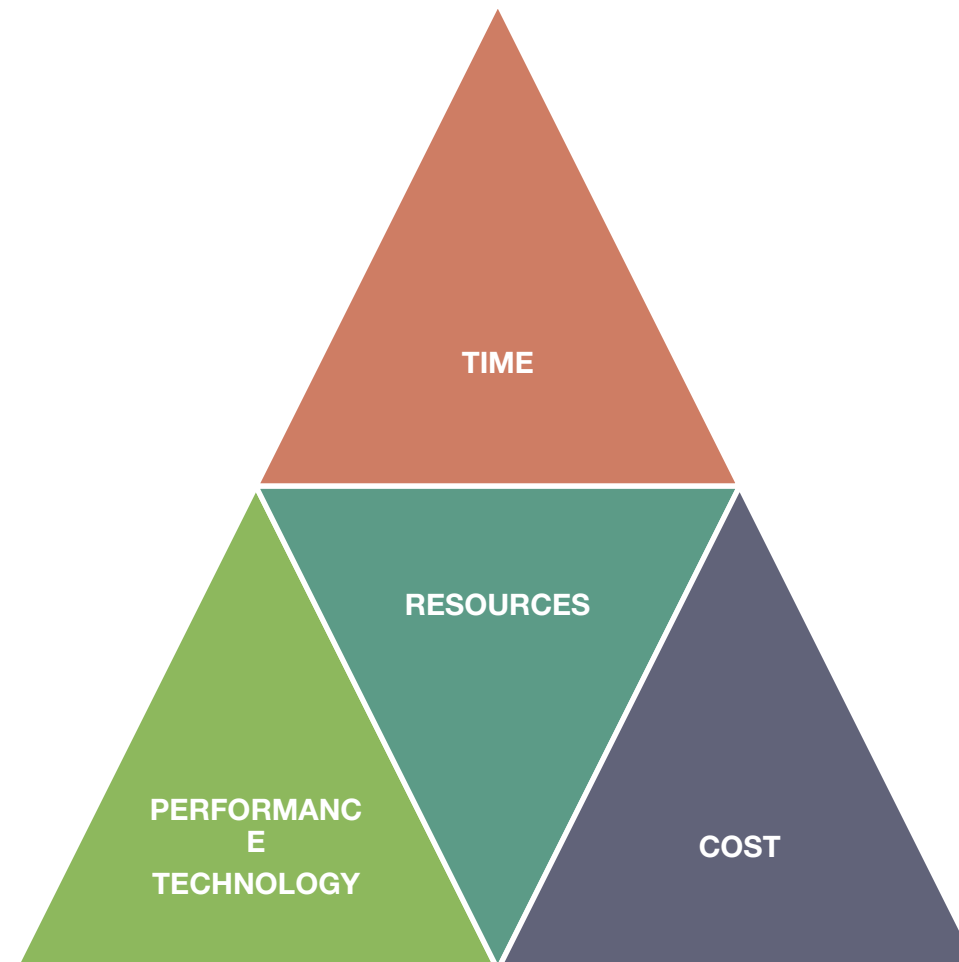
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- Projects are unique, transient endeavours undertaken to achieve a desired outcome.
- A project is a temporary endeavour undertaken to create a unique product or service.
- A unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organization to meet specific performance objectives with defined schedule, cost and performance parameters.
- A temporary organization that is needed to produce a unique and predefined outcome or result at a given time using predetermined resources.

# PROJECT PARAMETERS

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\* Within Good Customer Relations





# VOLUME vs VARIETY & PROJECTS

A basic classification of **processes** considers **volume** and **variety**.

The traditional **PM** area is **low-volume**, **high-variety** processes.



# VOLUME vs VARIETY & PROJECTS

## First-timers

Unique

Allure of the complex, difficult and risky

Need highly skilled project managers

## 'as...buts'

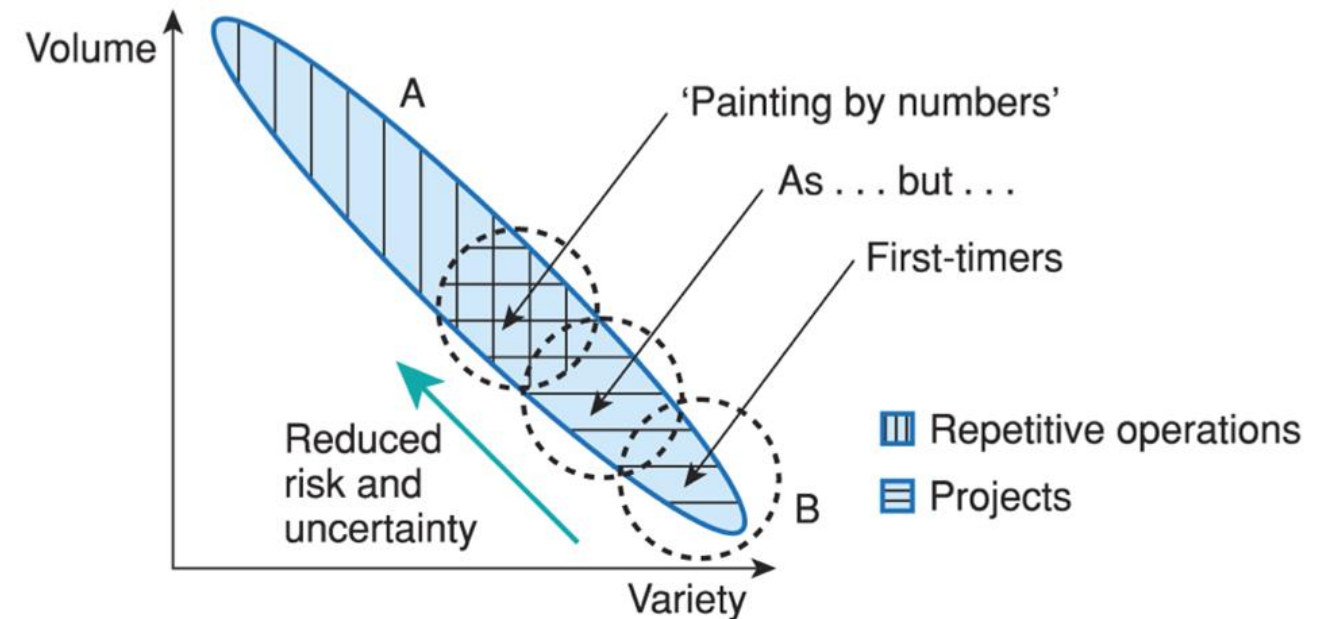
Similar to previous work in terms of either process followed or product delivered

