

# 專案管理實務



嘉義縣政府學分班:管理實務專題  
2006

中正大學企管系助理教授  
周瑞生



# 講師介紹

## > 學歷

- 台灣大學學士
- 台灣大學碩士
- 美國德州大學奧斯汀校區工程專案管理博士
- 中華民國土木工程、大地工程、水土保持工程專門技術人員高等考試及格、土木技師、大地技師、乙級測量技術士

## > 經歷

- 陸軍後勤學校機械保修組
- 亞新工程顧問公司
- 中興工程顧問公司
- 台灣營建研究院
- 華信保險公證公司
- 美國德州交通部奧斯汀區運輸研究中心

# 課程規劃

## > 專案管理簡介 (Introduction)

- 專案 (Project)
- 專案管理 (Project Management)
- 專案生命週期 (Project Life Cycle)
- 專案五大基本管理過程 (5 Processes)
- 專案管理九大知識領域 (9 Knowledge Areas)

## > 專案管理引用之技術

- 決策樹 (Decision Tree)
- 魚骨圖 (Fishbone Diagram)

# 課程規劃 (Cont'd)

- 甘特圖 (Gantt Chart)
  - 網路圖 (Network Diagram)
  - 要徑法 (Critical Path Method)
  - 計劃評核術 (PERT)
  - 資訊科技應用 (IT Applications)
- > 專案整合管理 (PIM)
- 專案選擇與決策分析模式
  - 規劃成功的專案計畫書
- > 專案範疇管理 (Project Scope Mgmt.)
- 專案範疇與產品範疇之定義與規劃實務
  - WBS工作分解之技巧與實務演練
  - 專案關鍵成敗因素KSF實務研討

# 課程規劃 (Cont'd)

- > 專案時間管理 (Project Time Mgmt.)
  - CPM/PERT技術實務演練
  - 時程發展與控制技巧
- > 專案成本管理 (Project Cost Mgmt.)
  - EVM實獲值管理理論
  - EVM實獲值管理之實務
- > 專案品質管理 (Project Quality Mgmt.)
  - 專案品質規劃與控制手法實務
  - 專案管理之整合、專案管理計劃實務研討
- > 專案人力資源管理 (Project HR Mgmt.)
- > 專案管理軟體之使用介紹及實務應用
- > 案例分析

\*專案溝通管理、專案風險管理、專案採購管理未包含於此次簡報

# 專案管理簡介

# 專案管理相關證照

## > 美國專案管理學會 [ Project Management Institute, 簡稱PMI ]

- 成立於1969年，並在1984年正式建立PMBOK知識體系與PMP國際專業認證體系
- 全球取得PMP人數已超過13萬多人
- 台灣通過認證者目前僅超過三百人 → 中華專案管理學會輔助認證 ([www.npma.org.tw](http://www.npma.org.tw))
- 「CPMP中華專案管理師」認證培訓課程，已於93年11月1日通過行政院人事行政局之審查，獲得「公務人員終身學習機構認證

## > 供不應求

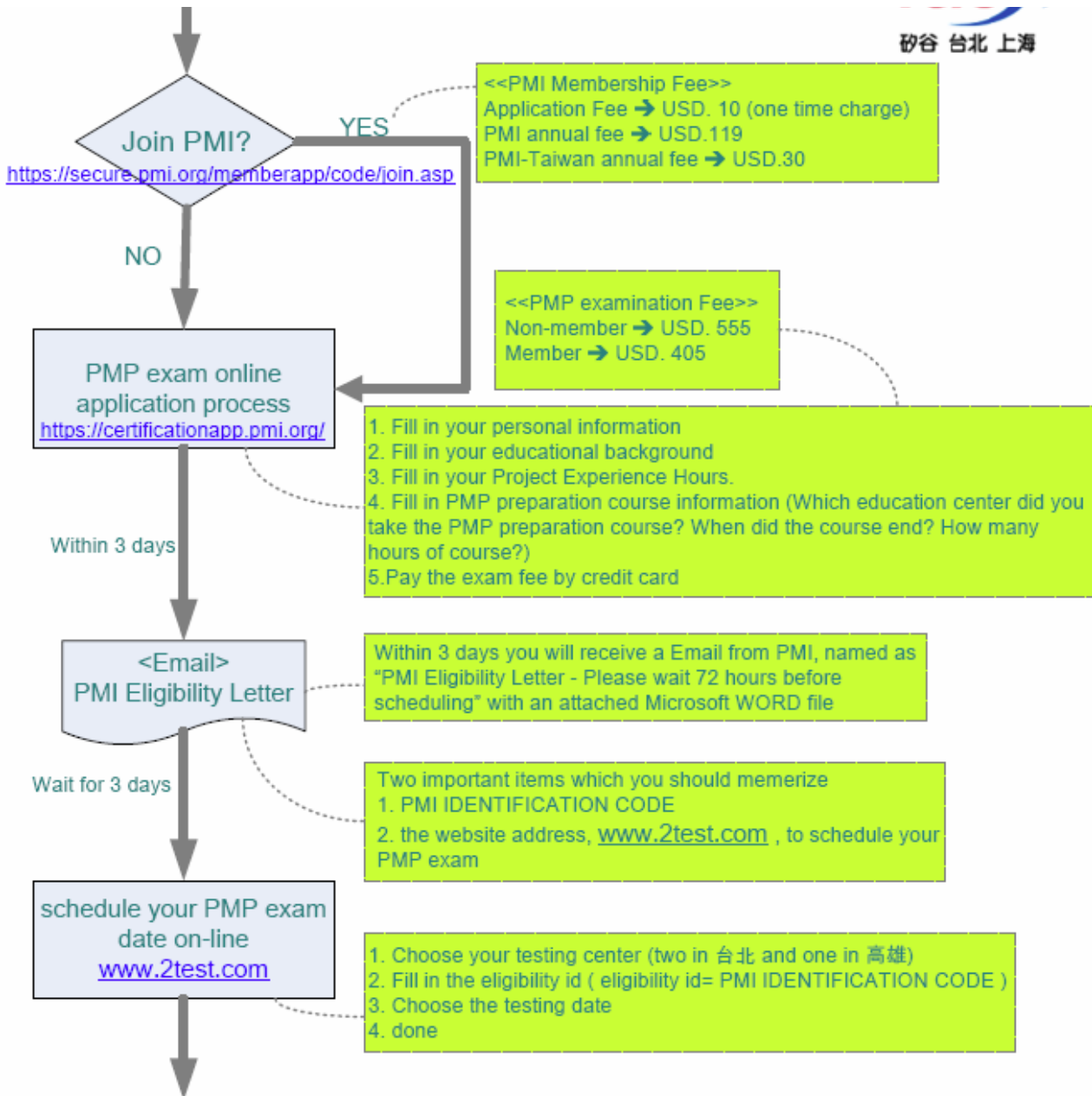
- 亞太PMP平均年薪118k元美金>美國 PMP 780k
- IBM、HP等大型企業、日本政府及大陸北京規定奧運工程公司須具備PMP資格

## > PMI在台測試中心：台北、高雄



# PMP認證流程 (<http://www.psig.com.tw/>)

砂谷 台北 上海



# IPMA（國際專案管理協會）

- > 歐洲國家為主
- > 台灣專案管理學會輔助認證 ([www.tpma-tw.org](http://www.tpma-tw.org))
- > A級
  - 管理大型專案的專案副總（Certified Project/Program Director），5年大型專案管理經驗
- > B級
  - 專案協理（Certified Project Manager，5年複雜專案管理經驗
- > C級
  - 專案經理（Certified Project Management Professional），3年一般專案管理經驗
- > D級
  - 合格的專案成員（Certified Project Management Practitioner），沒有工作經驗限制

# 中華知識管理應用協會

> <http://www.km.org.tw/>

> 企業專案管理技術師 (EPMP)

> 交通大學專案管理認證中心

> 報考資格

- 理相關科系之在校生，修業達三十小時以上之管理課程者，可憑在學成績單或畢業證書報名「一級企業專案管理技術師」考試。

- 詳細資格說明：

<http://www.km.org.tw/epmp/admissible.html>

# What is Project?

- > A group of tasks (activities) performed within a definable time period (schedule) in order to meet a specific set of goals/objectives (performance) within a budget (cost plan)
  - A project generally exhibits most of the following conditions:
    - > It is *unique* 非例行性的
    - > A project is *finite* 有限制時間、資源
    - > Usually *complex* 複雜的
    - > *Non-repetitive* 非重複性的
    - > Requires *multiple resources* from a finite resource pool 預算、資源與績效限制

# What is Project Management?

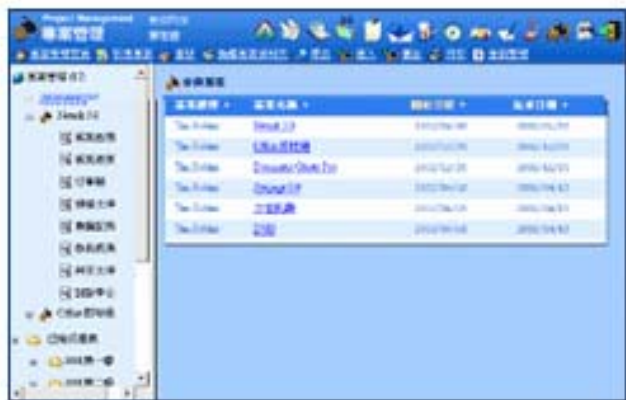
- > **Project management** is “the application of knowledge, skills, tools and techniques to project activities to meet project requirements.”\*

\*PMI, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (2004), p. 8.

# 常見之專案管理輔助軟體

- > 國內自行研發專案管理軟體
- > Microsoft Project 2003 → 中小型專案
- > Primavera → 大型專案
- > Primavera SureTrak Project Manager → 小型專案

# 專案管理應用軟體範例



專案管理首頁



專案管理專案任務列表

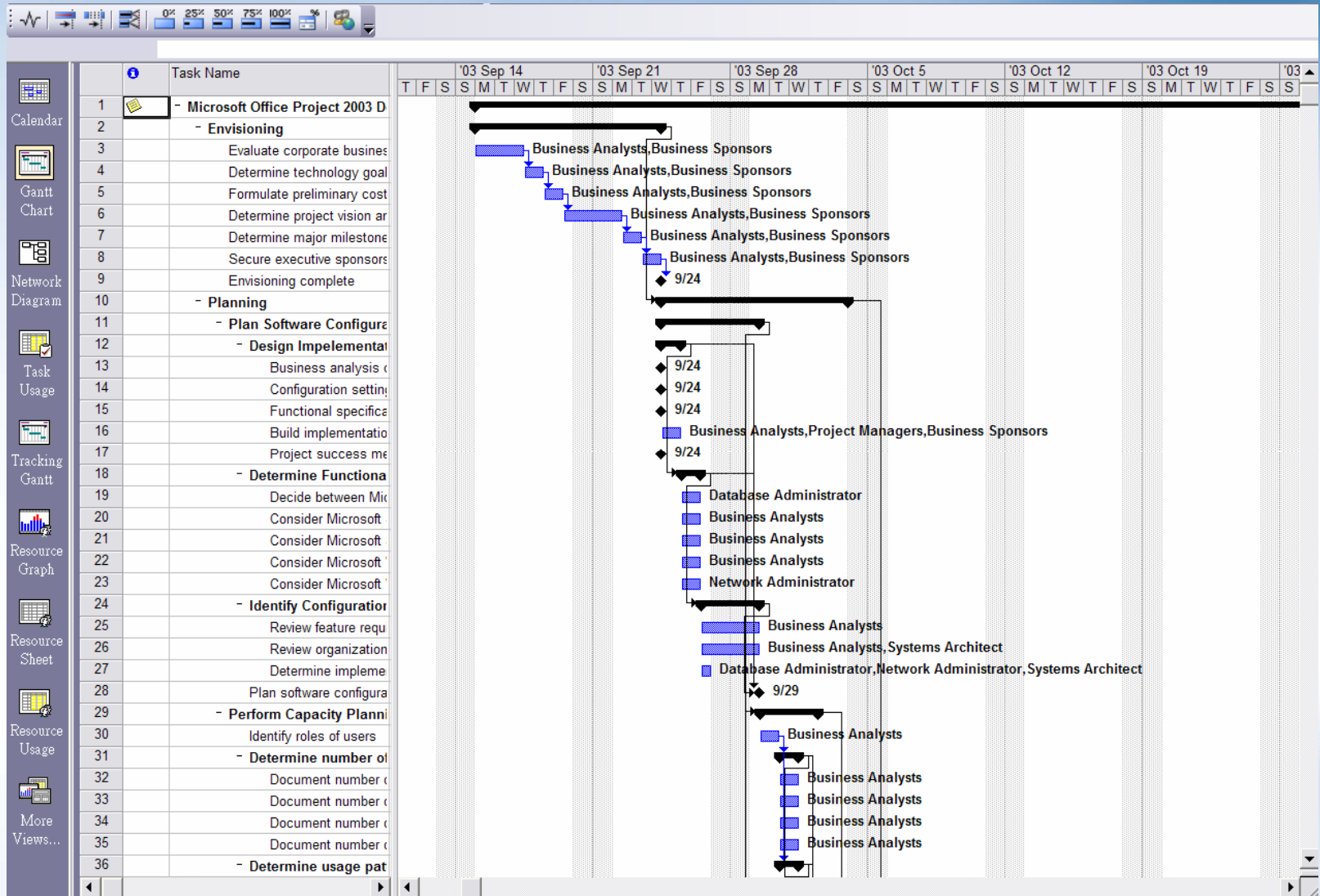


專案管理觀看會議記錄



專案管理觀看專案進度

# More examples





# More examples

The screenshot displays the Primavera software interface for a project named "Autumn Breezes Assisted Living Center". The interface is divided into several panels:

- Project Statistics:** A table showing project performance metrics.
- Contract Issues:** A 3D bar chart showing issues by category.
- Project Issues:** A 3D pie chart showing issues by owner.
- Communication Center:** A list of project participants with checkboxes for communication preferences.