Decrease in risk and uncertainty

## Painting by numbers

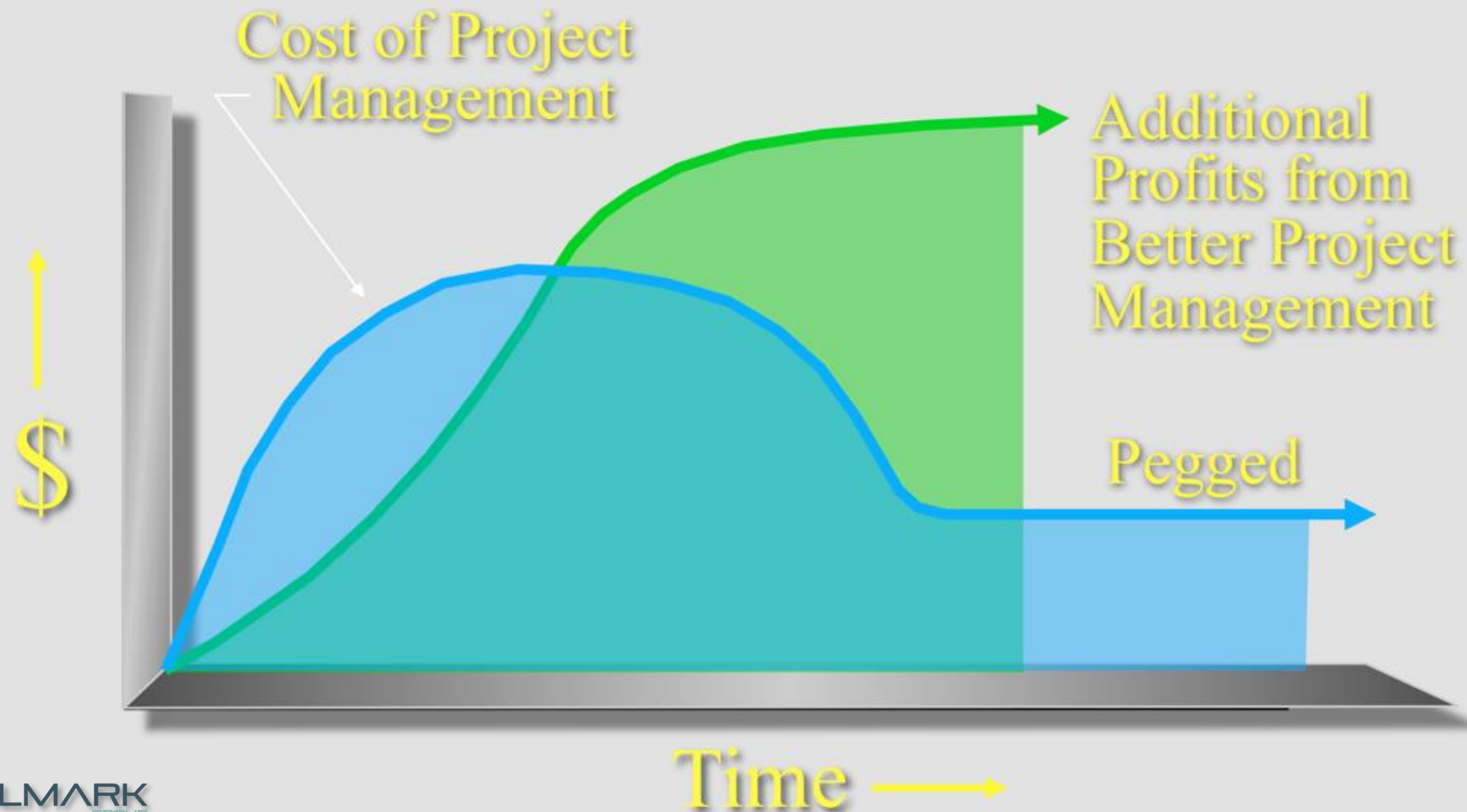
Process and outcomes are well known

Even less risk and uncertainty



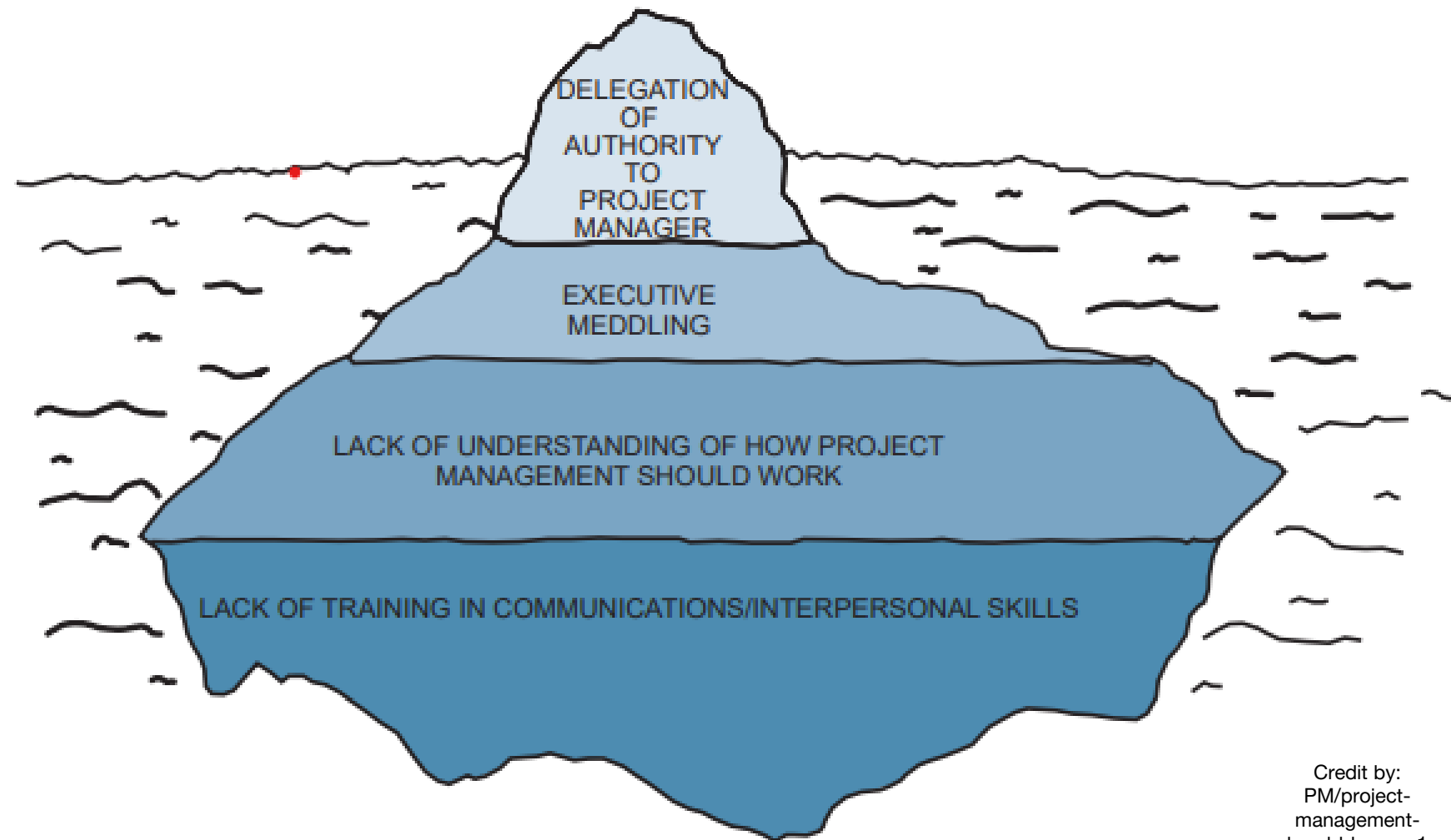


# PROJECT MANAGEMENT COSTS VS BENEFITS



# THE ICEBERG SYNDROME

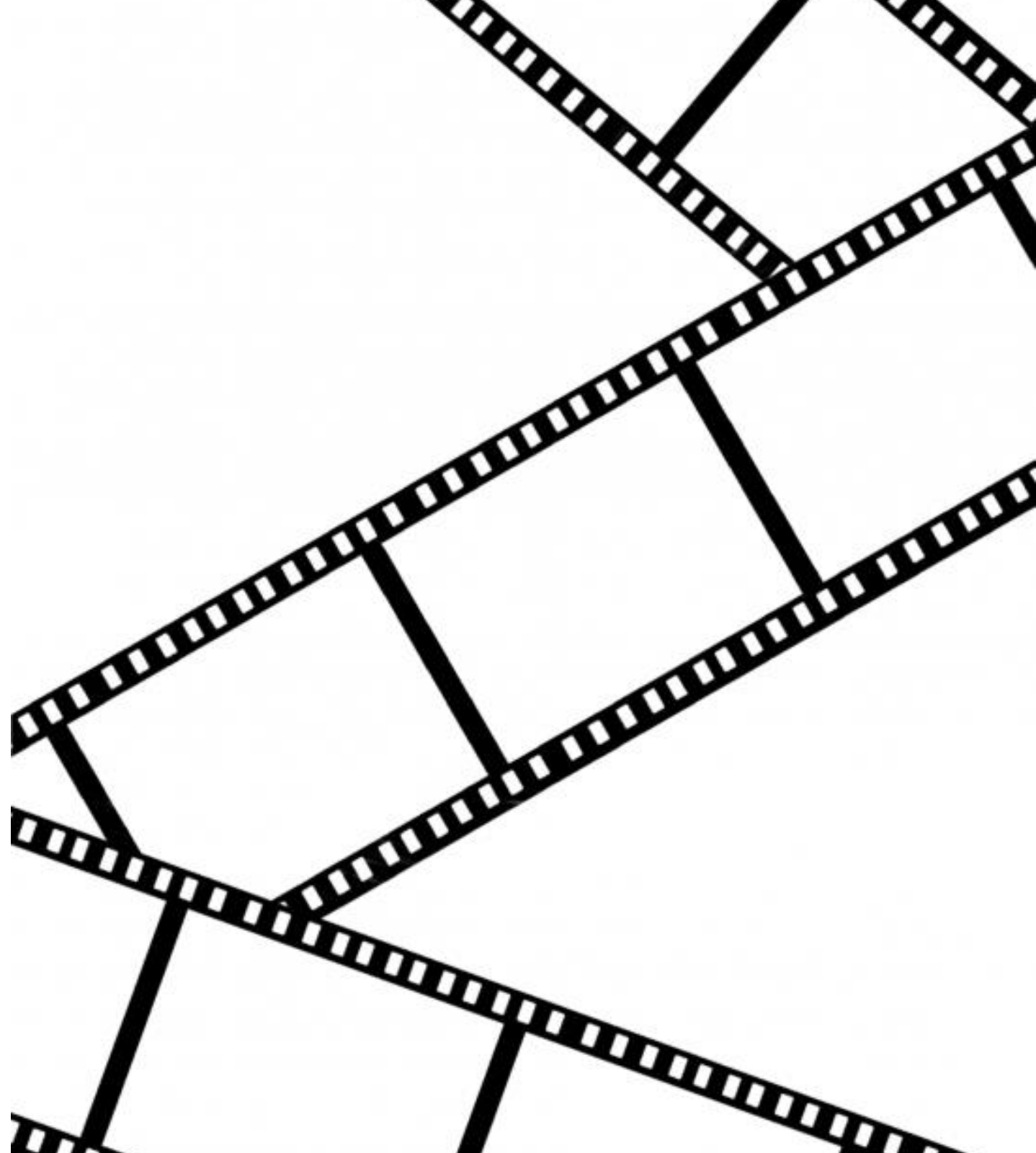
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Credit by:  
PM/project-  
management-  
harold-kerzner1

# FRAMEWORKS FOR DESCRIBING THE PROJECT CONTEXT

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# THE 7-S FRAMEWORK

<i>Element</i>	<i>Description</i>
<b>Strategy</b>	The high-level requirements of the project and the means to achieve them
<b>Structure</b>	The organisational arrangement that will be used to carry out the project
<b>Systems</b>	The methods for work to be designed, monitored and controlled
<b>Staff</b>	The selection, recruitment, management and leadership of those working on the project
<b>Skills</b>	The managerial and technical tools available to the project manager and the staff, and how these are developed
<b>Style/culture</b>	The underlying way of working and inter-relating within the work team or organisation
<b>Stakeholders</b>	Individuals and groups with an interest in the project process or outcome

# ORGANIZATIONAL STRUCTURES

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# INTRODUCTION

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Organizational structures are dictated by such factors as:

- technology and its rate of change,
- complexity,
- resource availability,
- products and/or services,
- competition, and
- decision-making requirements.

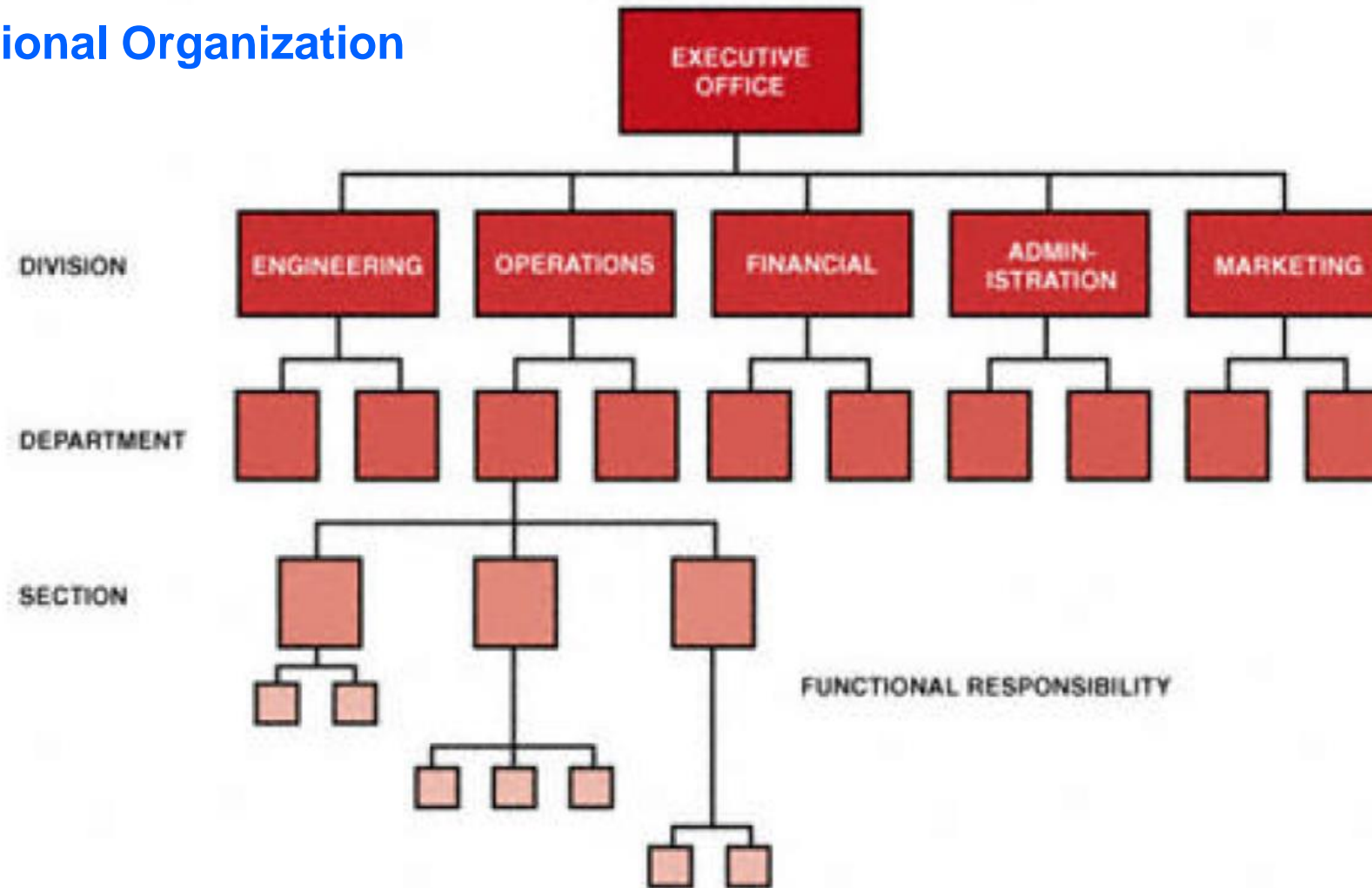
It's important to keep in mind that there is no such thing as a good or bad organizational structure:

THERE ARE ONLY APPROPRIATE OR INAPPROPRIATE ONES



# THE TRADITIONAL ORGANIZATION

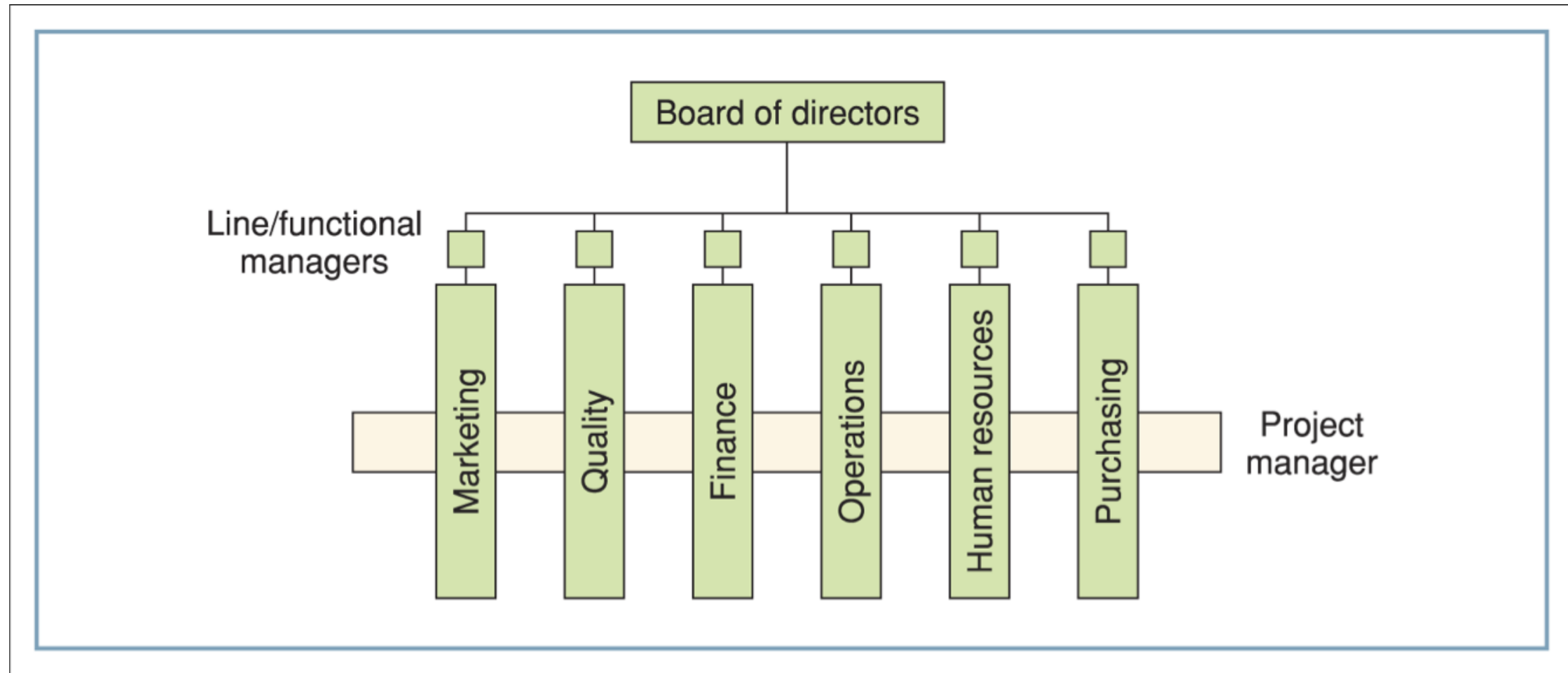
## The Functional Organization



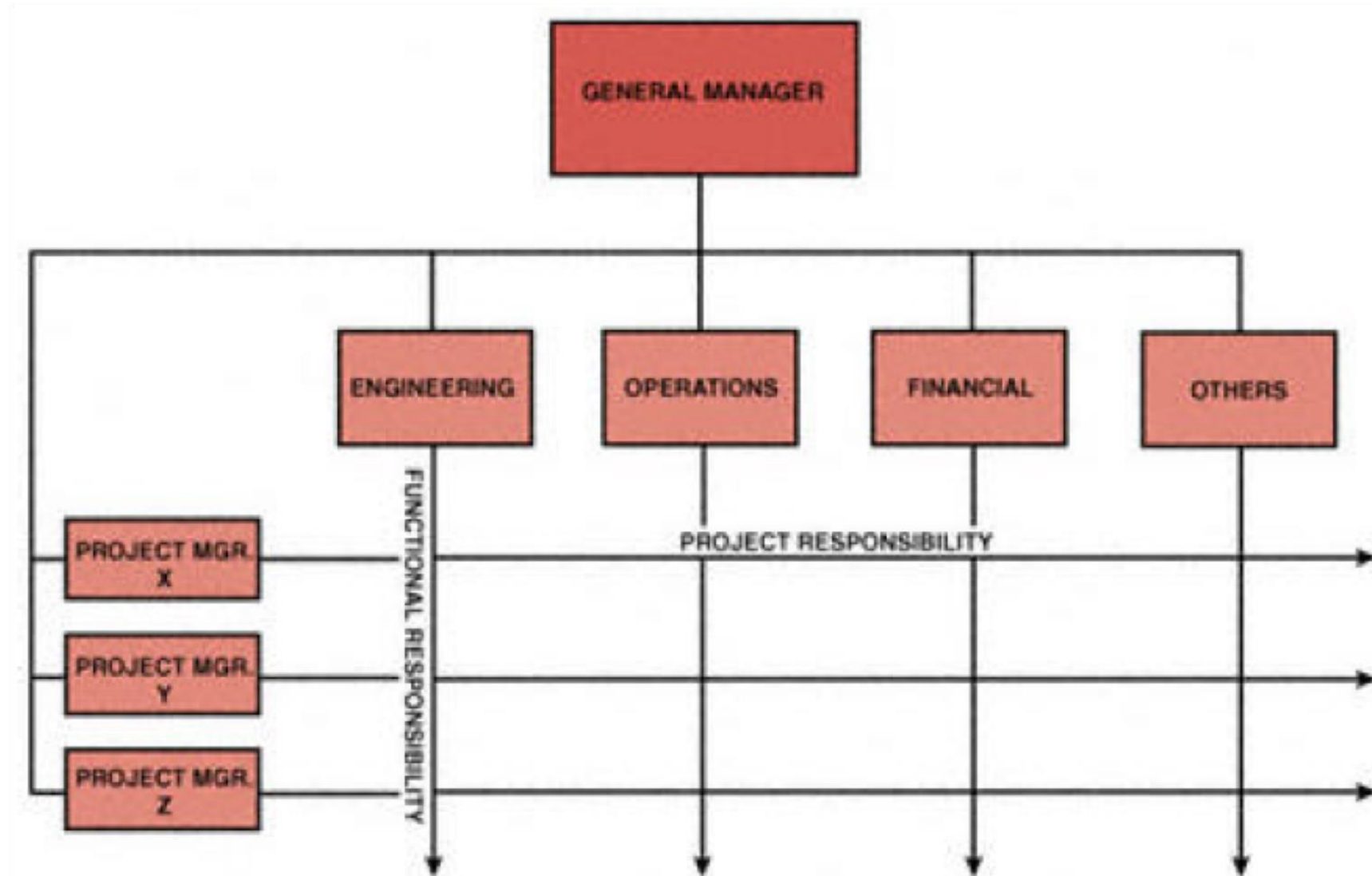
**DAMN .... we need project managers!**

**Where we place them in the organization?**

# PM vs LINE MANAGEMENT



# THE PM MATRIX



# THE MATRIX ORGANIZATIONAL FORM - RESOURCES

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## Resources

- Money
- Human Resources
- Tools and Machineries
- Infrastructures
- Materials
- Hardware and Software

Typically, PMs do not control any of these resources directly !

- Resources are controlled by FMs.
- PMs have to negotiate for all resources.

A good PM organization relies on:

- A good relation between PMs and FMs.

Capabilities of employees to respond both to PMs and FMs

# PEOPLE

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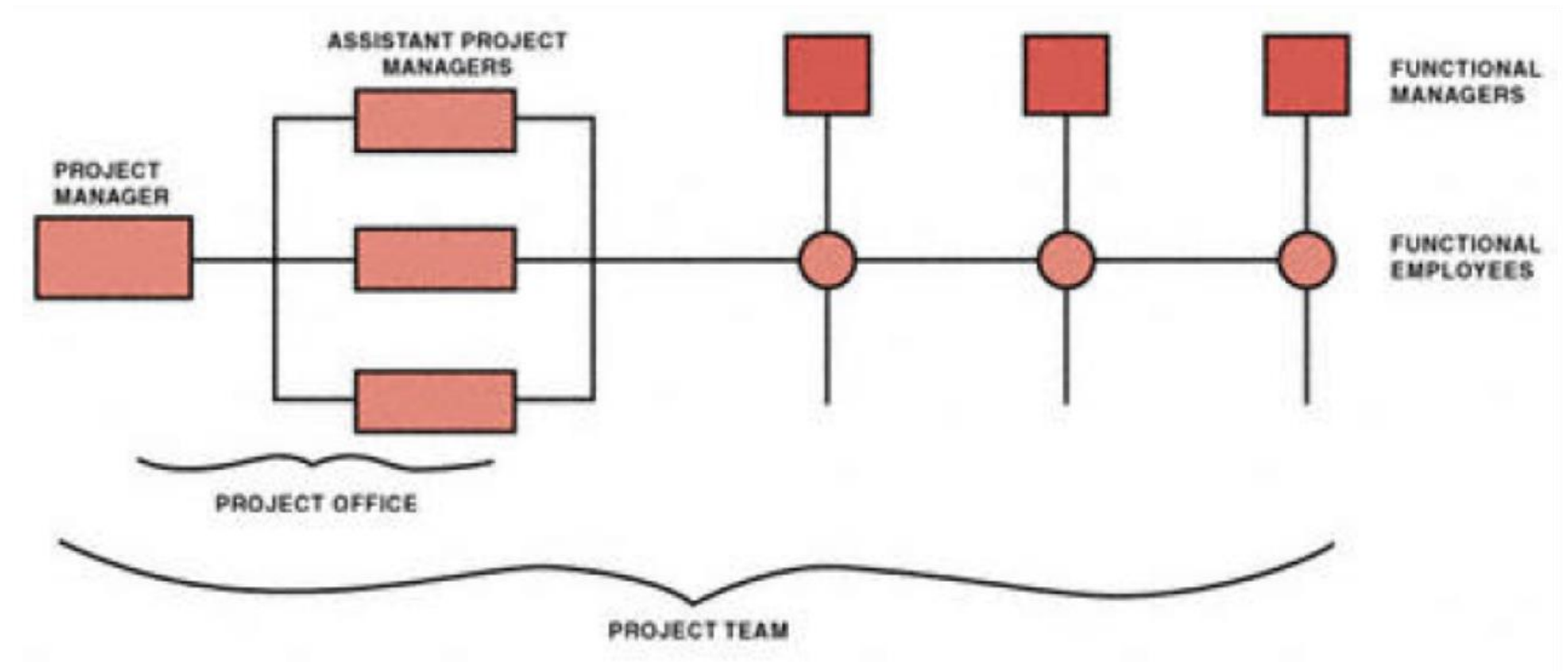


# PEOPLE INVOLVED IN PROJECTS

Project management is not a one-person operation; it requires **a group of individuals dedicated to the achievement of a specific goal.**

Project management includes:

- A project manager
- An assistant project manager
- A project (home) office
- A project team



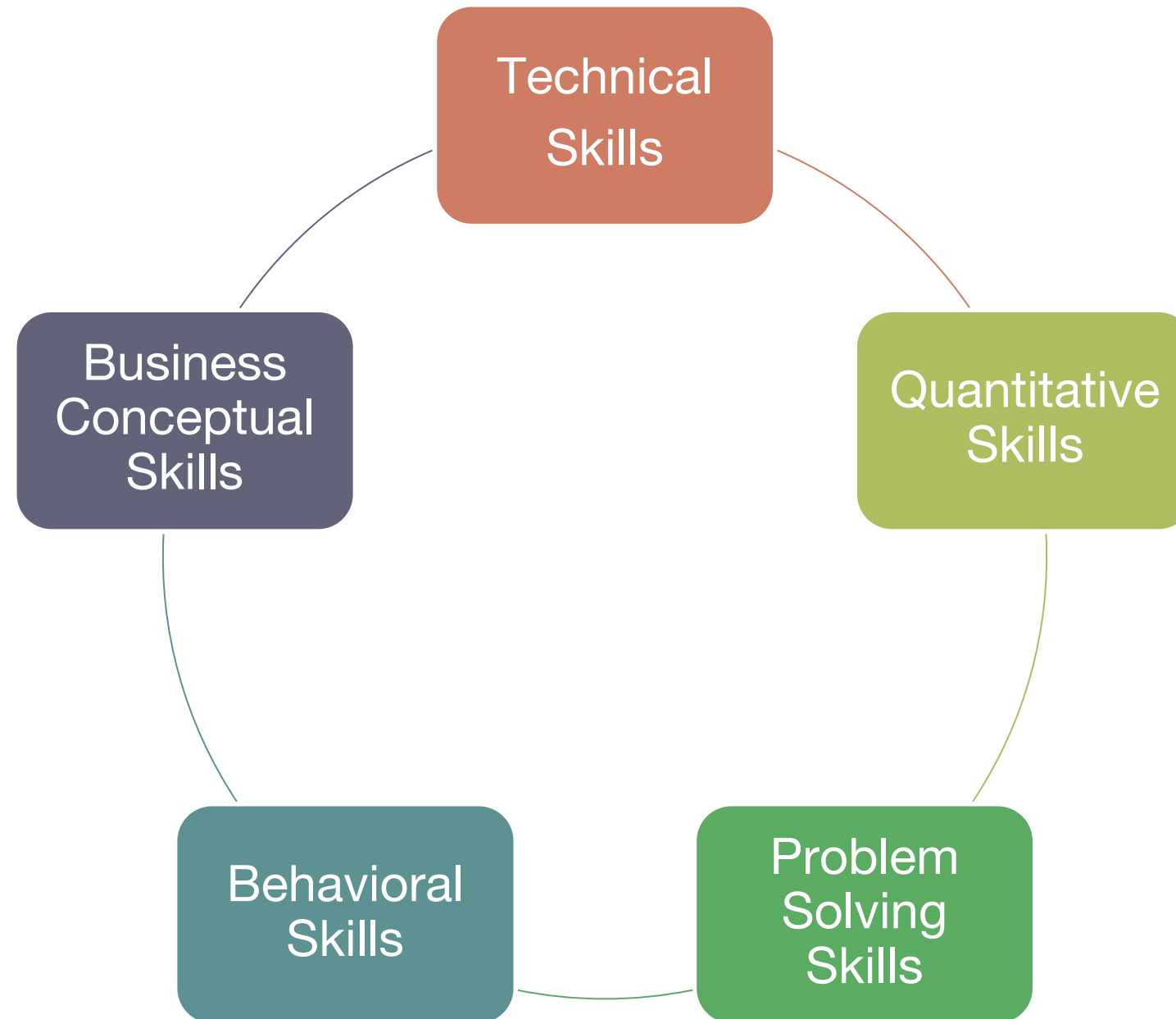
# THE PROJECT MANAGER FIGURE

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# THE PROJECT MANAGER FIGURE

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# PROJECT MANAGERS

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## Need to know:

- Methodologies and quantitative techniques
- Organizational structures and operations
- Behavior dynamics

# PROJECT MANAGERS - LEADERSHIP SKILLS

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An absolutely essential prerequisite for program success is the **program manager's ability to lead the team** within a relatively unstructured environment.

An effective management style might be characterized this way:

- Clear project leadership and direction
- Assistance in problem solving
- Facilitating the integration of new members into the team
- Ability to handle interpersonal conflict
- Facilitating group decisions
- Capability to plan and elicit commitments

# COMMUNICATION

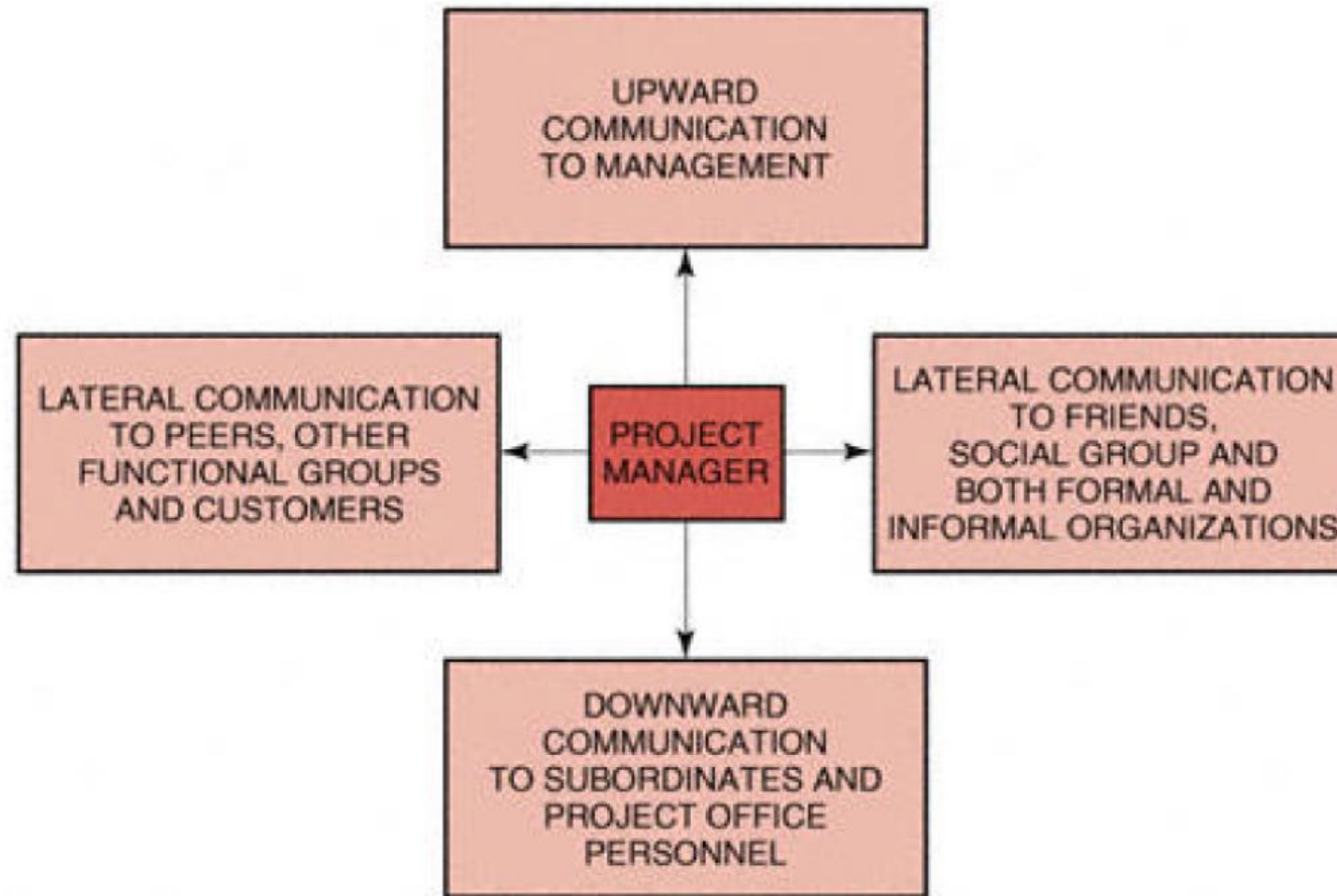
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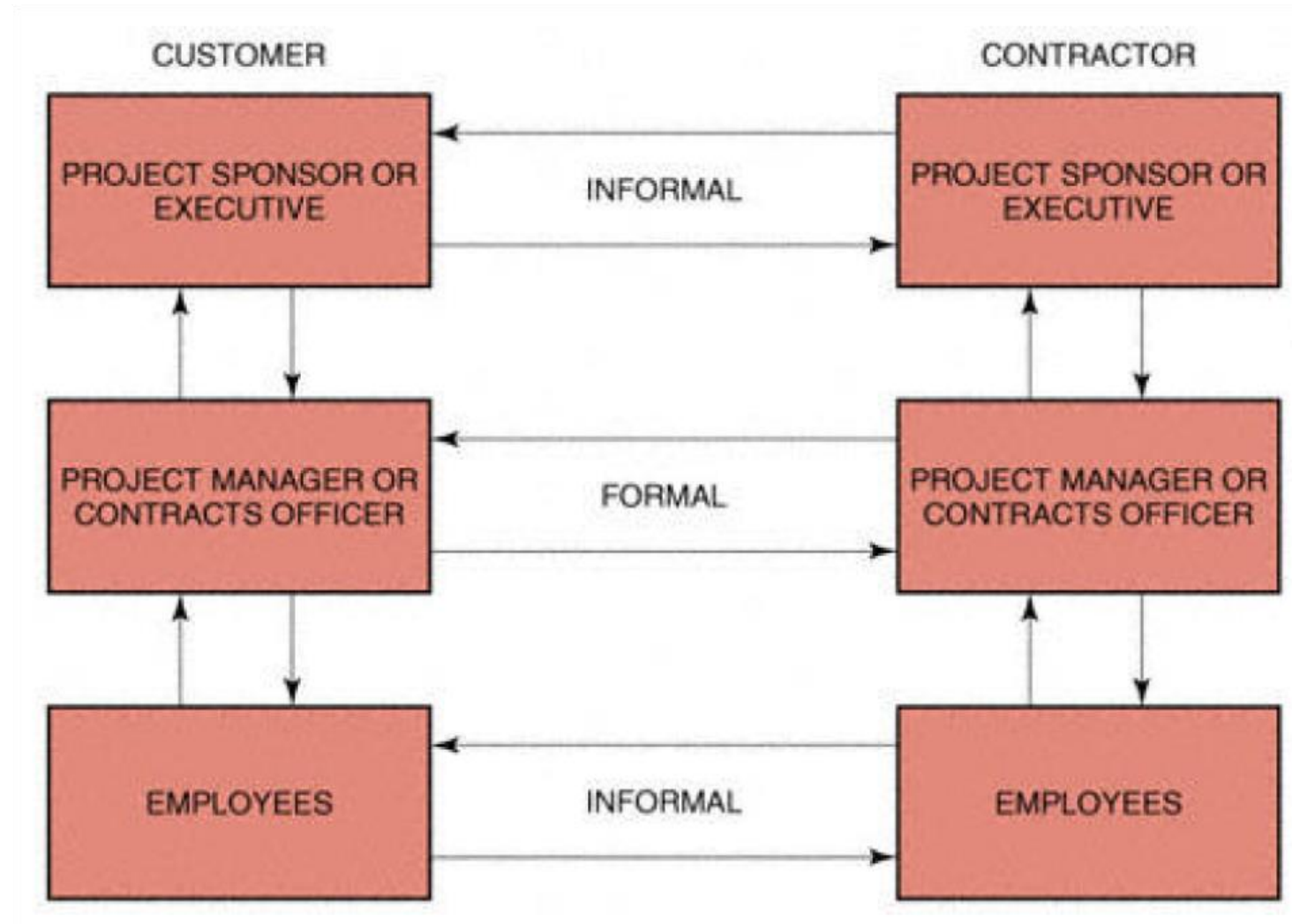


# COMMUNICATION CHANNELS

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# CUSTOMER COMMUNICATIONS



# STAKEHOLDERS, AND STRATEGIC TRADE-OFFS

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Is it possible to **satisfy** all **stakeholders** all of the time?