**Project Statistics Table:**

Name	Start	Finish	Schedule % Complete	BL Total Cost	Actual Total Cost	At Completion Total Cost
Total	Aug/02/04	Dec/06/05	38.6%	62,319,302	21,208,760	62,689,509
Autumn Breezes Assisted Living Center	Aug/02/04	Dec/06/05	30.6%	62,319,302	21,208,760	62,689,509
Milestones	Aug/02/04	Dec/06/05		0	0	0
Building 1	Aug/02/04	Jul/18/05	52.3%	18,185,995	11,045,725	18,913,420
Envelope	Nov/29/04	Mar/03/05	87.8%	2,067,115	1,945,520	2,067,115

**Contract Issues Chart:**

Category	Count
APP	3
CLO	1
NEW	5

**Project Issues Chart (Issues by Owner):**

Owner	Count	Percentage
Drywall Subcontractor	1	25%
Concrete Foundation Subcontractor	1	25%
Finishes & Fitout Subcontractor	2	50%

**Communication Center:**

- Autumn Breezes Assisted Living Center
  - Bruce (V.P. of Construction)
  - Chuck (Scheduling Manager)
  - Civil Structural Contractor
  - Jeff (Project Manager)
  - Mechanical Electrical Piping
  - Medical Facility Owner
  - Steve (Field Engineer)

PRIMAVERA Welcome, Jeff (Project Manager)

Project Workspace - Edison Area High School (Renovation & New Construction)

Project Reports

Assign Report | Schedule | Remove | Refresh

<input type="checkbox"/>	Report Name	Schedule State	Last Run Date	Schedule Type	Status
<input type="checkbox"/>	AD-01 Activity Status Report	Enabled		Every Day	Pending
<input type="checkbox"/>	CE-01 Cost, Effort Summary By Project (Labor)	Enabled		Every Month	Pending
<input checked="" type="checkbox"/>	CO-01 Change Order Log with Costs	Enabled		Every 2 Weeks	Pending
<input type="checkbox"/>	CT-01 Monthly Project Cash Flow	Enabled		Every Month	Pending
<input type="checkbox"/>	LA-01 Two Week Lookahead	Enabled		Every Week	Pending
<input type="checkbox"/>	PW-01 WBS Earned Value	Enabled			
<input type="checkbox"/>	RE-01 Earned Value Costs for WBS and Activities	Enabled			
<input type="checkbox"/>	SR-01 Classic Schedule Report - Sort by ES, TF	Enabled			
<input type="checkbox"/>	SR-07 Activity Breakdown By WBS	Enabled			

Report Schedule Options - Microsof...

OK | Cancel

**Report Schedule Options**

Everyday at  
 0 Hours 0 Minutes

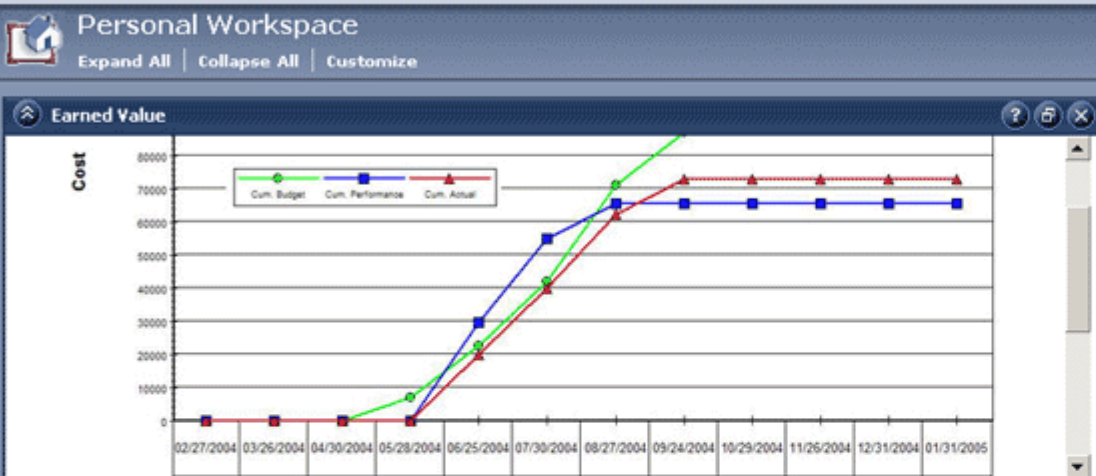
Every week on  
 Sunday at 0 Hours 0 Minutes

Every two weeks on the  
 first Friday at 12 Hours 0 Minutes

Every month on the  
 first Sunday at 0 Hours 0 Minutes

Run as soon as possible

Done



### Communication Center

Name	
<input type="checkbox"/>	9 Pacific Drive - Lofty Heights
<input checked="" type="checkbox"/>	Autumn Breezes Assisted Living Center
<input type="checkbox"/>	Bruce (V.P. of Construction)
<input checked="" type="checkbox"/>	Chuck (Scheduling Manager)
<input type="checkbox"/>	Concrete Foundation Subcontractor
<input type="checkbox"/>	Finishes Subcontractor
<input type="checkbox"/>	Jeff (Project Manager)
<input type="checkbox"/>	Paving & Roadways Subcontractor
<input type="checkbox"/>	Rough Capentry Subcontractor
<input checked="" type="checkbox"/>	Edison Area High School (Renovation & New Construction)
<input checked="" type="checkbox"/>	Lincoln Hospital Project
<input checked="" type="checkbox"/>	Trauma Ward - April update

Page: 1 of 1

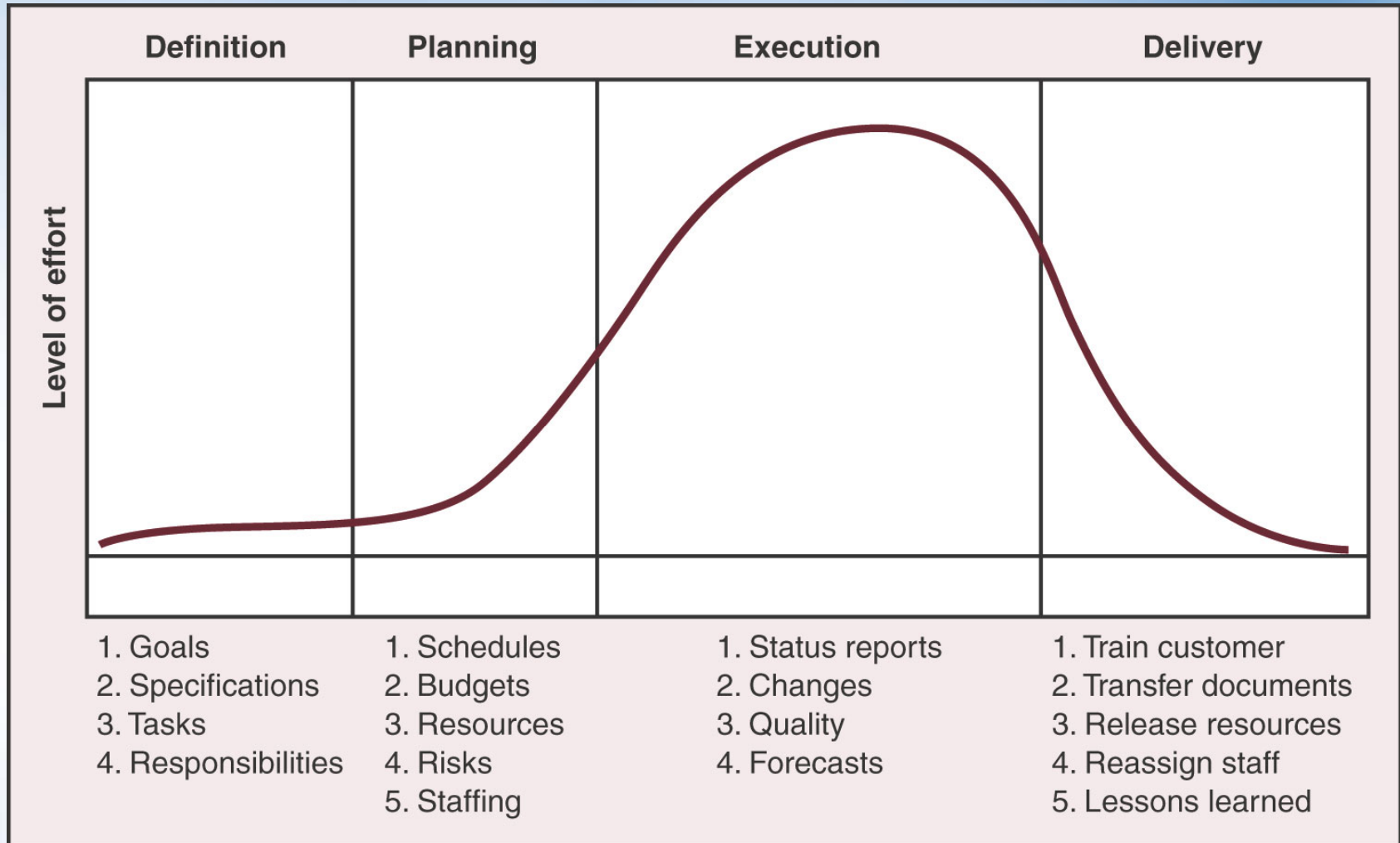
Send an e-mail



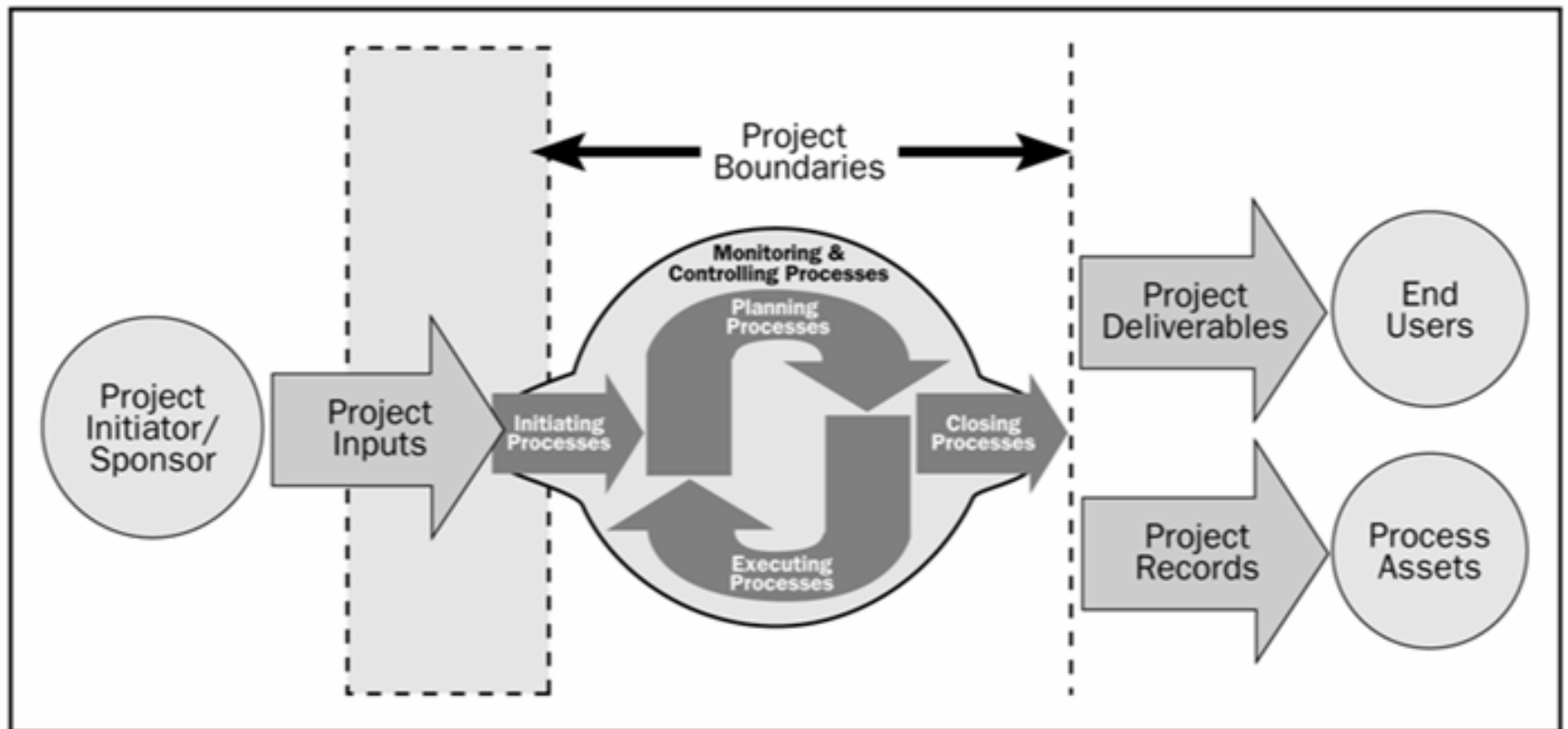
# 專案實例

- > 電子商務行銷專案 (服飾代理、家具...)
- > 大型活動專案 (學校、百貨、歌唱比賽...)
- > 資訊系統發展專案 (電視新聞數位影音資料庫、區域無線上網、行政院防救災資訊系統委外專案計畫...)
- > 產品開發專案 (手機、RFID...)
- > 工程專案 (建築、土地開發、高鐵、捷運、公路、海港、道路修復、橋梁設計、掩埋場設計...)
- > 其它：醫療防疫小組、人力招募專案、創業

# Project Life Cycle (專案生命週期)



# PM Processes (PDCA)

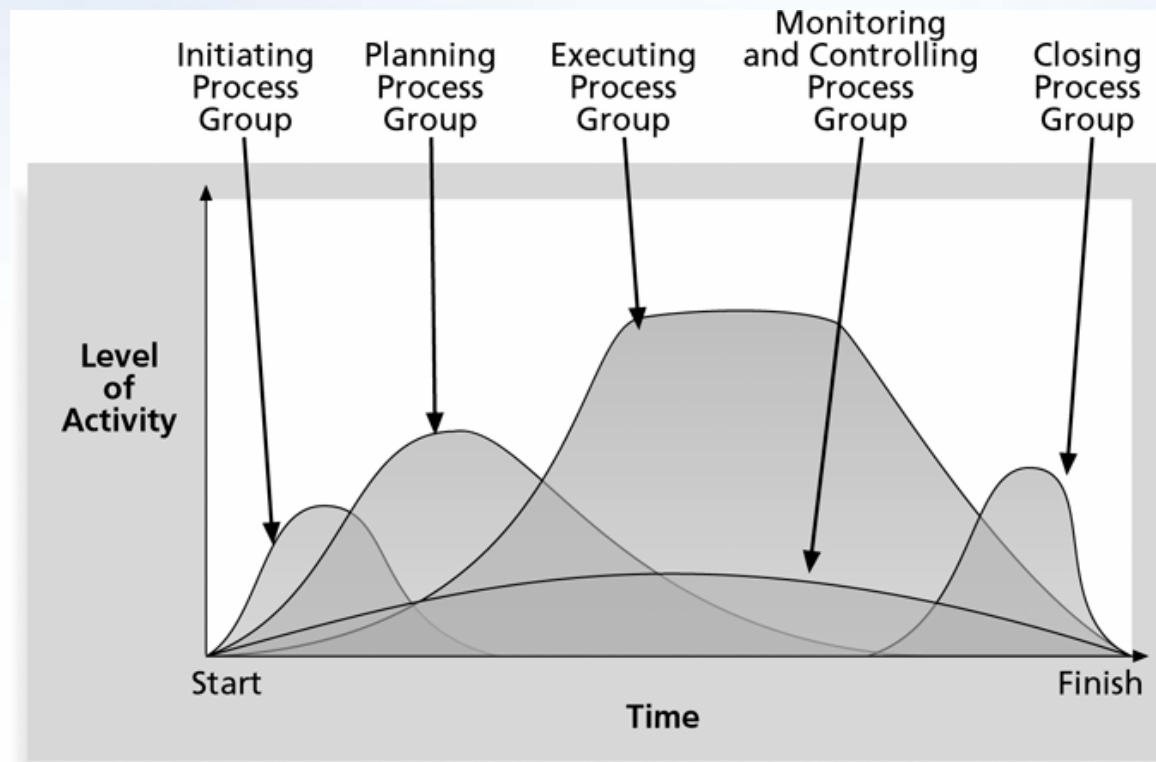


Plan – Do – Check – Action Cycle

Source: PMBOK 2004

# Five Project Management Processes

- > **Initiating Processes (起始過程)**
- > **Planning Processes (計畫過程)**
- > **Executing Processes (執行過程)**
- > **Controlling Processes (控制過程)**
- > **Closing Processes (結案過程)**