# TIMING

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Sometimes, it's just longer than expected..!



## Channel Tunnel

2 years late, double its original budget

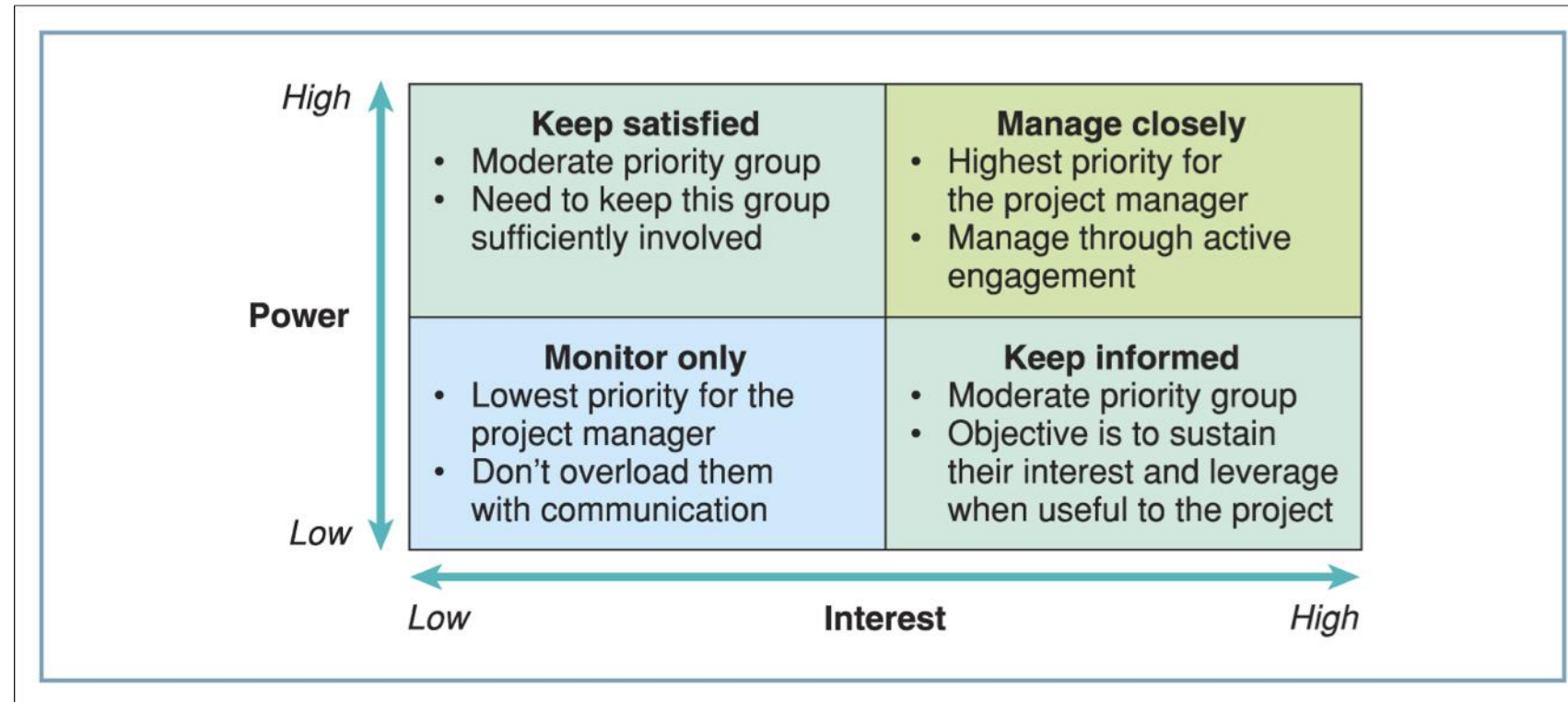


## Concorde

years late, over five times its original budget

# Managing Stakeholders

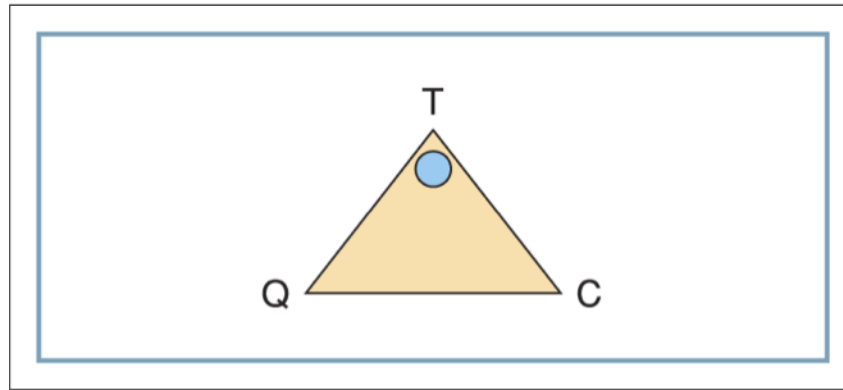
## Power / Impact Maps



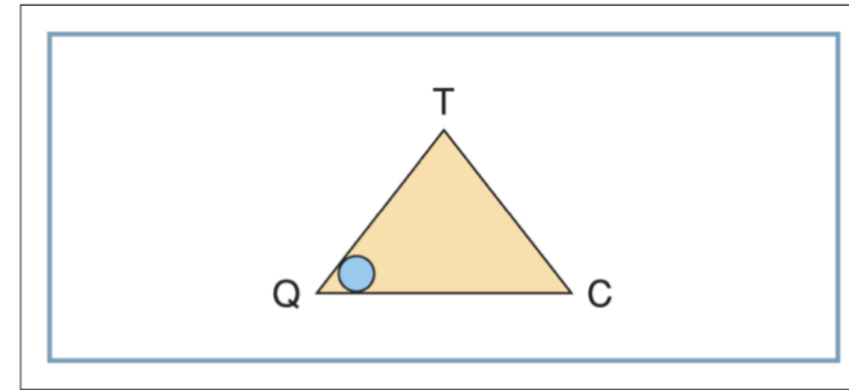


# TRADE-OFFS IN PROJECT MANAGEMENT

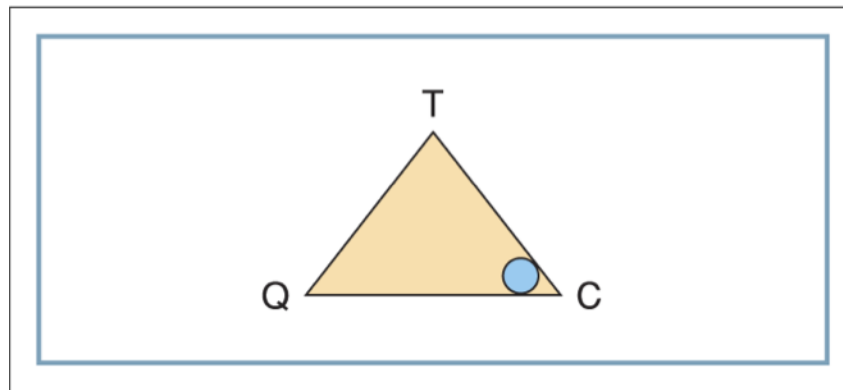
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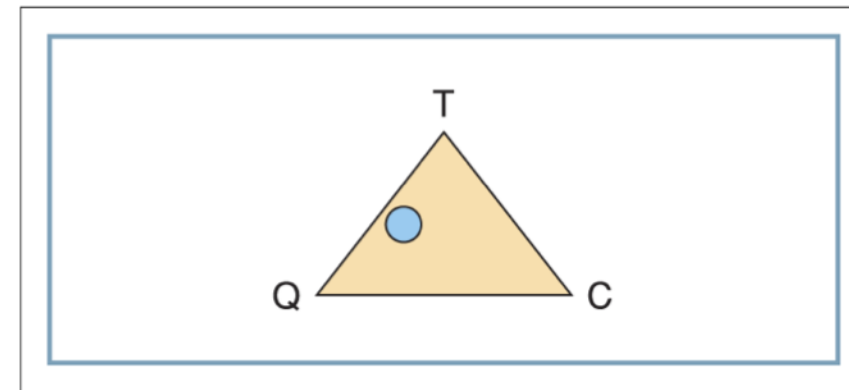
Time priority project



Quality priority project



Cost priority project



Quality & Time priority project

# INITIAL PLANNING

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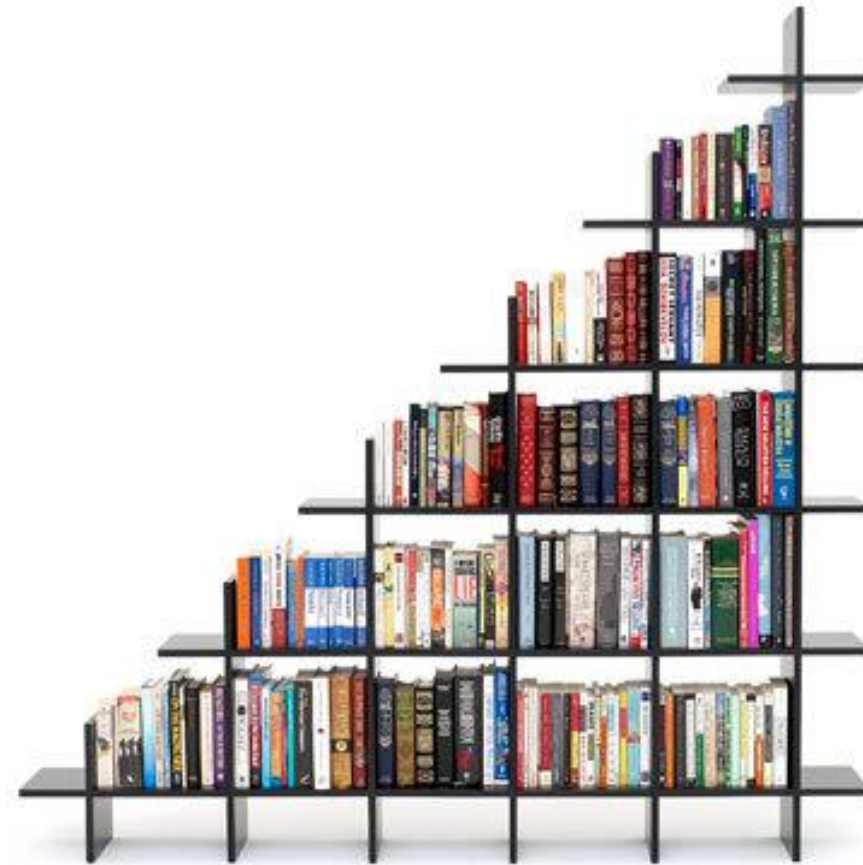


**EVEN THE LONGEST JOURNEY  
BEGINS WITH A SINGLE STEP**

# PROJECT CHARACTERISTICS

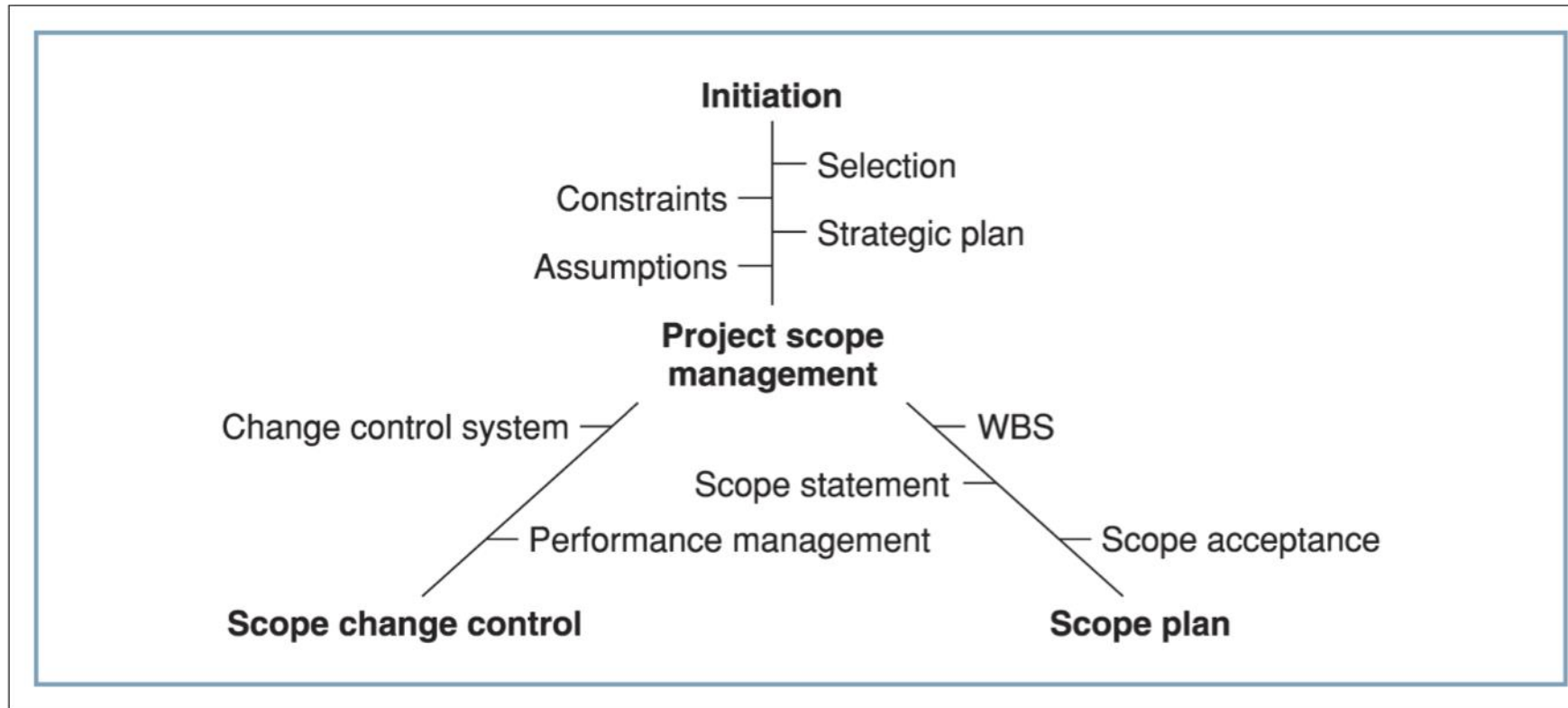
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## Chaos & Order



# EXPLICIT MANAGEMENT OF SCOPE

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...sign-off !

# PLANNING: COSTS & BENEFIT

## Costs of the planning process

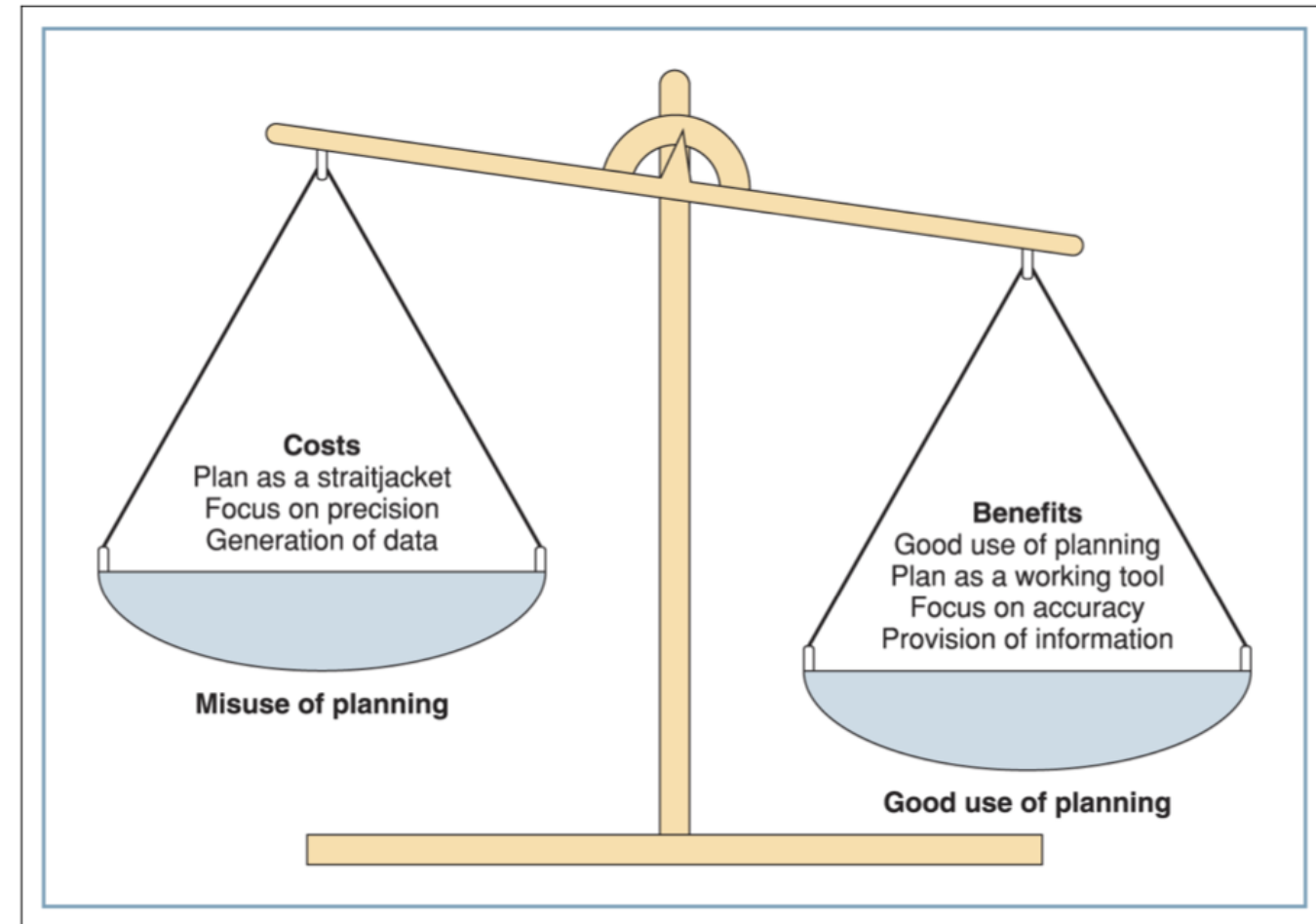
- Labour (time)
- Associated expenses
- Planning tools
- Cost of preparing formal written plan
- Opportunity costs

## Benefits of the planning process

- Avoids costs of chaos of unplanned activity
- Provides a basis for evaluation (or filtering)
- Identifies problems in advance

## Output of planning – a working tool or straitjacket?

- Plans help decision making and guides future activities
- Plans should change as circumstances change
- Planning is a means to an end
- Planning facilitates a beneficial insight into what may happen



# PARTICIPANTS' ROLE

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The responsibilities of the major players are as follows.

## **Project manager will define (after negotiation):**

- Goals and objectives
- Major milestones
- Requirements
- Ground rules and assumptions
- Time, cost, and performance constraints
- Operating procedures
- Administrative policy
- Reporting requirements



# PARTICIPANTS' ROLE

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## **Line manager will define:**

- Detailed task descriptions to implement objectives, requirements, and milestones
- Detailed schedules and manpower allocations to support budget and schedule
- Identification of areas of risk, uncertainty, and conflict

## **Senior management (project sponsor) will:**

- Act as the negotiator for disagreements between project and line management
- Provide clarification of critical issues
- Provide communication link with customer's senior management

**Successful planning requires that project, line, and senior management are in agreement with the plan.**

# PROJECT PLANNING

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Effective total program planning cannot be accomplished unless all of the necessary information becomes available at **project initiation**.

**These information requirements are:**

- The statement of work (SOW)
- The project specifications
- The milestone schedule
- The work breakdown structure (WBS)

# THE STATEMENT OF WORK (SOW)

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**The statement of work (SOW) is a narrative description of the work required for the project.**

- The **complexity** of the SOW is determined by the desires of top management, the customer, and/or the user groups.
- For projects internal to the company, the SOW is prepared by the project office.
- For projects external to the organization, as in competitive bidding, the contractor may have to prepare the SOW for the customer because the customer may not have a team of people trained in SOW preparation.
- In this case, as before, the contractor would submit the SOW to the customer for approval.

# THE STATEMENT OF WORK (SOW) - REMARKS !

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**The above three examples show that misinterpretations of the SoW can result in losses of hundreds of millions of dollars a year.**

**Common causes of misinterpretation are:**

- Mixing tasks, specifications, approvals, and special instructions
- Using imprecise language ("nearly," "optimum," "approximately," etc.)
- No pattern, structure, or chronological order
- Wide variation in size of tasks
- Wide variation in how to describe details of the work
- Failing to get third-party review

# MILESTONE SCHEDULE

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**Project milestone schedules contain such information as:**

- Project start date
- Project end date
- Other major milestones
- Data items (deliverables or reports)

Other major milestones such as review meetings, prototype available, procurement, testing, and so on, should also be identified.

# REPORTS

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The **steps required to prepare a report**, after the initial discovery work or collection of information, includes:

- Organizing the report
- Writing
- Typing
- Proofing
- Editing
- Retyping
- Graphic arts
- Submittal for approvals
- Reproduction and distribution



# PROJECT PLANNING

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- Successful project management, whether it be in response to an in-house project or a customer request, **must utilize effective planning techniques.**
- **The quantitative and qualitative tools for project planning must be identified.**

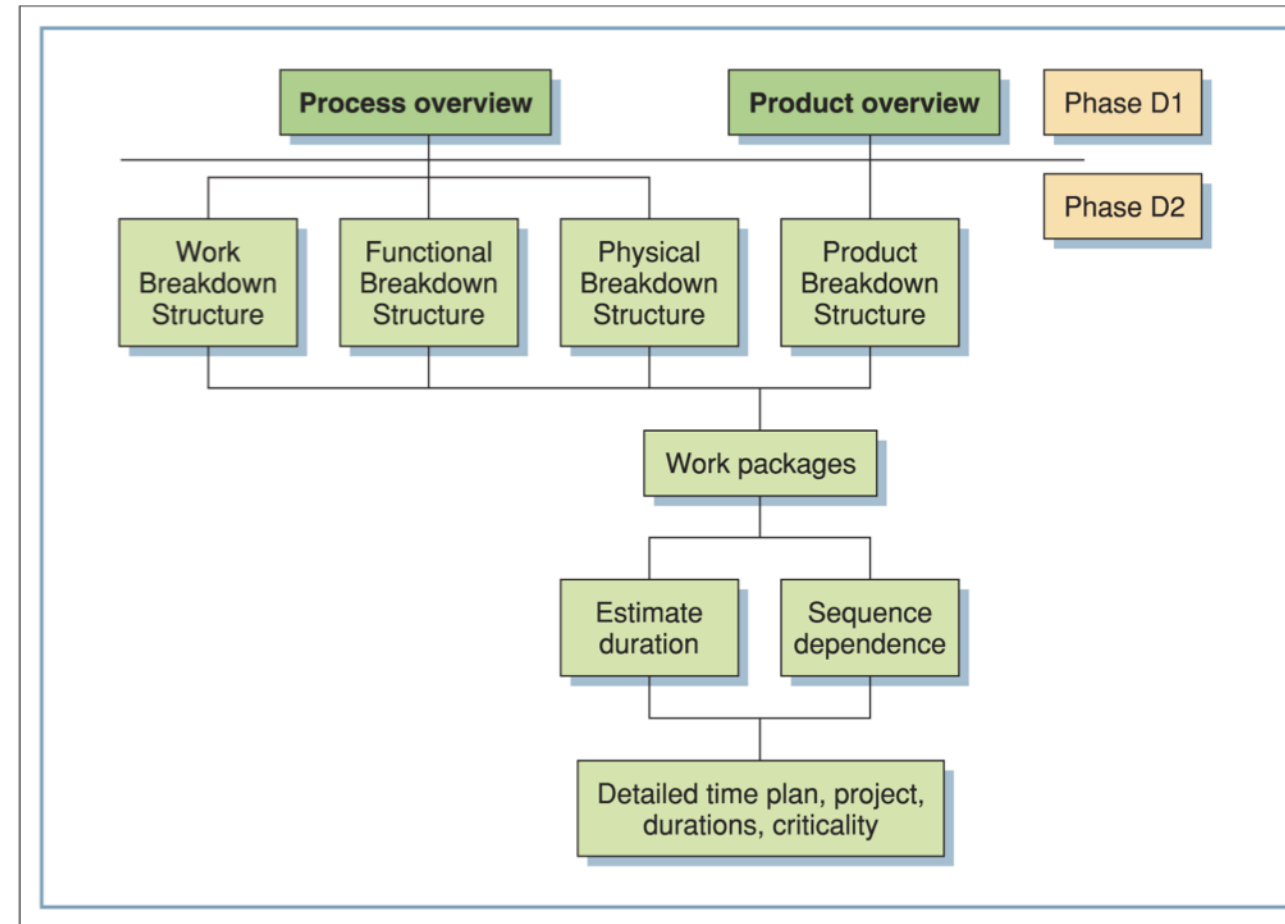




# PLANNING AND MANAGING WORK



# DECONSTRUCTION OF A PROJECT (..OR CONSTRUCTION!)



# WORK BREAKDOWN STRUCTURE (WBS)

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## **Breaking down large activities into comprehensible or manageable units**

- Gives people responsibility for each manageable part
- Facilitates financial control, individual parts can have their consumption of resources tracked
- Bottom level will be a list of work packages

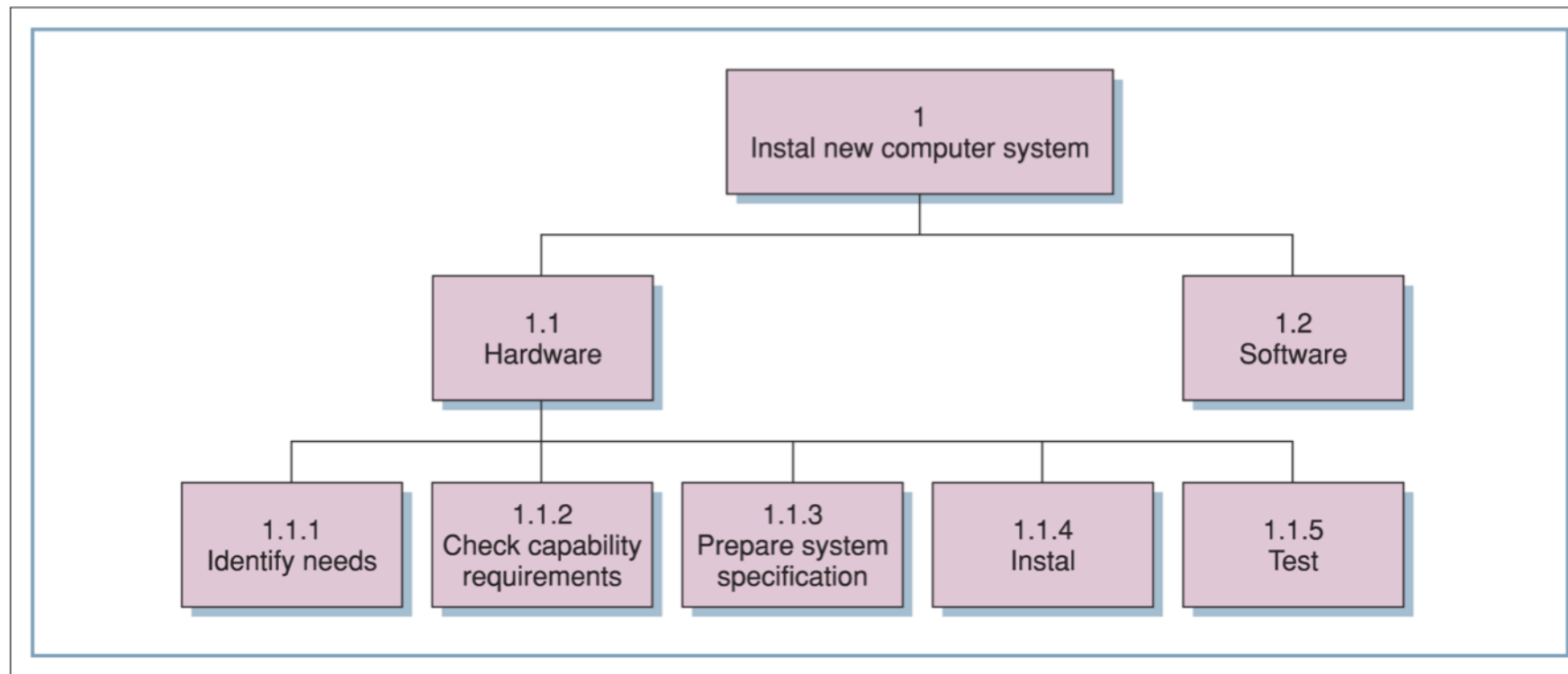
## **Creates a linked set of hierarchical activities**