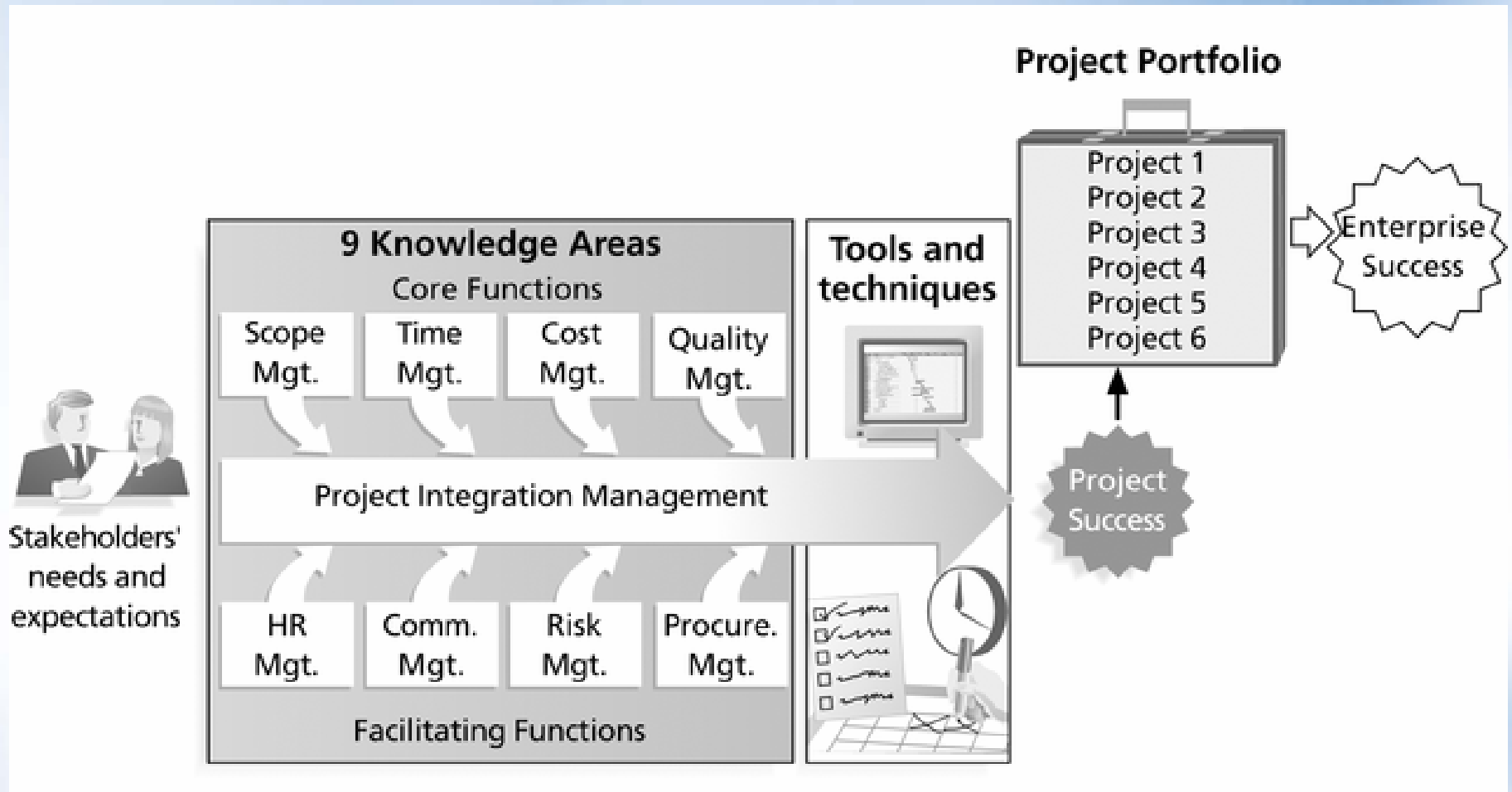


# Nine Project Management Knowledge Areas

- > **Knowledge areas describe the key competencies that project managers must develop.**
  - Four core knowledge areas lead to specific project objectives (**scope, time, cost, and quality**).
  - Four facilitating knowledge areas are the means through which the project objectives are achieved (**human resources, communication, risk, and procurement management**).
  - One knowledge area (**project integration management**) affects and is affected by all of the other knowledge areas.
  - All knowledge areas are important!



# Project Management Framework



# Relationships Among Process Groups and Knowledge Areas

KNOWLEDGE AREA	PROJECT MANAGEMENT PROCESS GROUPS				
	INITIATING	PLANNING	EXECUTING	MONITORING & CONTROLLING	CLOSING
<i>Project Integration Management</i>	Develop project charter, Develop preliminary project scope statement	Develop project management plan	Direct and manage project execution	Monitor and control project work, Integrated change control	Close project
<i>Project Scope Management</i>		Scope planning, Scope definition, Create WBS		Scope verification, Scope control	
<i>Project Time Management</i>		Activity definition, Activity sequencing, Activity resource estimating, Activity duration estimating, Schedule development		Schedule control	
<i>Project Cost Management</i>		Cost estimating, Cost budgeting		Cost control	

PMBOK® Guide 2004, p. 69

# Relationships Among Process Groups and Knowledge Areas (cont'd)

KNOWLEDGE AREA	PROJECT MANAGEMENT PROCESS GROUPS				
	INITIATING	PLANNING	EXECUTING	MONITORING & CONTROLLING	CLOSING
<i>Project Quality Management</i>		Quality planning	Perform quality assurance	Perform quality control	
<i>Project Human Resource Management</i>		Human resource planning	Acquire project team, Develop project team	Manage project team	
<i>Project Communications Management</i>		Communications planning	Information distribution	Performance reporting, Manage stakeholders	
<i>Project Risk Management</i>		Risk management planning, Risk identification, Qualitative risk analysis, Quantitative risk analysis, Risk response planning		Risk monitoring and control	
<i>Project Procurement Management</i>		Plan purchases and acquisitions, Plan contracting	Request seller responses, Select sellers	Contract administration	Contract closure

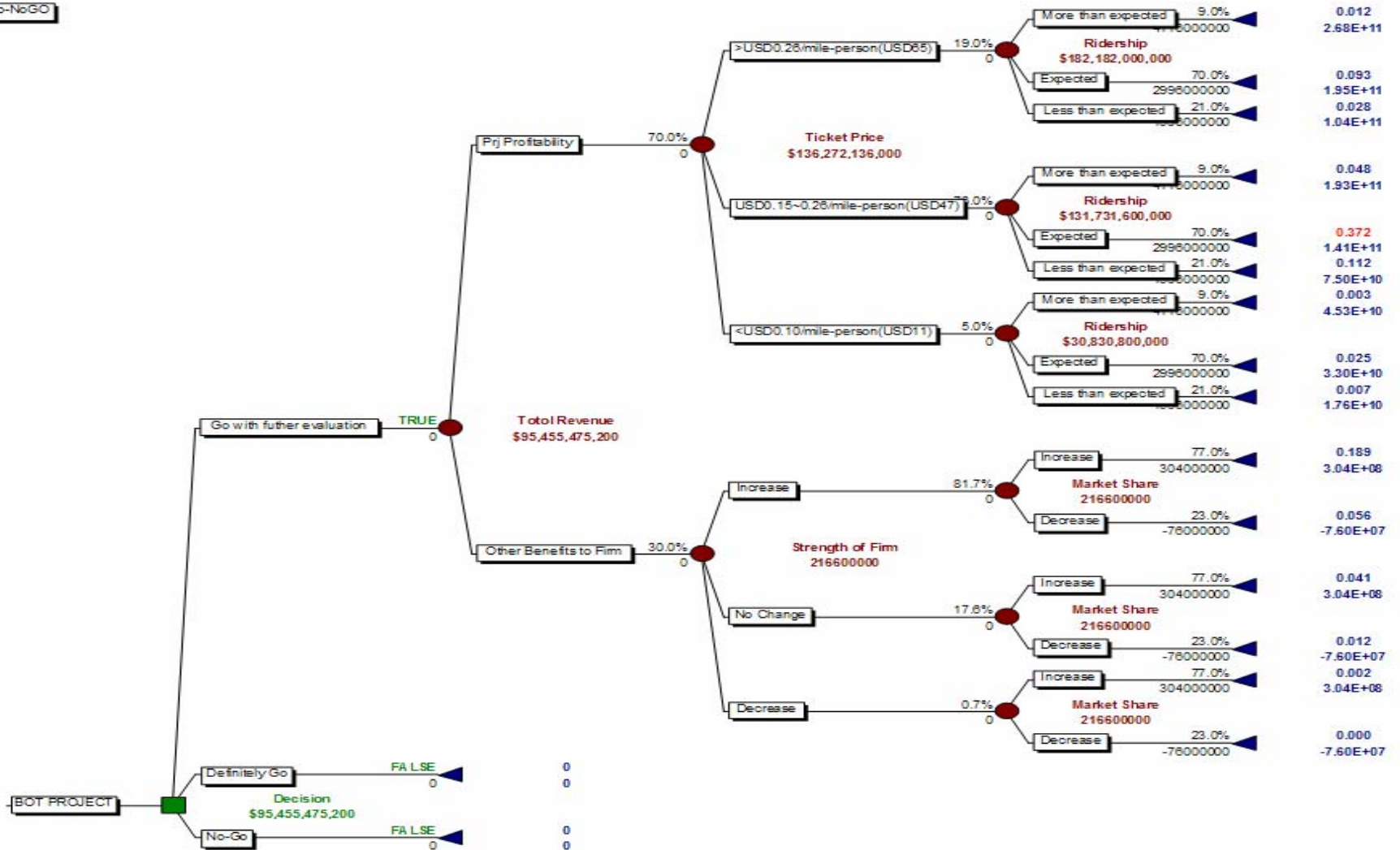
# 專案管理引用之技術

# Decision Tree 決策樹

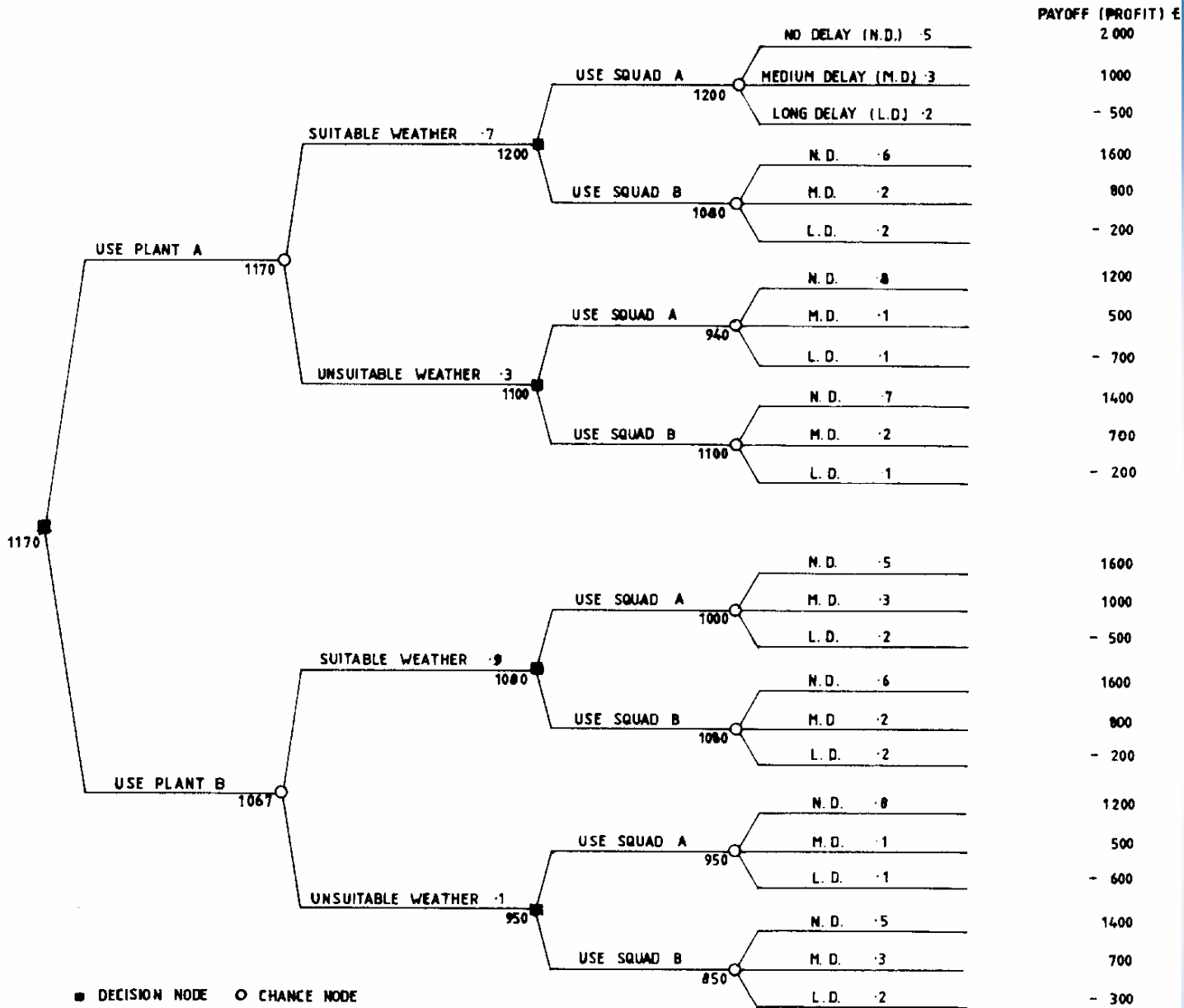
- > Decision Tree: a graphical model of the natural sequence of both decision and state variables and their possible values
  - **Sequence may/may not matter**
  - **All possible conditions should be included in model**