- Which are independent units
- But which are still part of the whole
- Inevitable conflict
- Interfaces must be managed
- Need to build up individual activities to make them work together
- Decisions at this stage are fundamental to success

# TYPES OF WBS

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## WBS - Physical Breakdown



# WORK BREAKDOWN STRUCTURE (WBS)

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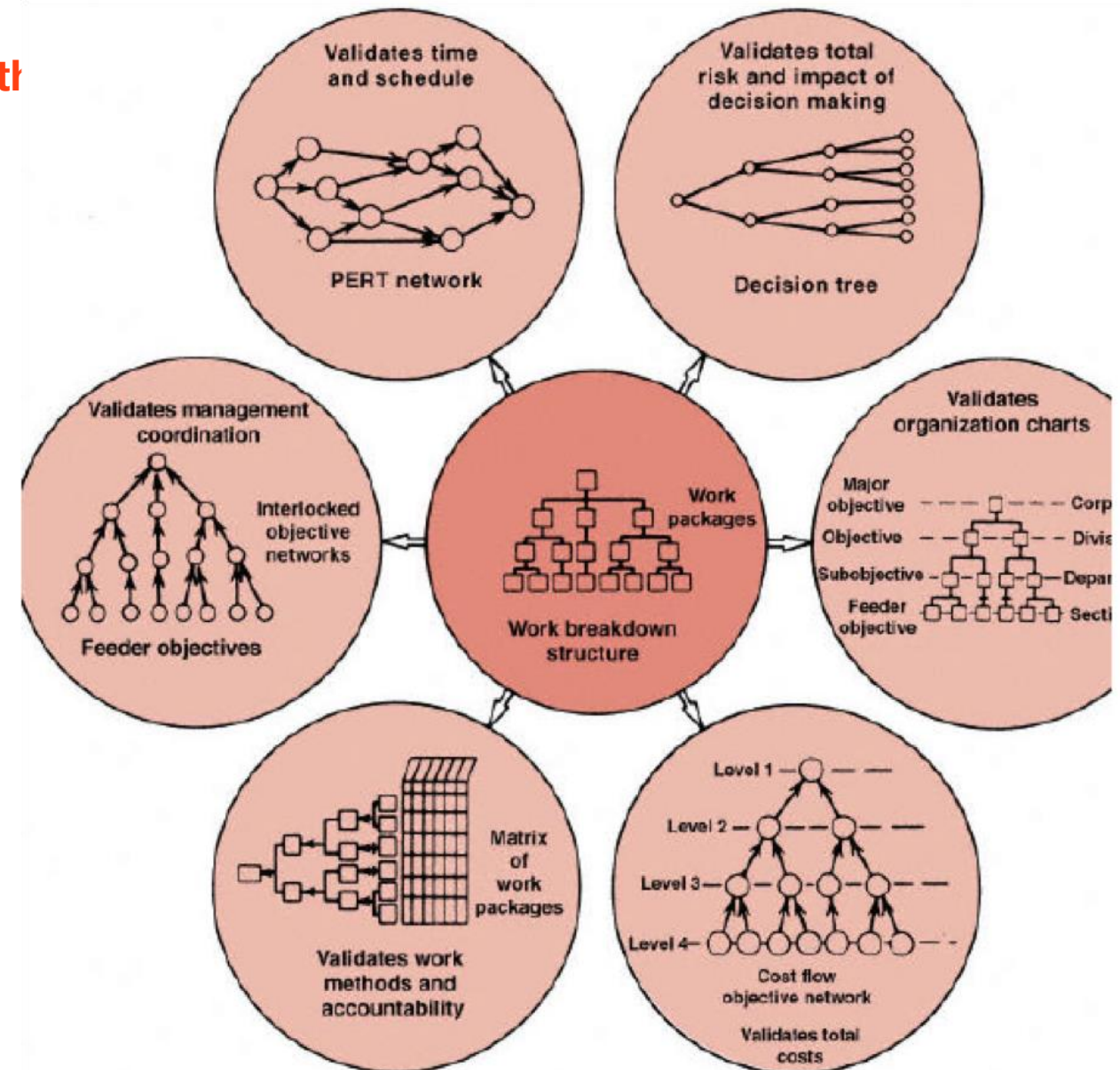
**The WBS is the single most important element because it provides a common framework from which:**

- The total program can be described as a summation of subdivided elements.
- Planning can be performed.
- Costs and budgets can be established.
- Time, cost, and performance can be tracked.
- Objectives can be linked to company resources in a logical manner.
- Schedules and status-reporting procedures can be established.
- Network construction and control planning can be initiated.
- The responsibility assignments for each element can be established.

# WORK BREAKDOWN STRUCTURE (WBS)

The work breakdown structure can be used to provide the following:

- The responsibility matrix
- Network scheduling
- Costing
- Risk analysis
- Organizational structure
- Coordination of objectives
- Control (including contract administration)



# PLANNING AND MANAGING TIME

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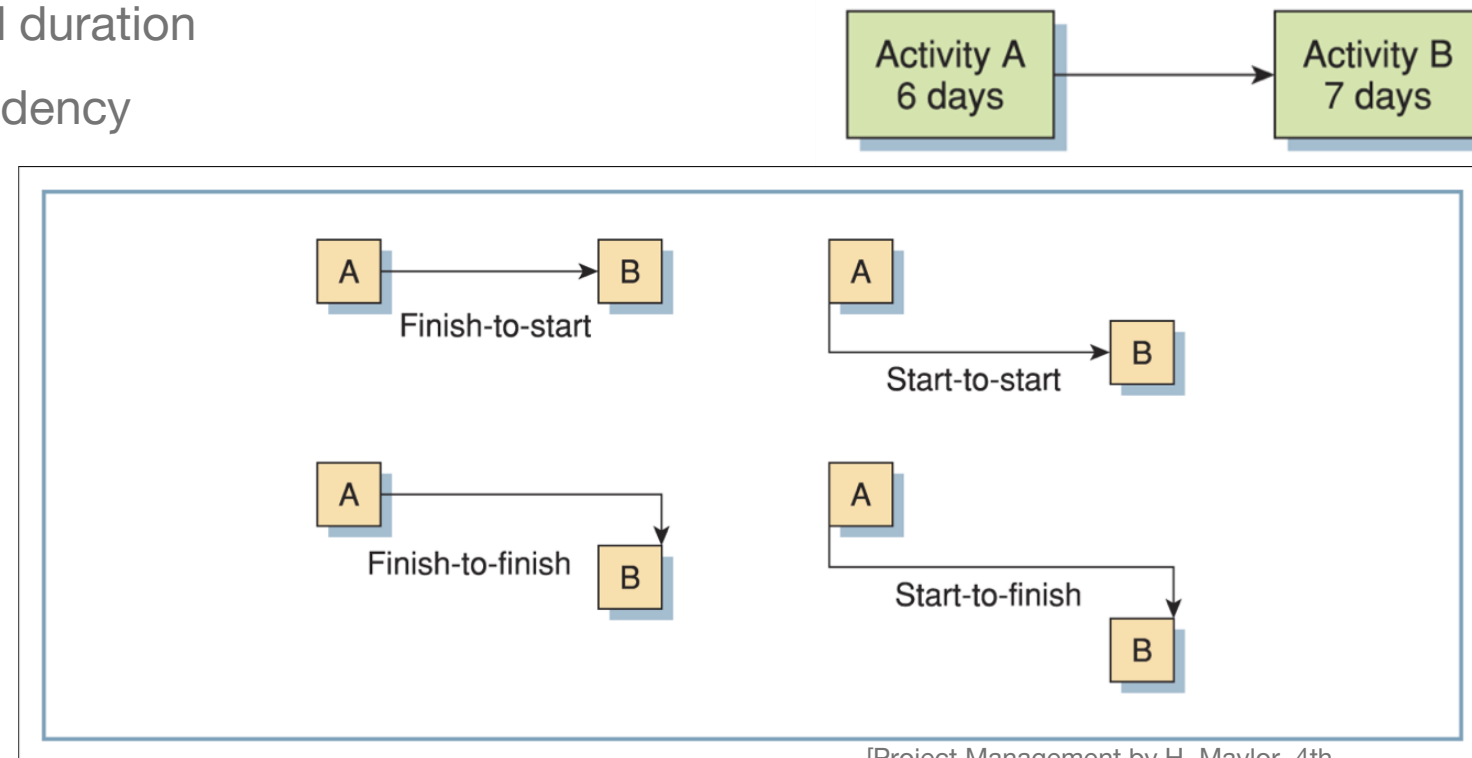


# ACTIVITY-ON-NODE DIAGRAMS (A-O-N)

## A-o-N

- Activities (from WBS)
- Present as tasks
- In logical sequence
- With estimated duration
- And the dependency

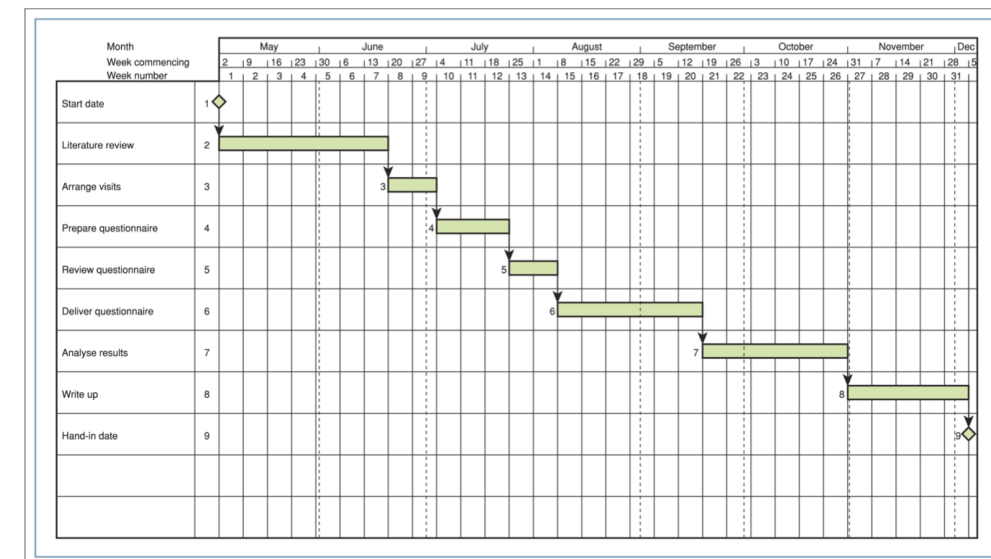
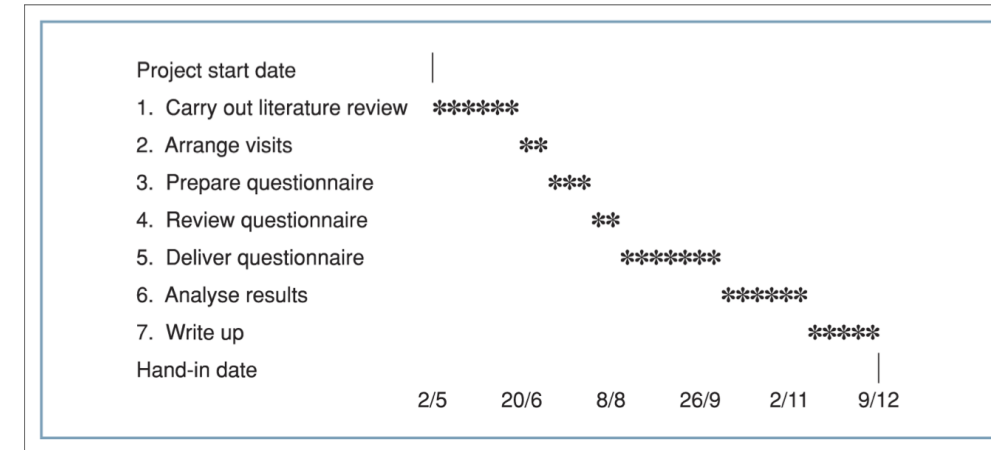
## Linkages:



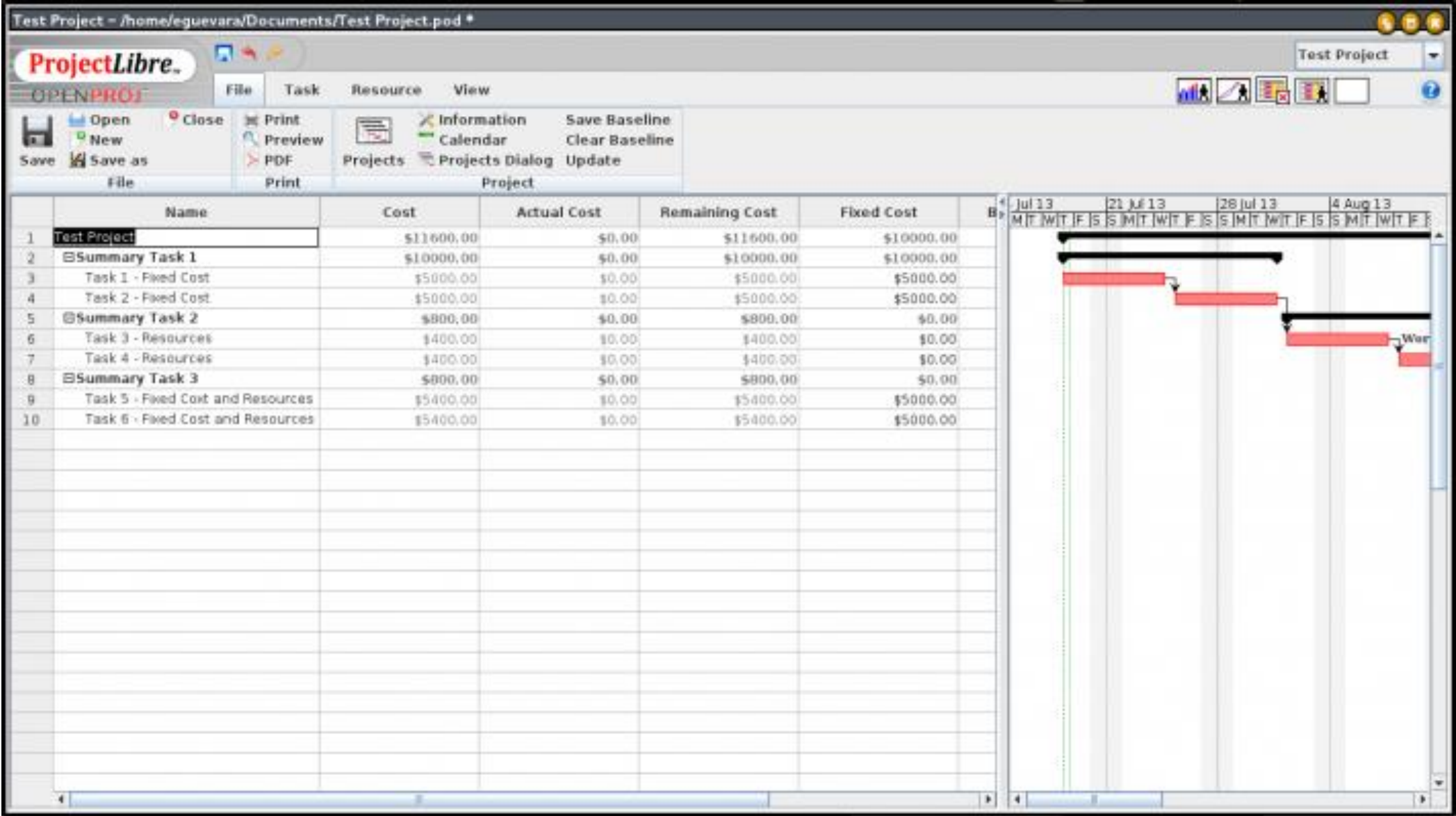
[Project Management by H. Maylor, 4th Edition]

# USING GANTT CHARTS

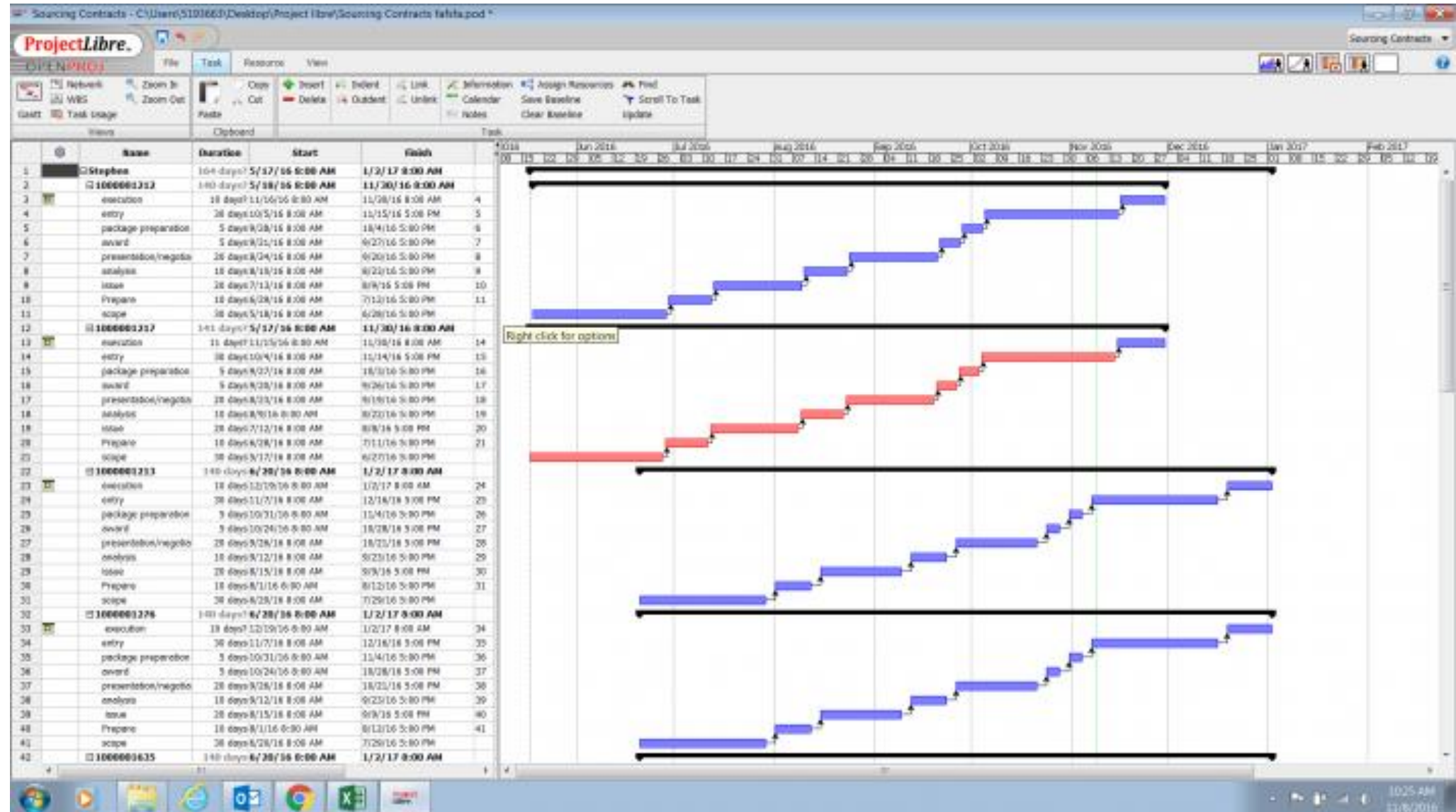
- Establishes a level of logic
- Conventions: time goes from left to right, activities arranged top to bottom in order of occurrence
- Viewing the forward schedule
- Viewing the backward schedule
- Logical links indicated with arrows
- The head of the arrow indicates an activity that cannot proceed until the activity at the tails is completed
- Diamonds represent milestones



# POPULAR GANTT CHART



# POPULAR GANTT CHART



# PLANNING AND MANAGING COSTS

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Do you control costs, **or do costs control you ?**



# THE ROLE OF COSTING

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**The cost planning process resembles the iterative steps of the time planning process**

- Likely changes in resource prices adds additional uncertainty
- Currency fluctuations, inflation and base materials costs

$$\text{Price} = \text{cost} + \text{profit}$$

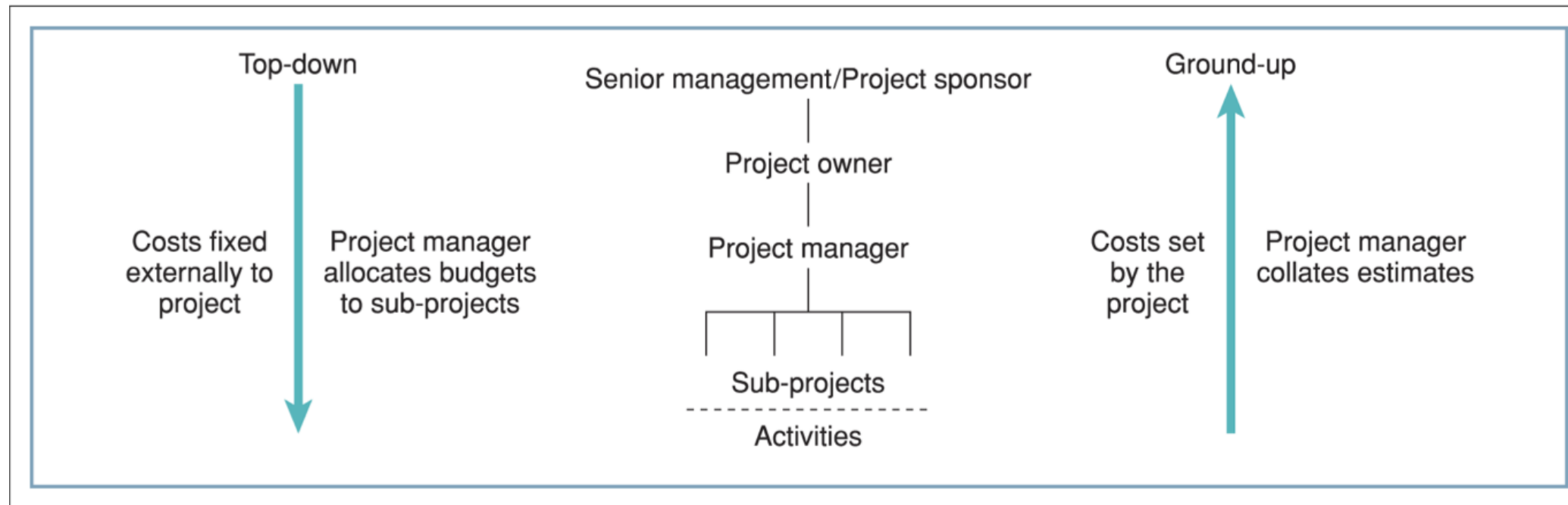
$$\text{Cost} = \text{price} - \text{profit}$$

$$\text{Profit} = \text{price} - \text{cost}$$



# APPROACHES TO COSTING

## Ground-up Costing / Top-down Costing



# COST PLANNING

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## Elements of Cost

- **Time** - Direct input of labour
- 
- **Materials**
  - Consumables and other items
  - At cost or cost + margin
- **Capital equipment**
  - The means of providing the conversion process plus maintenance, running, depreciation
  - Entire cost when purchased specifically
  - Possible residual value
- **Indirect expenses**
  - Transport, training, etc., not directly related to activities but considered necessary
- **Overheads** - Office, financial and legal support, managers and non-direct staff
- **Contingency** - Margin or allowance, e.g. 10 percent

# COST PLANNING

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## Estimating Techniques

- **Parametric estimating**

- Projects are rarely totally unique, often repetition of activities at lower levels of WBS
- Break down project into units that can be readily estimated based on considerable experience of a particular type of project
- Can be used at different levels of the product breakdown

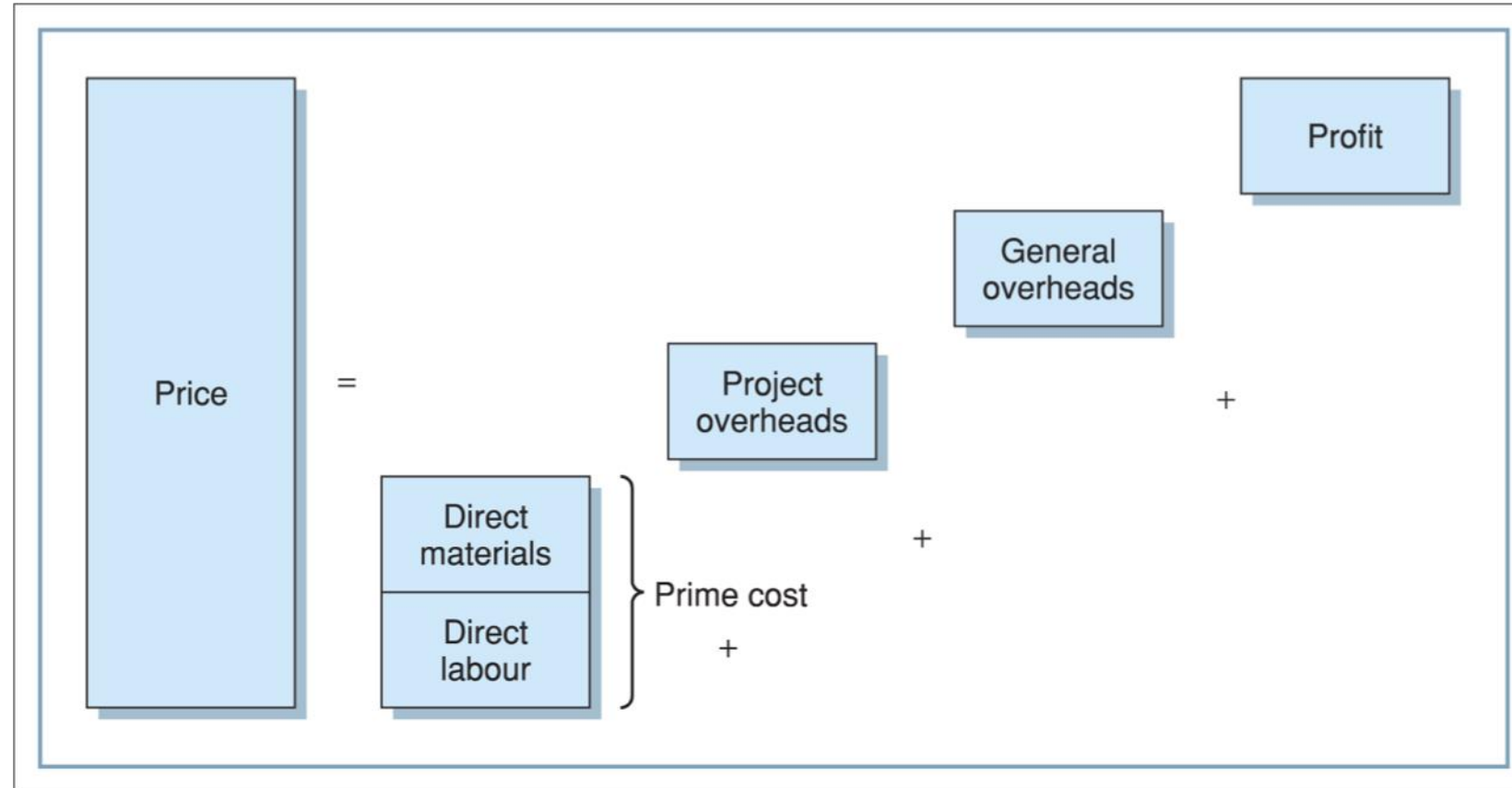
- **As...but...s**

- Experience of similar projects
- Use previous cost as base line (assuming validity) and proportion up or down

- **Forecasts**

- A 'best guess' when uncertainty (e.g. exchange rates)
- Use parametrics or proxies
- Differentiate between fixed (firm/known) and variable costs (fluctuate, estimate)
- Provide series of estimates to see impact on budget

# GROUND-UP COSTING



# COST & TIME CONTROL - EARNED VALUE TECHNIQUES

The **Earned Value**, brings together time and cost performance elements into a monetary quantity.

Example:

Activity	Time	Budget
1	1 week	5.000 €
2	1 week	8.000 €
3	1 week	7.000 €
4	1 week	12.000 €
5	1 week	14.000 €
6	1 week	10.000 €
7	1 week	13.000 €
8	1 week	11.000 €
9	1 week	16.000 €
10	1 week	4.000 €
<b>TOTAL</b>	<b>10 weeks</b>	<b>100.000 €</b>

◀ How is it going ?  
Spend is 36.000€,  
and completed 1-4

# RISK MANAGEMENT

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# INTRODUCTION

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For projects with a time duration of less than one year, we normally assume that the environment is known and stable, particularly the technological environment.

**For projects over a year or so in length, technology forecasting must be considered.**

- Computer technology doubles in performance about every two years.
- Engineering technology is said to double every three or so years.