# Go/No-Go Decision (Chou)

Go-No-Go



# Cost Prediction (Birnie 1991)



Example:



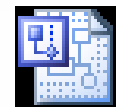
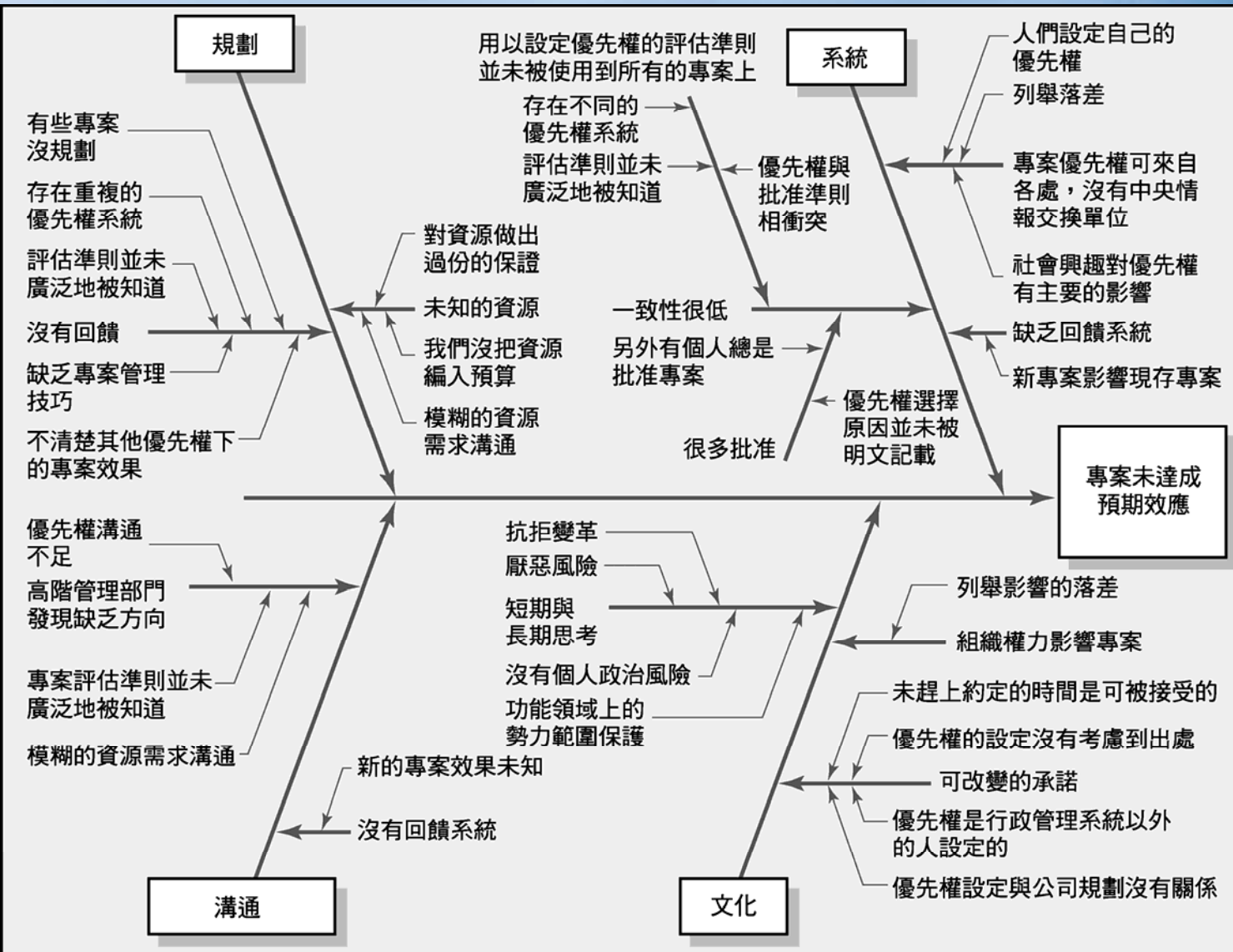
Microsoft Excel  
工作表

# 其它的決策實例

- > 該買預售屋或是成屋?
- > 活動該辦在地點A, B, or C?
- > 賣場大樓該建於何處?
- > 該錄取何人?
- > 道路規劃路線該選擇A, B, or C?
- > 醫療精密儀器該選擇何廠牌?
- > 隧道工程該採用何種工法? (TBM、爆破法、潛盾工法...)
- > ...

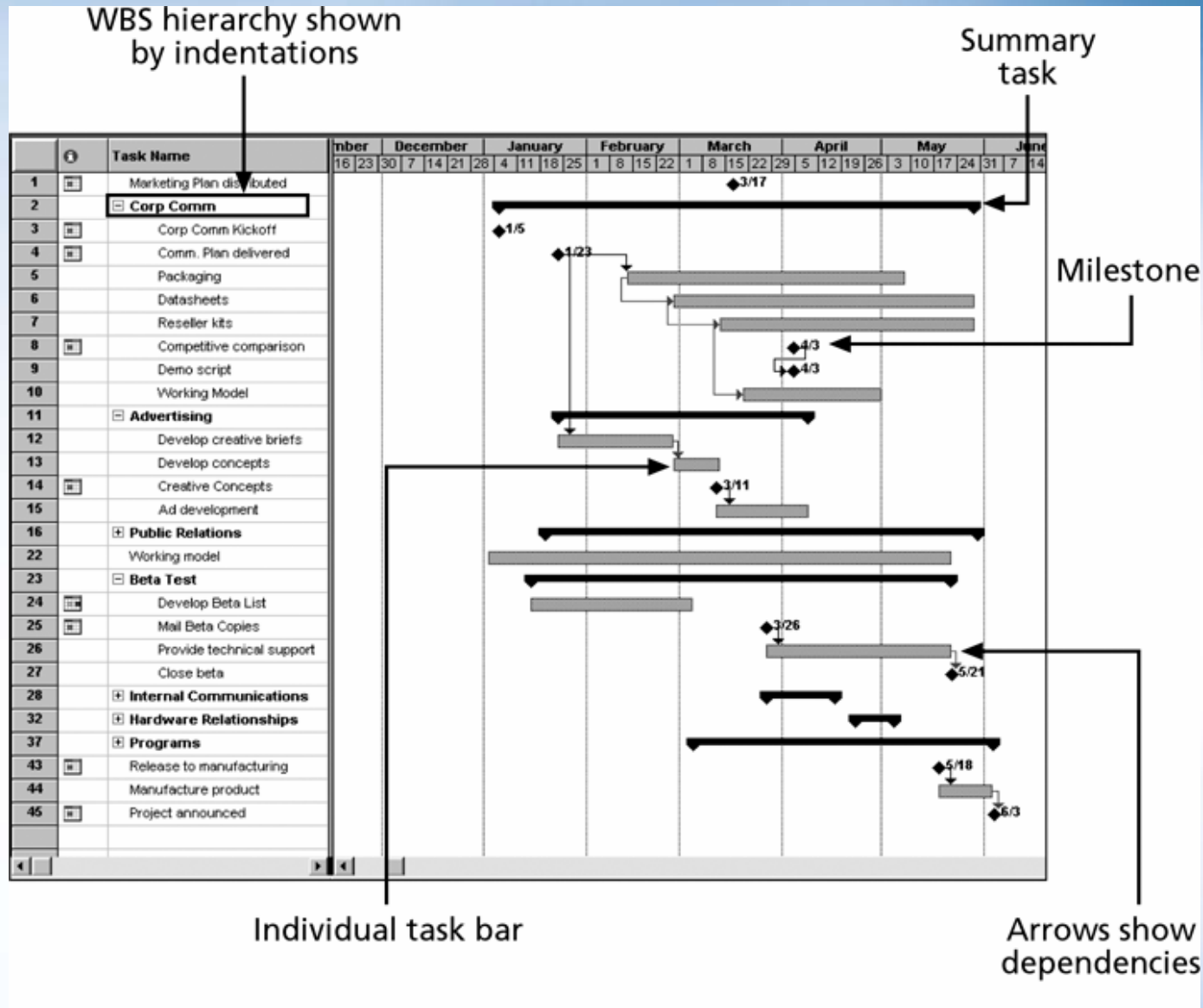


# Fishbone Diagram

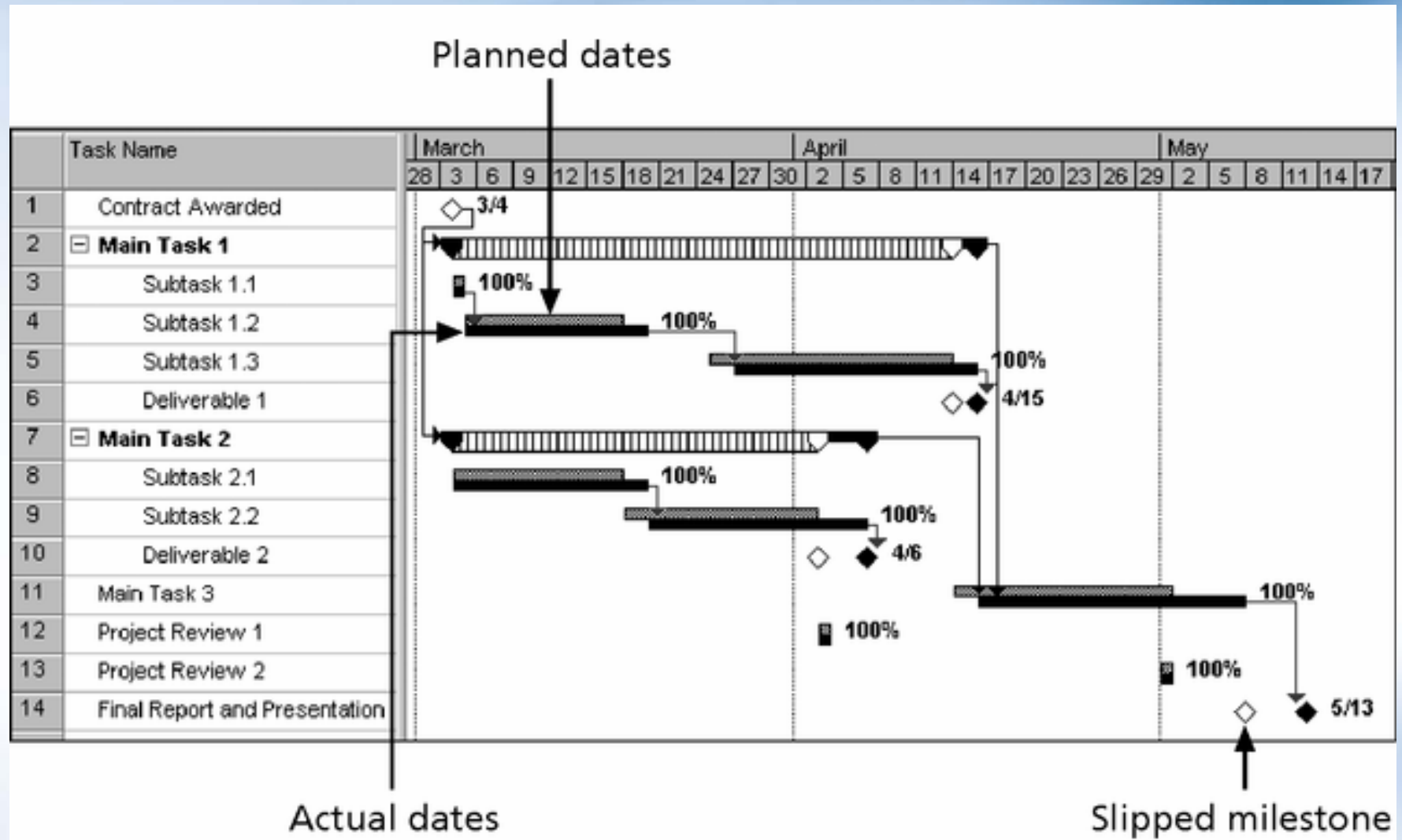


Microsoft Visio Drawing

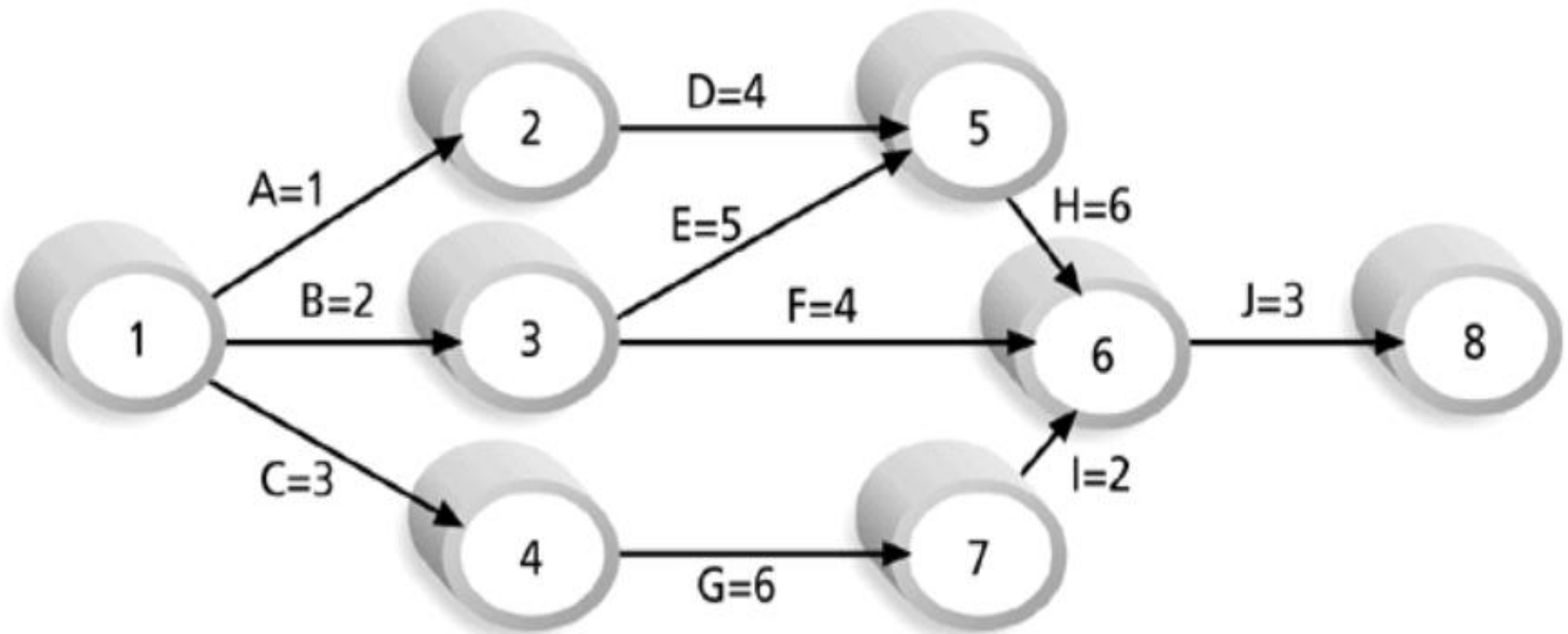
# Gantt Chart for Software Launch Project



# Sample Tracking Gantt Chart



# Sample Activity-on-Arrow (AOA) Network Diagram for Project X

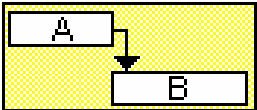
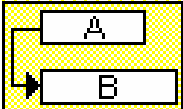
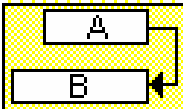
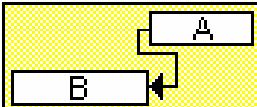


Note: Assume all durations are in days; A=1 means Activity A has a duration of 1 day.