# INTRODUCTION

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## The Risk Management Process

- **Planning** - the activity
- **Assessment (Identification + Analysis)** - to estimate the likelihood and predic impacts
- **Handling** - strategy for selected risks
- **Monitoring** - the progress in reducing the selected risks to the desidered level.

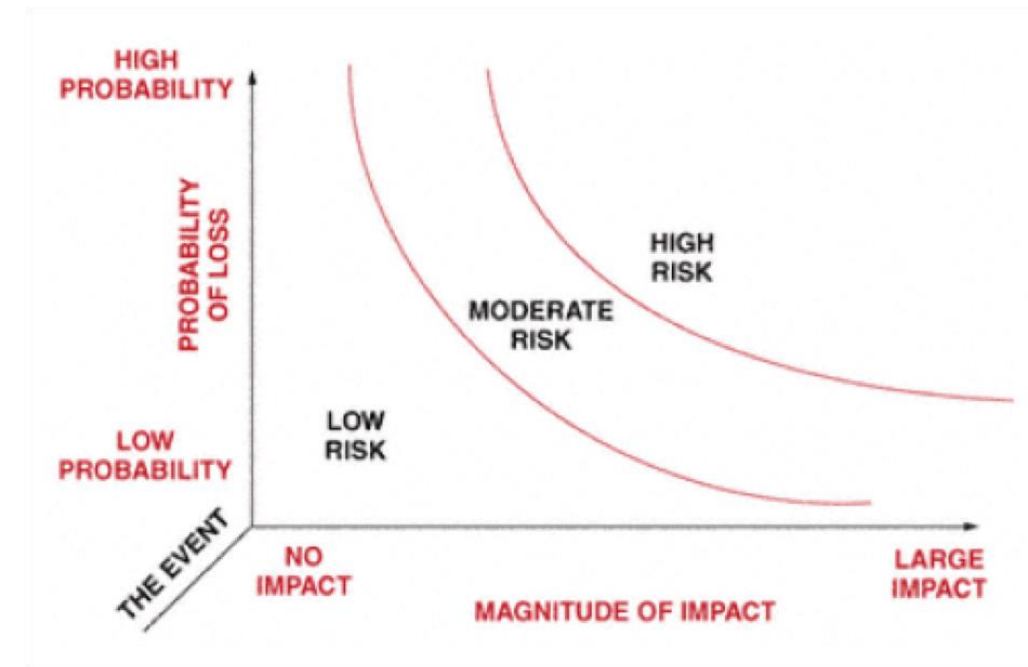


# RISK

## Definition of Risk

**Risk is a measure of the probability and consequence of not achieving a defined project goal. Most people agree that risk involves the notion of uncertainty.**

- Risk has two primary components for a given event:
  - A probability of occurrence of that event
  - Impact of the event occurring (amount at stake)
  - Risk = F (Likelihood, impact)



# CERTAINTY, RISK AND UNCERTAINTY

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## Decision-making falls into three categories:

- certainty;

Decision-making under certainty implies that we know with 100 percent accuracy what the states of nature will be and what the expected payoffs will be for each state of nature.

- risk;
- uncertainty.

**The difference between risk and uncertainty is that under risk there are assigned probabilities, and under uncertainty meaningful assignments of probabilities are not possible.**

expected payoffs will be for each state of nature.

# RISK PLANNING

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**Risk planning is the detailed formulation of a program of action for the management of risk.**

It is the process to:

- Develop and document an organized, comprehensive, and interactive risk management strategy.
- Determine the methods to be used to execute a program's risk management strategy.
- Plan for adequate resources.

The result is often the **risk management plan** (RMP).

# RISK ASSESSMENT

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## Identification

The second step in risk management is to identify all potential risk issues. **This may include a survey of the program, customer, and users for concerns and problems.**

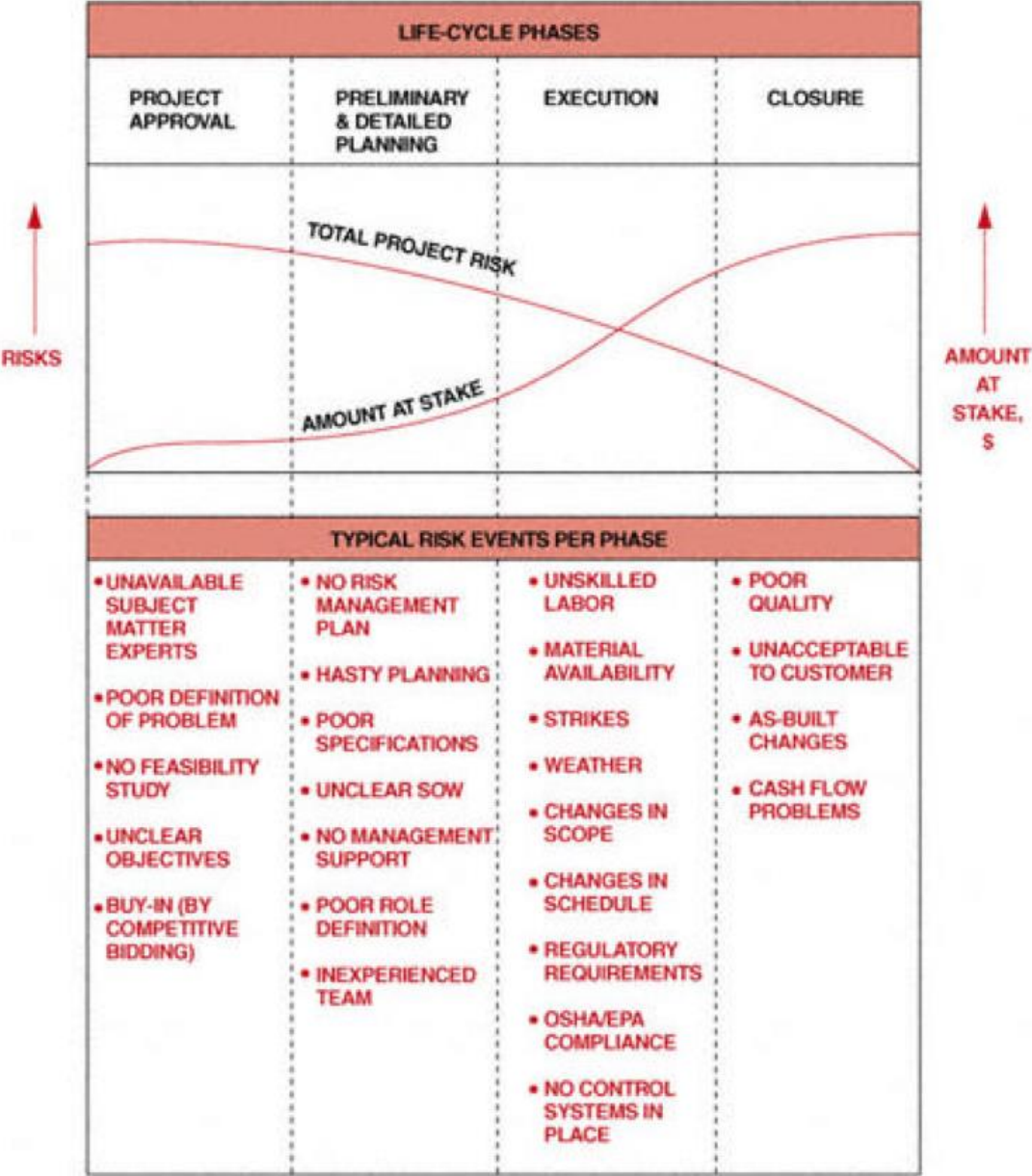
Some degree of risk always exists in project, technical, test, logistics, production, and engineering areas. **Project risks include cost, funding, schedule, contract relationships, political risks, and technical risks.**

The methods for identifying risk are numerous. **Common practice is to classify project risk according to its source. Most sources are either objective or subjective.**

# RISK ASSESSMENT

## Identification

**Risks can also be identified according to life-cycle phases.** In the early life-cycle phases, the total project risk is high because of lack of information. In the later life-cycle phases, the financial risk is the greatest.



# RISK ASSESSMENT

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## Identification

**Any source of information that allows recognition of a potential problem can be used for risk identification.** These include:

-

- Life-cycle cost analysis
- Plan/WBS decomposition
- Schedule analysis
- Lessons learned files
- Trade studies/analyses
- Technical performance measurement (TPM) planning/analysis
- Decision drivers
- Brainstorming
- Expert judgment

# RISK ASSESSMENT

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## Analysis

**Risk analyses are often based on detailed information that may come from:**

- Comparisons with similar systems
- Relevant lessons-learned studies
- Experience
- Results from tests and prototype development
- Data from engineering or other models
- Specialist and expert judgments
- Analysis of plans and related documents
- Modeling and simulation
- Sensitivity analysis of alternatives

# RISK ASSESSMENT

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## Analysis

After performing a risk analysis, it is often necessary to convert the results into **risk**

- **levels (likelihood, impact):**

- **High risk:** Substantial impact on cost, schedule, or technical. Substantial action required to alleviate issue. High priority management attention is required.
- **Moderate risk:** Some impact on cost, schedule, or technical. Special action may be required to alleviate issue. Additional management attention may be needed.
- **Low risk:** Minimal impact on cost, schedule, or technical. Normal management oversight is sufficient.



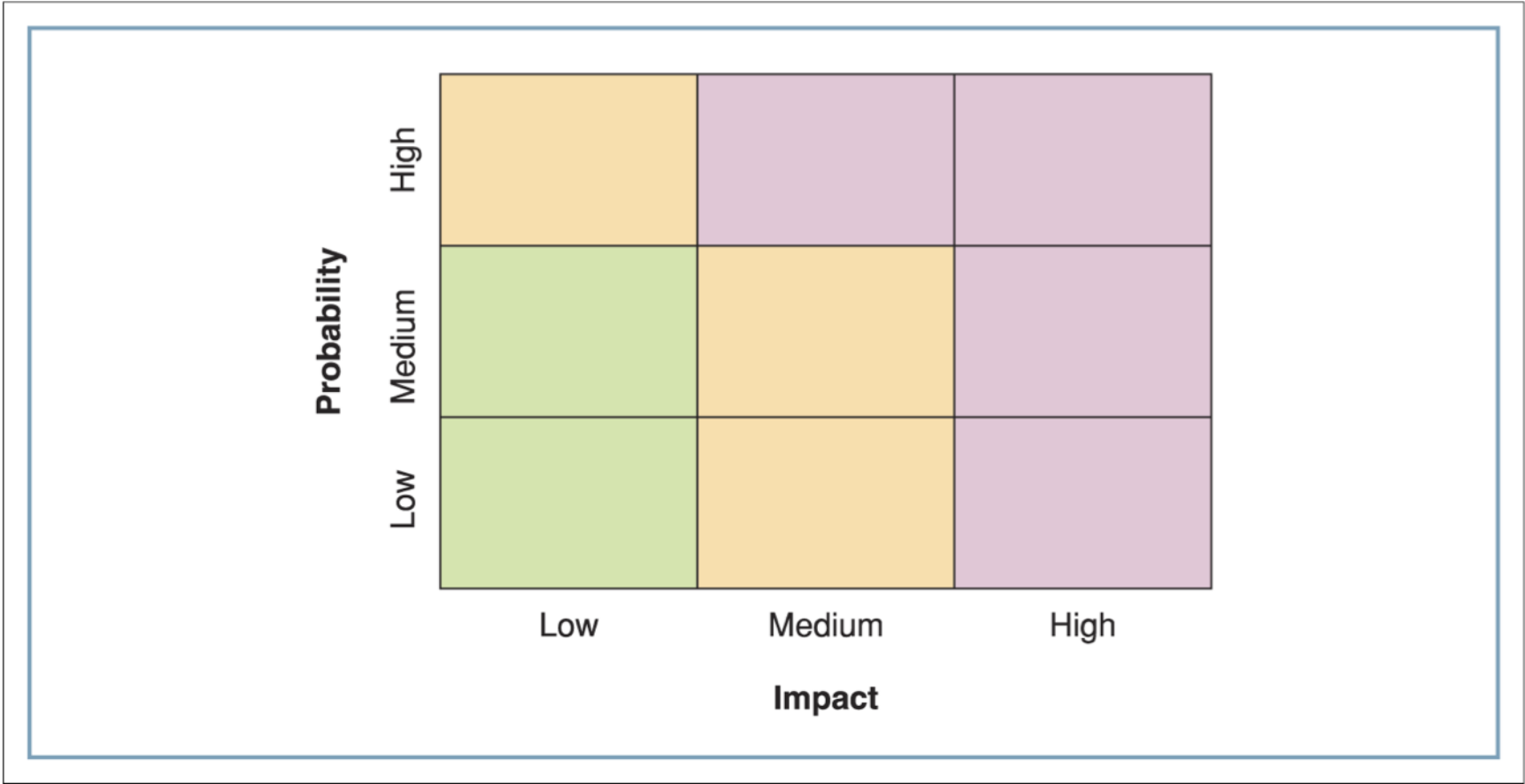
# RISK ASSESSMENT

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PROCESS	DESCRIPTION	CATEGORY	PRIORITY	IMPACT	PROBABILITY	OWNER	STATUS	NEXT STEP	NOTE

# RISK ASSESSMENT

## Analysis



# RISK HANDLING

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**Risk handling includes specific methods and techniques to deal with known risks,** identifies who is responsible for the risk issue, and provides an estimate of the cost and schedule associated with reducing the risk, if any.

4 categories for handling risk:

- Risk assumption
- Risk avoidance
- Risk control
- Risk transfer

# RISK HANDLING

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## Risk Assumption

**Risk assumption is an acknowledgment of the existence of a particular risk situation and a conscious decision to accept the associated level of risk, without engaging in any special efforts to control it.**

However, a general cost and schedule reserve may be set aside to deal with any problems that may occur as a result of various risk assumption decisions.

The key to successful risk assumption is twofold:

1. Identify the resources (e.g., money, people, and time) that will be needed to overcome a risk if it materializes.
2. Plan consequent actions

# RISK HANDLING

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## Risk Avoidance

**Risk avoidance involves a change in the concept, requirements, specifications, and/or practices to reduce risk to an acceptable level.** Simply stated, it eliminates the sources of high or possibly medium risk and replaces them with a lower risk solution.

Trade-offs need to be carefully evaluated.

# RISK HANDLING

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## Risk Control

**Risk control seeks to reduce or mitigate the risk. It manages the risk in a manner that reduces the likelihood and/or consequence of its occurrence on the program.**

Actions include:

- Alternative design
- Demonstration events
- Early prototyping
- Key parameter control boards
- ...

# RISK MONITORING

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**The monitoring process systematically tracks and evaluates the effectiveness of risk handling actions against established metrics.**

The key to the risk monitoring process is to establish a cost, performance, and schedule management indicator system over the program that the program manager and other key personnel use to evaluate the status of the program.

- cost monitoring
- schedule monitoring
- technical performance measurement (TPM)