# Task Dependency Types

## Task dependencies

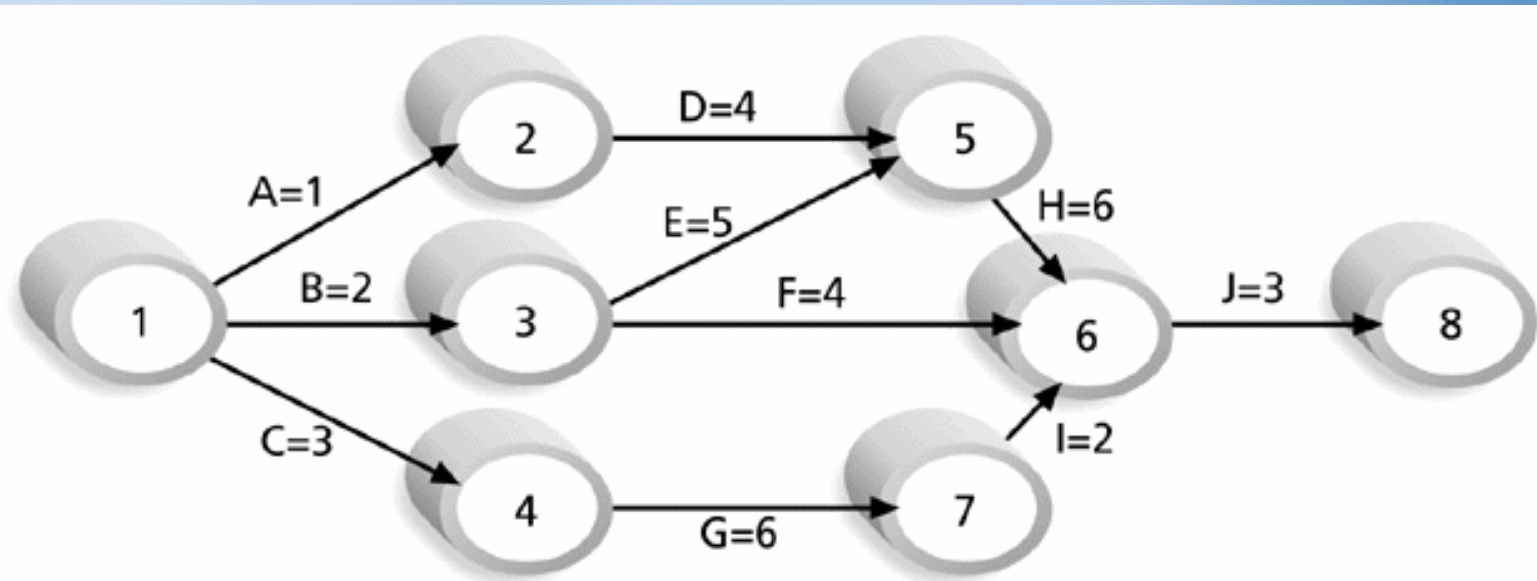
The nature of the dependencies between linked tasks. You link tasks by defining a dependency between their finish and start dates. For example, the "Contact caterers" task must finish before the start of the "Determine menus" task. There are four kinds of task dependencies in Microsoft Project:

Task dependency	Example	Description
Finish-to-start (FS)		Task (B) cannot start until task (A) finishes.
Start-to-start (SS)		Task (B) cannot start until task (A) starts.
Finish-to-finish (FF)		Task (B) cannot finish until task (A) finishes.
Start-to-finish (SF)		Task (B) cannot finish until task (A) starts.

# Critical Path Method (CPM)

- > **CPM** is a network diagramming technique used to predict total project duration.
- > A **critical path** for a project is the series of activities that determines the *earliest time* by which the project can be completed.
- > The critical path is the *longest path* through the network diagram and has the least amount of slack or float.
- > **Slack or float** is the amount of time an activity can be delayed without delaying a succeeding activity or the project finish date.

# Determining the Critical Path for Project X



Note: Assume all durations are in days.

Path 1: A-D-H-J Length =  $1+4+6+3 = 14$  days

Path 2: B-E-H-J Length =  $2+5+6+3 = 16$  days

Path 3: B-F-J Length =  $2+4+3 = 9$  days

Path 4: C-G-I-J Length =  $3+6+2+3 = 14$  days

Since the critical path is the longest path through the network diagram, Path 2, B-E-H-J, is the critical path for Project X.

# Program Evaluation and Review Technique (PERT)

- > **PERT** is a network analysis technique used to estimate project duration when there is a high degree of uncertainty about the individual activity duration estimates.
- > **PERT uses probabilistic time estimates:**
  - **Duration estimates based on using optimistic, most likely, and pessimistic estimates of activity durations, or a three-point estimate.**



# PERT Formula and Example

> PERT weighted average =

$$\frac{\text{optimistic time} + 4X \text{ most likely time} + \text{pessimistic time}}{6}$$

> Example:

PERT weighted average =

$$\frac{8 \text{ workdays} + 4 X 10 \text{ workdays} + 24 \text{ workdays}}{6} = 12 \text{ days}$$

where:

optimistic time= 8 days

most likely time = 10 days

pessimistic time = 24 days

Therefore, you'd use 12 days on the network diagram instead of 10 when using PERT for the above example.

# Management Information Systems in PM

## > MS Office

- Word
- Excel
- Visio
- Project 2003
- FrontPage
- PowerPoint
- Access

## > Primavera

## > ASP

- Application tailored for client's needs

## > Open Source Software

## > ...

## Microsoft Office Project Standard 2003

Project  
Standard 2003

Desktop application  
For individual business and project managers  
Most similar to previous versions of Project

## Microsoft Enterprise Project Management (EPM) Solution

Project team members and executives use Client Access Licenses to access information

Project managers use on their desktops, provides full functionality

Project Web  
Access

Project  
Professional  
2003

Project  
Server 2003

Server software, central location for project-related information

Microsoft SQL Server

Required for enterprise project management functionality

Figure A-4. Microsoft Office Project Standard 2003 Versus Microsoft Enterprise Project Management (EPM) Solution

# 九大知識領域

- > Project Integration Management
  
- > Core Knowledge [main focus in this two lectures]
  - Project Scope Management
  - Project Time Management
  - Project Cost Management
  - Project Quality Management
  
- > Facilitating Knowledge [introduction only]
  - Project Human Resource management
  - Project Communication Management
  - Project Risk Management
  - Project Procurement Management

# Project Integration Management Processes

- > **Develop the project charter:** Work with stakeholders to create the document that formally authorizes a project—the charter.
- > **Develop the preliminary project scope statement:** Work with stakeholders, especially users of the project's products, services, or results, to develop the high-level scope requirements and create a preliminary project scope statement.
- > **Develop the project management plan:** Coordinate all planning efforts to create a consistent, coherent document—the project management plan.



Adobe Acrobat  
7.0 Document

# Project Integration Management Processes (cont'd)

- > **Direct and manage project execution:** Carry out the project management plan by performing the activities included in it.
- > **Monitor and control the project work:** Oversee project work to meet the performance objectives of the project.
- > **Perform integrated change control:** Coordinate changes that affect the project's deliverables and organizational process assets.
- > **Close the project:** Finalize all project activities to formally close the project.

# PROJECT INTEGRATION MANAGEMENT

## 4.1 Develop Project Charter

1. **Inputs**
  - .1 Contract
  - .2 Statement of work
  - .3 Enterprise environmental factors
  - .4 Organizational process assets
2. **Tools and Techniques**
  - .1 Project selection methods
  - .2 Project management methodology
  - .3 Project management information system
  - .4 Expert judgment
3. **Outputs**
  - .1 Project charter

## 4.2 Develop Preliminary Project Scope Statement

1. **Inputs**
  - .1 Project charter
  - .2 Statement of work
  - .3 Enterprise environmental factors
  - .4 Organizational process assets
2. **Tools and Techniques**
  - .1 Project management methodology
  - .2 Project management information system
  - .3 Expert judgment
3. **Outputs**
  - .1 Preliminary project scope statement

## 4.3 Develop Project Management Plan

1. **Inputs**
  - .1 Preliminary project scope statement
  - .2 Project management processes
  - .3 Enterprise environmental factors
  - .4 Organizational process assets
2. **Tools and Techniques**
  - .1 Project management methodology
  - .2 Project management information system
  - .3 Expert judgment
3. **Outputs**
  - .1 Project management plan

## 4.4 Direct and Manage Project Execution

1. **Inputs**
  - .1 Project management plan
  - .2 Approved corrective actions
  - .3 Approved preventive actions
  - .4 Approved change requests
  - .5 Approved defect repair
  - .6 Validated defect repair
  - .7 Administrative closure procedures
2. **Tools and Techniques**
  - .1 Project management methodology
  - .2 Project management information system
3. **Outputs**
  - .1 Deliverables
  - .2 Requested changes
  - .3 Implemented change requests
  - .4 Implemented corrective actions
  - .5 Implemented preventive actions
  - .6 Implemented defect repair
  - .7 Work performance information

## 4.5 Monitor and Control Project Work

1. **Inputs**
  - .1 Project management plan
  - .2 Work performance information
  - .3 Rejected change requests
2. **Tools and Techniques**
  - .1 Project management methodology
  - .2 Project management information system
  - .3 Earned value technique
  - .4 Expert judgment
3. **Outputs**
  - .1 Recommended corrective actions
  - .2 Recommended preventive actions
  - .3 Forecasts
  - .4 Recommended defect repair
  - .5 Requested changes

## 4.6 Integrated Change Control

1. **Inputs**
  - .1 Project management plan
  - .2 Requested changes
  - .3 Work performance information
  - .4 Recommended preventive actions
  - .5 Recommended corrective actions
  - .6 Recommended defect repair
  - .7 Deliverables
2. **Tools and Techniques**
  - .1 Project management methodology
  - .2 Project management information system
  - .3 Expert judgment
3. **Outputs**
  - .1 Approved change requests
  - .2 Rejected change requests
  - .3 Project management plan (updates)
  - .4 Project scope statement (updates)
  - .5 Approved corrective actions
  - .6 Approved preventive actions
  - .7 Approved defect repair
  - .8 Validated defect repair
  - .9 Deliverables

## 4.7 Close Project

1. **Inputs**
  - .1 Project management plan
  - .2 Contract documentation
  - .3 Enterprise environmental factors
  - .4 Organizational process assets
  - .5 Work performance information
  - .6 Deliverables
2. **Tools and Techniques**
  - .1 Project management methodology
  - .2 Project management information system
  - .3 Expert judgment
3. **Outputs**
  - .1 Administrative closure procedure
  - .2 Contract closure procedure
  - .3 Final product, service, or result
  - .4 Organizational process assets (updates)

# 專案選擇與決策分析模式-

## Financial Analysis of Projects

- > Financial considerations are often an important aspect of the project selection process.
- > Three primary methods for determining the projected financial value of projects:

- **Net present value (NPV) analysis**



Microsoft Excel  
工作表

- **Payback analysis**



Microsoft Excel  
工作表



# Return on investment (ROI)

Multiply by the discount factor each year, then subtract costs from cumulative benefits to get NPV.

Discount rate	8%						
Assume the project is completed in Year 0			Year				
	0	1	2	3	Total		
Costs	140,000	40,000	40,000	40,000			
Discount factor	1	0.93	0.86	0.79			
<b>Discounted costs</b>	<b>140,000</b>	<b>37,200</b>	<b>34,400</b>	<b>31,600</b>	<b>243,200</b>		
Benefits	0	200,000	200,000	200,000			
Discount factor	1	0.93	0.86	0.79			
<b>Discounted benefits</b>	<b>0</b>	<b>186,000</b>	<b>172,000</b>	<b>158,000</b>	<b>516,000</b>		
Discounted benefits - costs	(140,000)	148,800	137,600	126,400	<b>272,800</b>	← NPV	
Cumulative benefits - costs	(140,000)	8,800	146,400	272,800			
ROI	→		<b>112%</b>				
	<b>Payback In Year 1</b>						

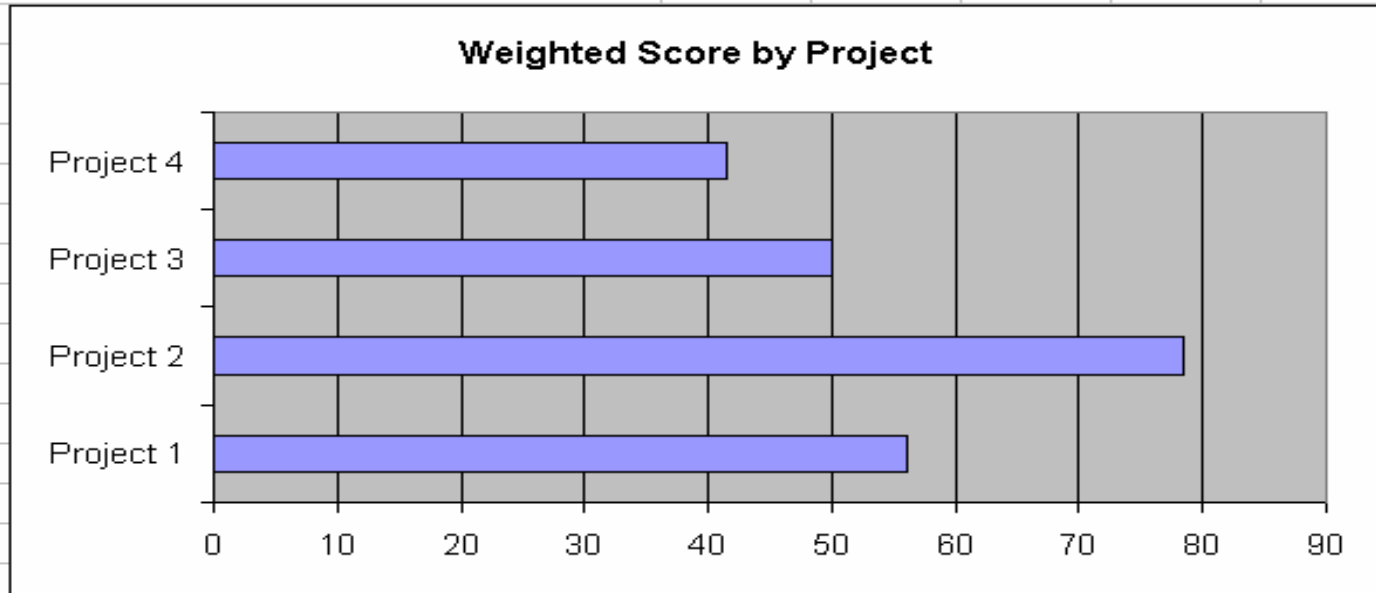
$$\text{ROI} = (\text{total discounted benefits} - \text{total discounted costs}) / \text{discounted costs}$$

# Weighted Scoring Model

- > A weighted scoring model is a tool that provides a systematic process for selecting projects based on many criteria.
- > Steps in identifying a weighted scoring model:
  1. Identify criteria important to the project selection process.
  2. Assign weights (percentages) to each criterion so they add up to 100 percent.
  3. Assign scores to each criterion for each project.
  4. Multiply the scores by the weights to get the total weighted scores.
- > The higher the weighted score, the better.

# Sample Weighted Scoring Model for Project Selection

	A	B	C	D	E	F
1	<b>Criteria</b>	<b>Weight</b>	<b>Project 1</b>	<b>Project 2</b>	<b>Project 3</b>	<b>Project 4</b>
2	Supports key business objectives	25%	90	90	50	20
3	Has strong internal sponsor	15%	70	90	50	20
4	Has strong customer support	15%	50	90	50	20
5	Realistic level of technology	10%	25	90	50	70
6	Can be implemented in one year or less	5%	20	20	50	90
7	Provides positive NPV	20%	50	70	50	50
8	Has low risk in meeting scope, time, and cost goals	10%	20	50	50	90
9	<b>Weighted Project Scores</b>	<b>100%</b>	<b>56</b>	<b>78.5</b>	<b>50</b>	<b>41.5</b>
10						



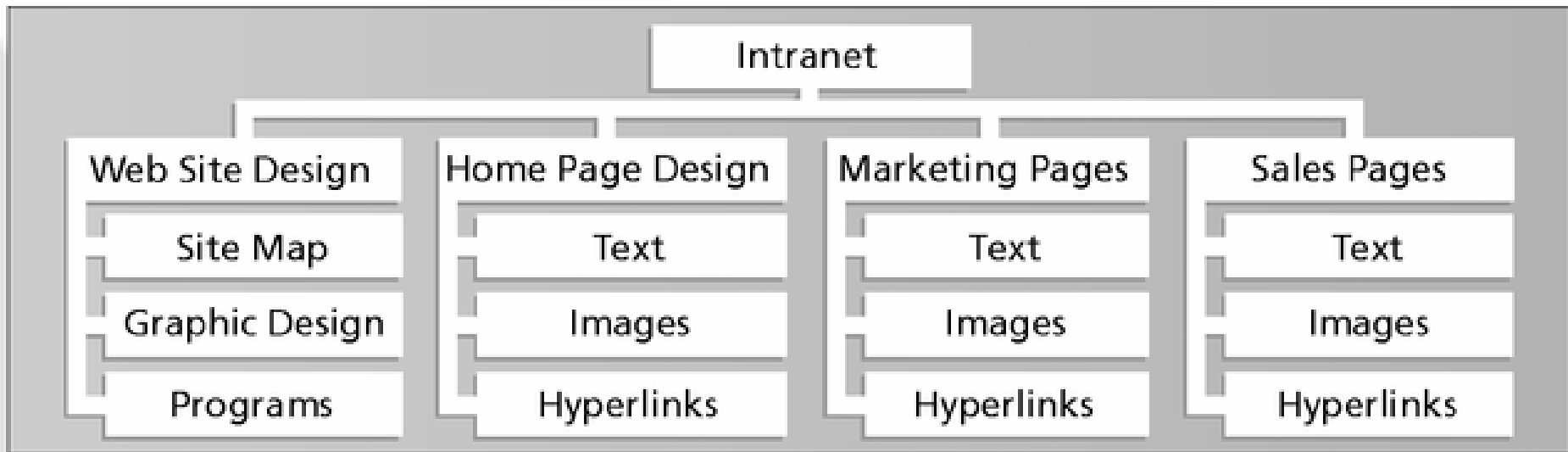
# What is Project Scope Management?

- > **Scope** refers to *all* the work involved in creating the products of the project and the processes used to create them.
- > A **deliverable** (交付標的) is a product produced as part of a project, such as hardware or software, planning documents, or meeting minutes.
- > Project scope management includes the processes involved in **defining and controlling** what is or is not included in a project.

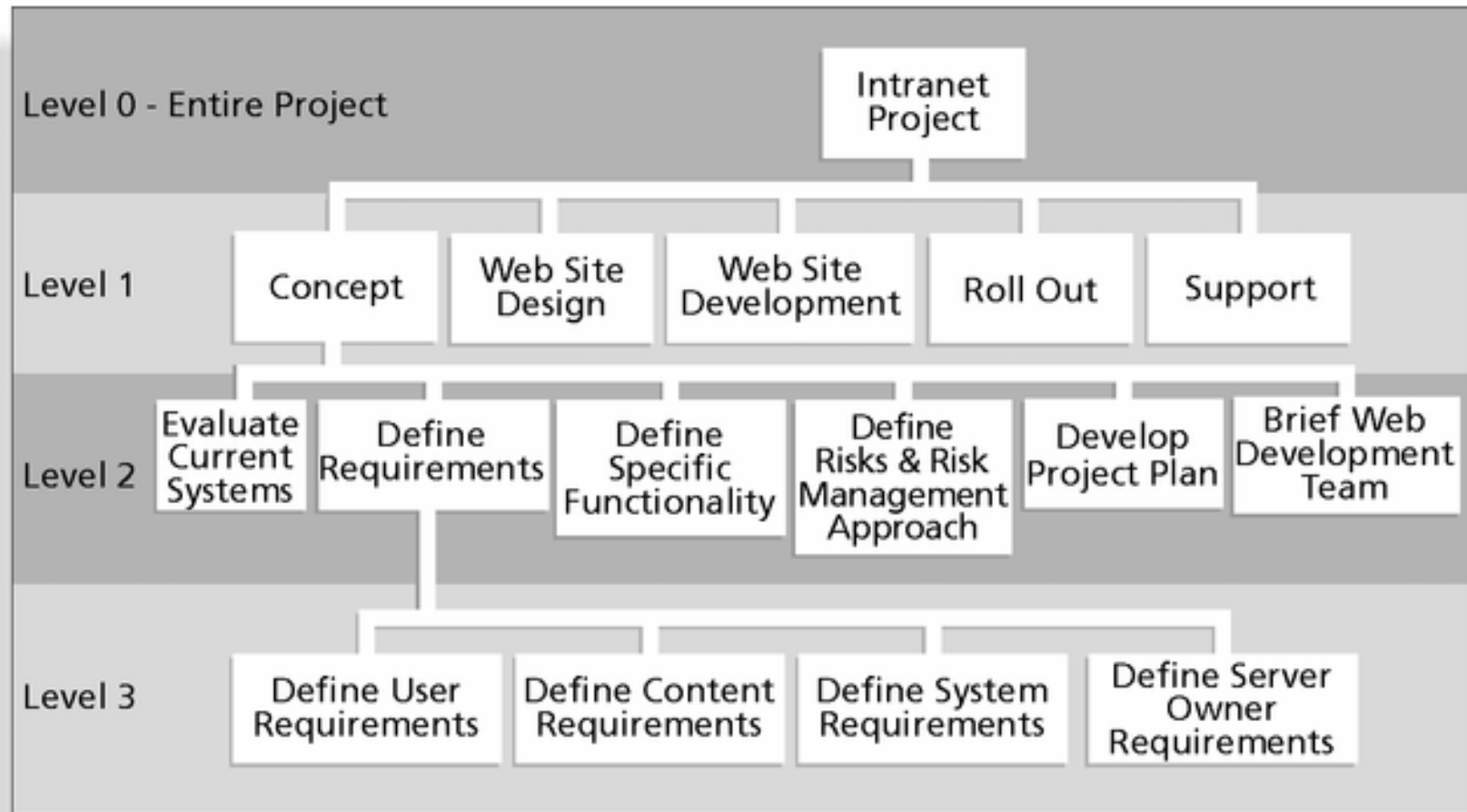
# Project Scope Management Processes

- > **Scope planning:** Key inputs include the project charter, preliminary scope statement, and project management plan.
- > **Scope definition:** Reviewing the project charter and preliminary scope statement and adding more information as requirements are developed and change requests are approved.
- > **Creating the WBS:** Subdividing the major project deliverables into smaller, more manageable components.
- > **Scope verification:** Formalizing acceptance of the project scope. → Scope creep!
- > **Scope control:** Controlling changes to project scope.

# Sample Intranet WBS Organized by Product



# Sample Intranet WBS Organized by Phase



# Intranet WBS in Tabular Form

## 1.0 Concept

1.1 Evaluate current systems

1.2 Define requirements

1.2.1 Define user requirements

1.2.2 Define content requirements

1.2.3 Define system requirements

1.2.4 Define server owner requirements

1.3 Define specific functionality

1.4 Define risks and risk management approach

1.5 Develop project plan

1.6 Brief Web development team

2.0 Web Site Design

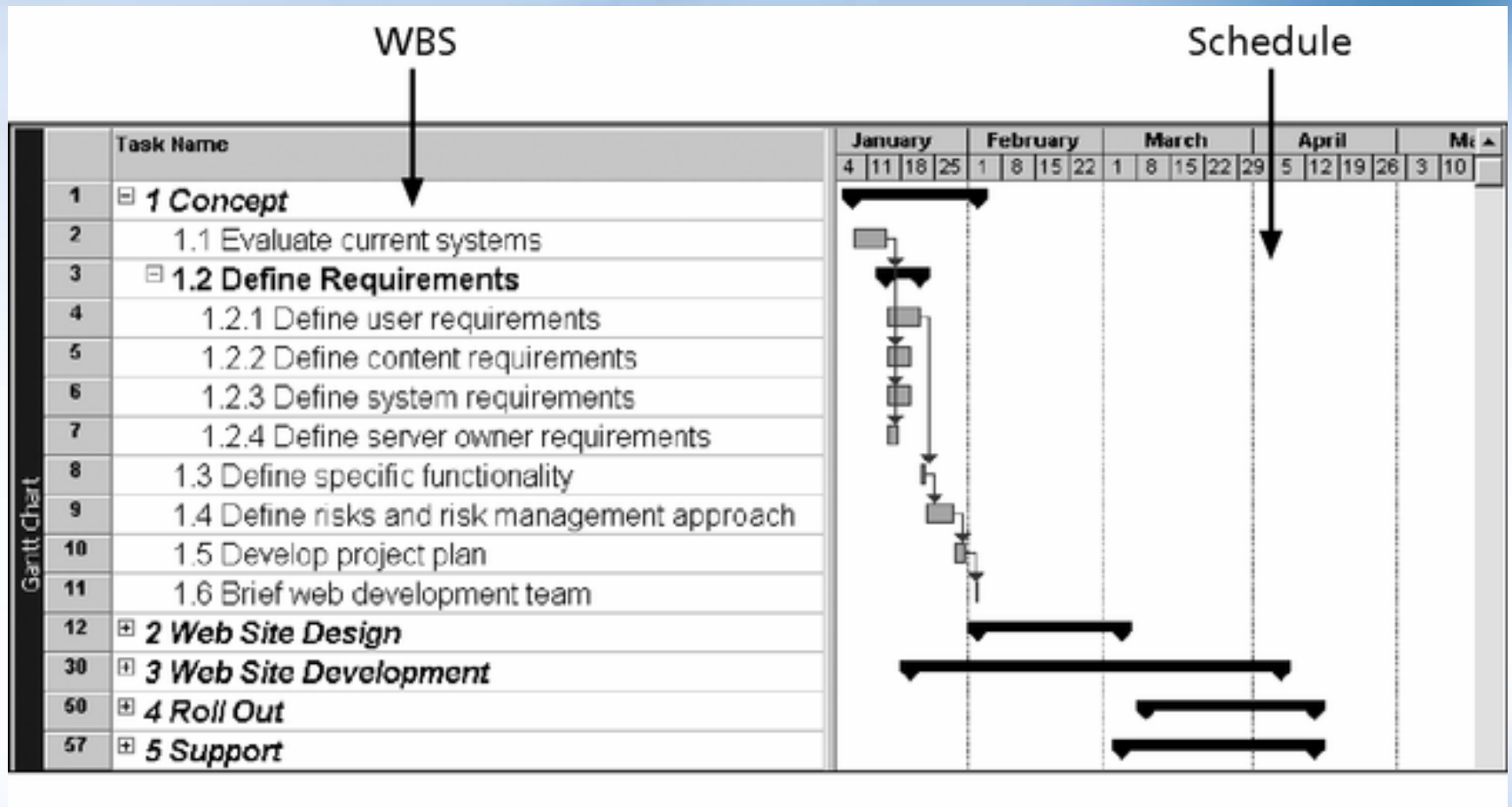
3.0 Web Site Development

4.0 Roll Out

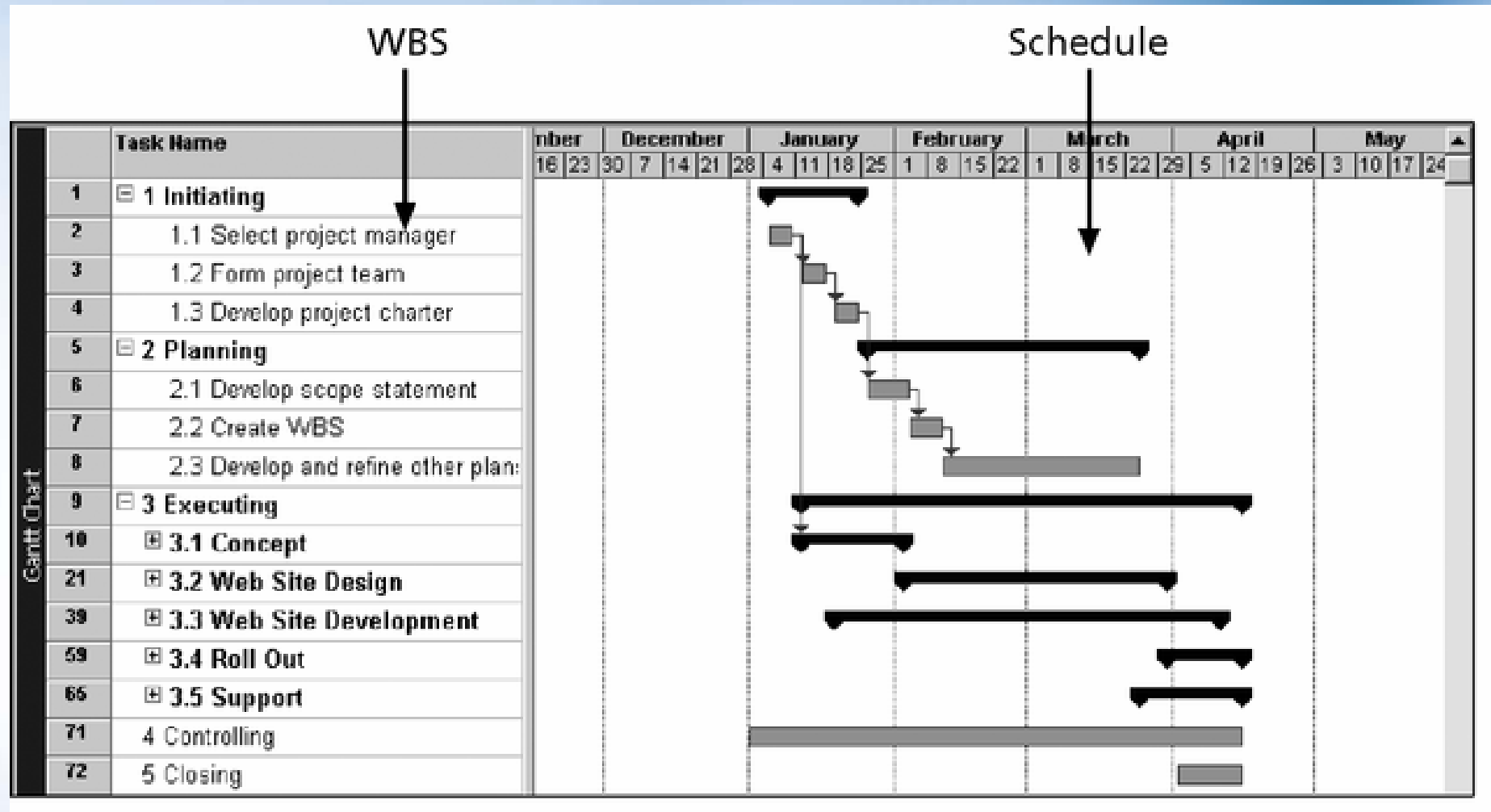
5.0 Support



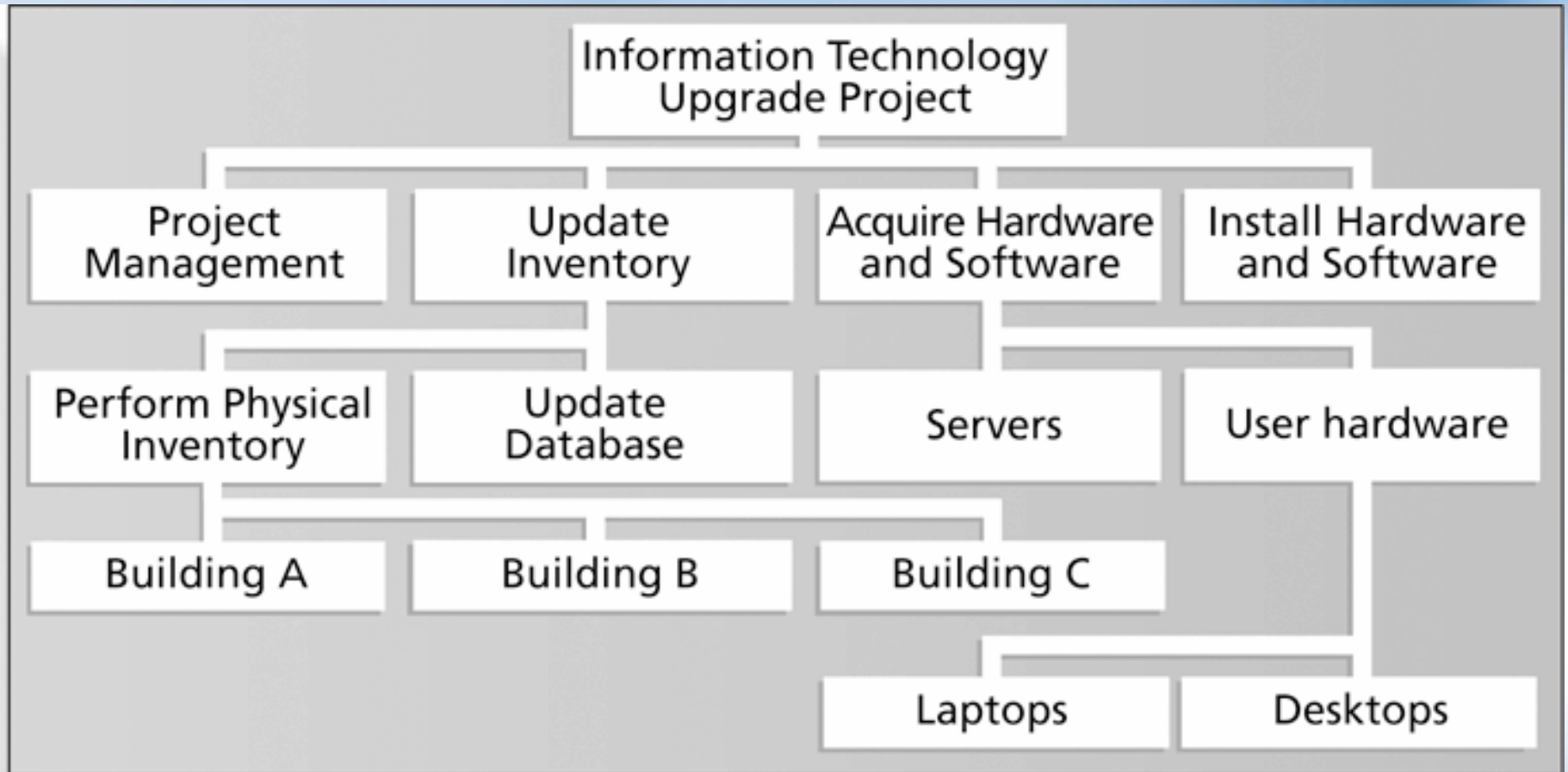
# Intranet WBS and Gantt Chart in Project 2000



# Intranet Gantt Chart Organized by Project Management Process Groups



# Resulting WBS in Chart Form



# Scope Management Demo

How to input scope based on WBS

How to number activities

Output to VISIO



Microsoft  
Project Document

# Project Time Management Processes

- > **Activity definition:** Identifying the specific activities that the project team members and stakeholders must perform to produce the project deliverables.
- > **Activity sequencing:** Identifying and documenting the relationships between project activities.
- > **Activity resource estimating:** Estimating how many resources a project team should use to perform project activities.
- > **Activity duration estimating:** Estimating the number of work periods that are needed to complete individual activities.
- > **Schedule development:** Analyzing activity sequences, activity resource estimates, and activity duration estimates to create the project schedule.
- > **Schedule control:** Controlling and managing changes to the project schedule.

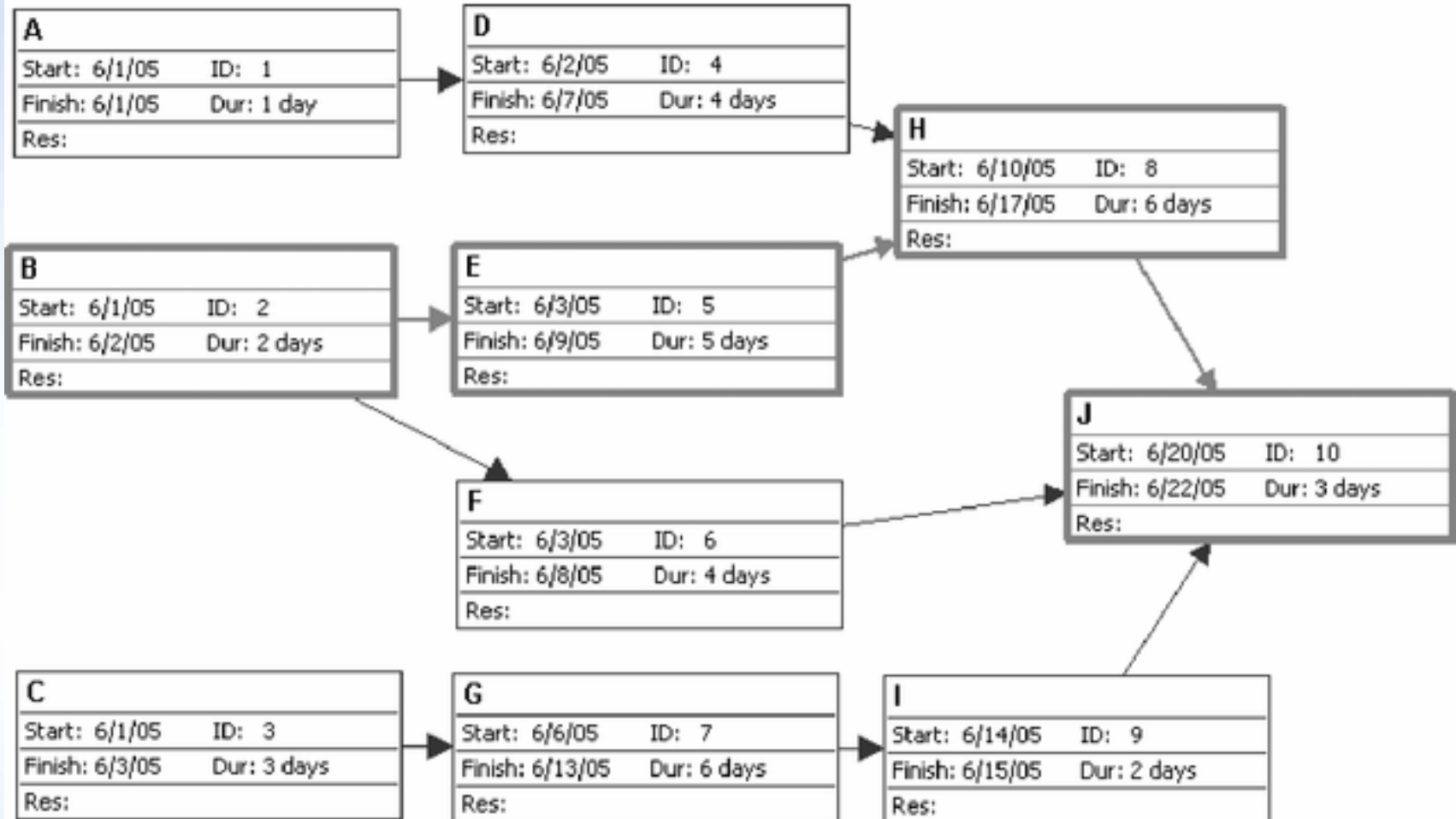
# Activity Sequencing

- > Involves reviewing activities and determining dependencies.
- > A **dependency or relationship** relates to the sequencing of project activities or tasks.
- > You *must* determine dependencies in order to use critical path analysis.

# Network Diagrams

- > **Network diagrams** are the preferred technique for showing activity sequencing.
- > **A network diagram** is a schematic display of the logical relationships among, or sequencing of, project activities.
- > Two main formats are the **arrow** and **precedence** diagramming methods.

# Sample PDM (Precedence Diagramming Method) Network Diagram

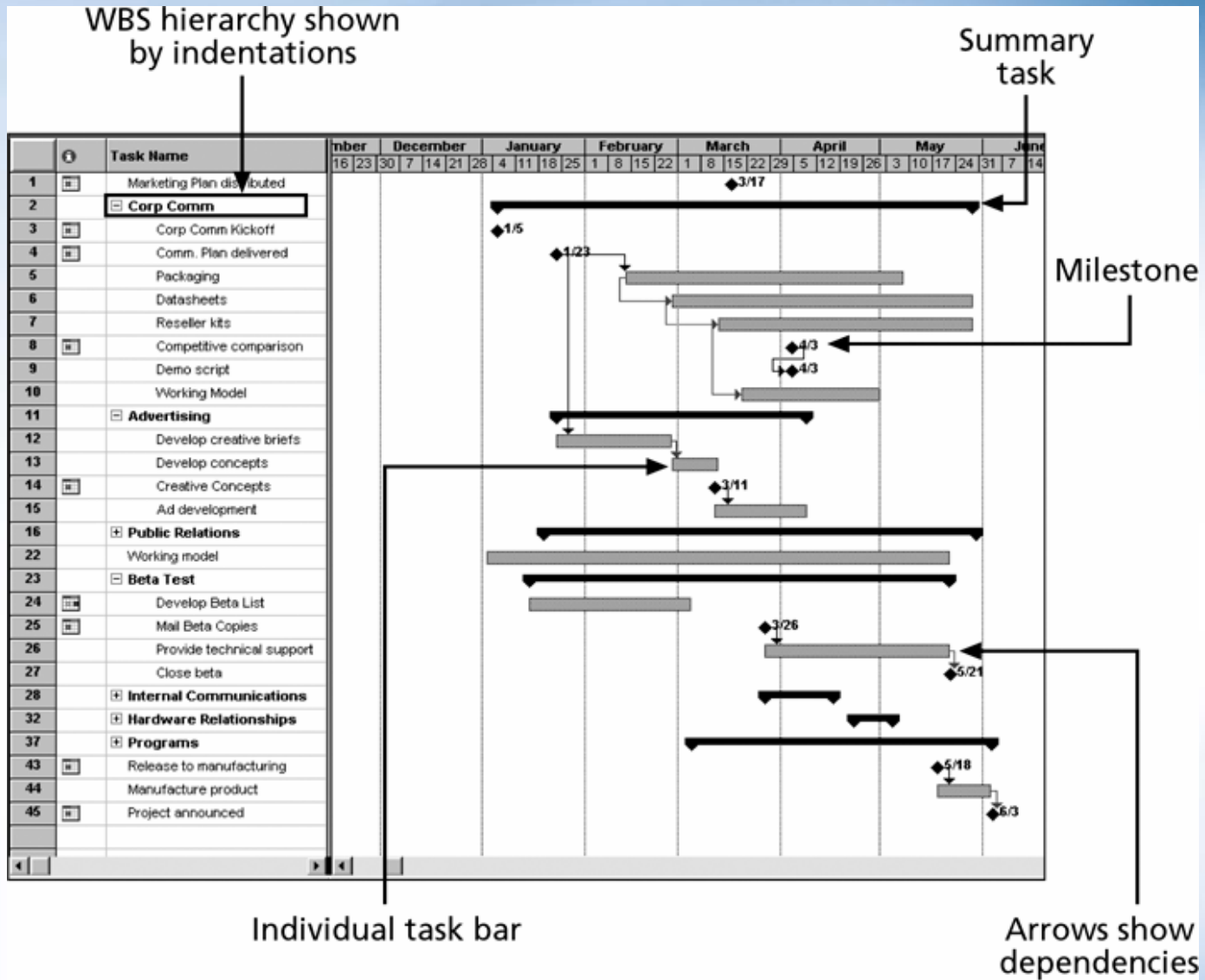




# Gantt Charts

- > **Gantt charts** provide a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format.
- > **Symbols include:**
  - **Black diamonds: Milestones**
  - **Thick black bars: Summary tasks**
  - **Lighter horizontal bars: Durations of tasks**
  - **Arrows: Dependencies between tasks**

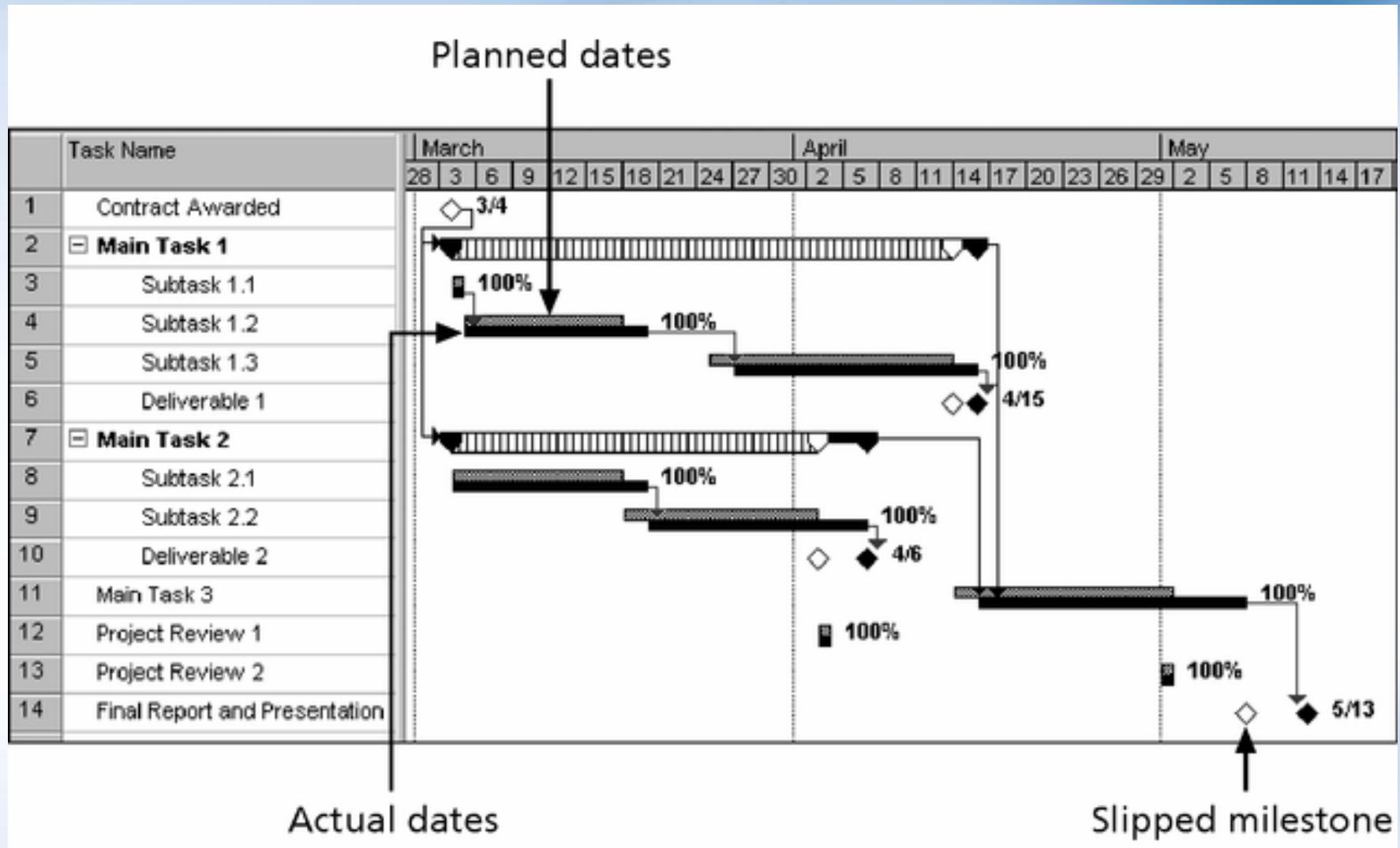
# Gantt Chart for Software Launch Project



# Adding Milestones to Gantt Charts

- > Many people like to focus on meeting milestones, especially for large projects.
- > Milestones emphasize important events or accomplishments in projects.
- > You typically create milestone by entering tasks that have a zero duration, or you can mark any task as a milestone.

# Sample Tracking Gantt Chart



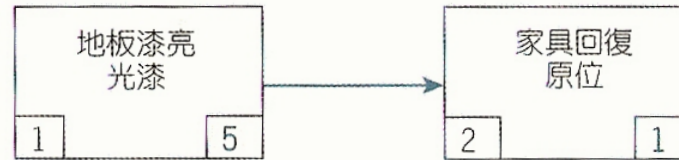
# Critical Path Method (CPM)

- > **CPM** is a network diagramming technique used to predict total project duration.
- > A **critical path** for a project is the series of activities that determines the *earliest time* by which the project can be completed.
- > The critical path is the *longest path* through the network diagram and has the least amount of slack or float.
- > **Slack** or **float** is the amount of time an activity can be delayed without delaying a succeeding activity or the project finish date.

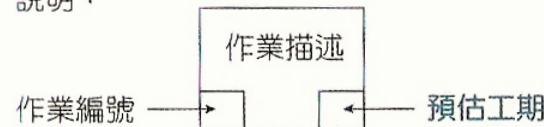
# Estimate Activity Duration

AIB

作業工期預估圖(盒狀型作業格式)

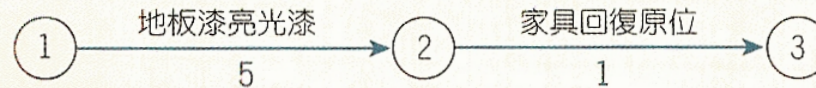


說明：

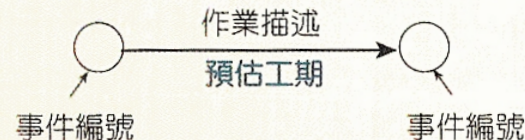


AOA

作業工期預估圖(箭線型作業格式)



說明：



Source: Successful PM

# Case Study: Development of a Web-based IS

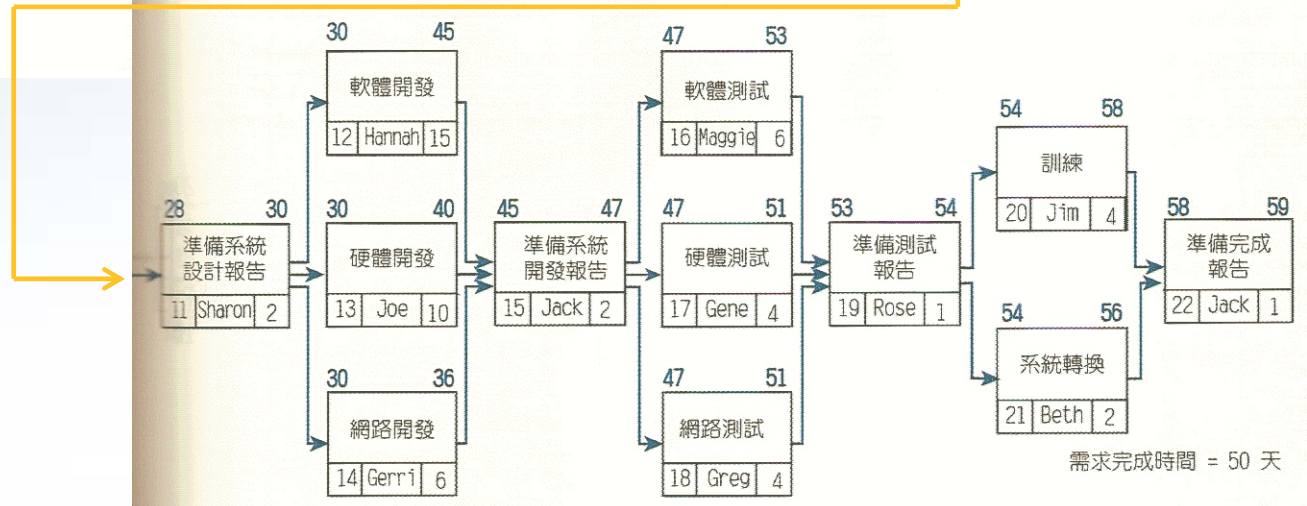
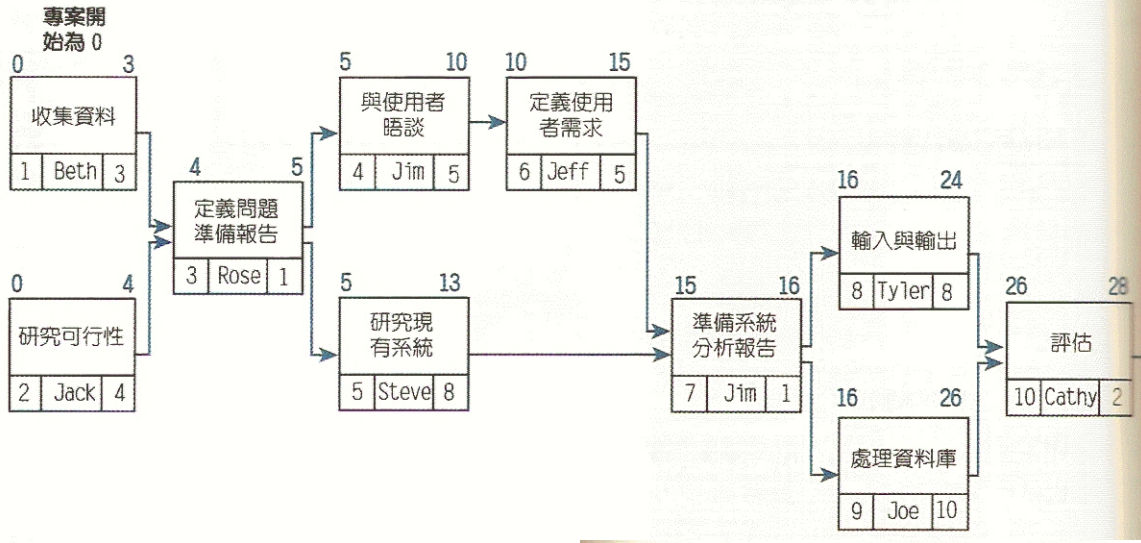
Requested to complete in  
50 days

## 網路報告系統專案

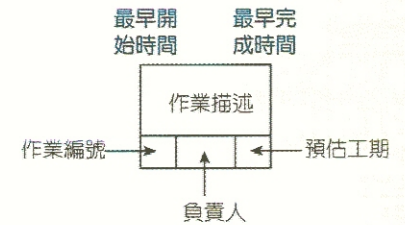
作業	前置作業	預估工期
1. 收集資料	—	3
2. 研究可行性	—	4
3. 定義問題準備報告	1, 2	1
4. 與使用者晤談	3	5
5. 研究現有系統	3	8
6. 定義使用者需求	4	5
7. 準備系統分析報告	5, 6	1
8. 輸入與輸出	7	8
9. 處理資料庫	7	10
10. 評估	8, 9	2
11. 準備系統設計報告	10	2
12. 軟體開發	11	15
13. 硬體開發	11	10
14. 網路開發	11	6
15. 準備系統開發報告	12, 13, 14	2
16. 軟體測試	15	6
17. 硬體測試	15	4
18. 網路測試	15	4
19. 準備測試報告	16, 17, 18	1
20. 訓練	19	4
21. 系統轉換	19	2
22. 準備完成報告	20, 21	1

Source: Successful PM

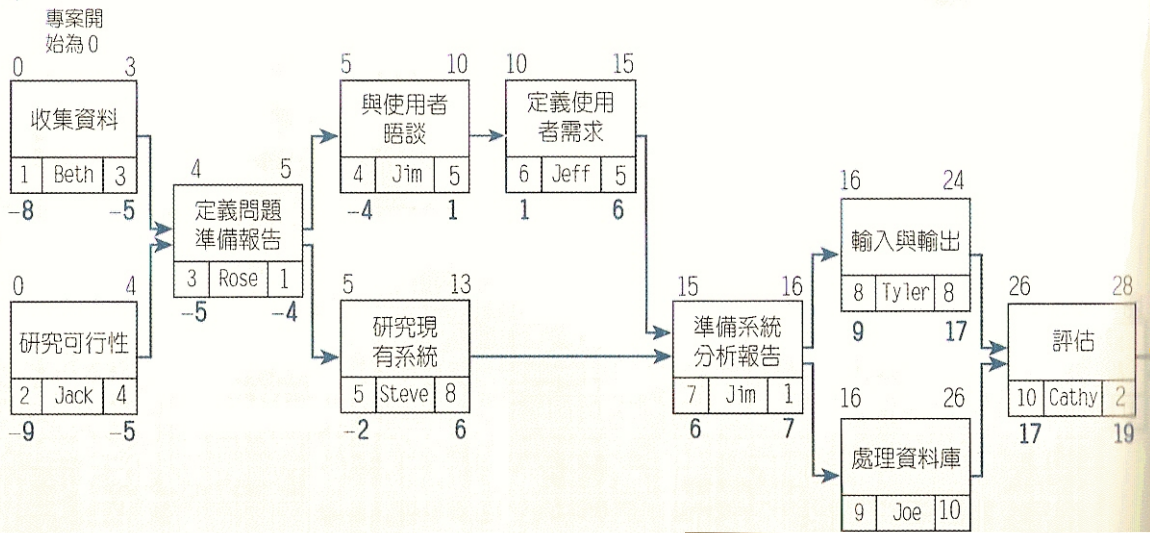
# Forward Path: ES & EF



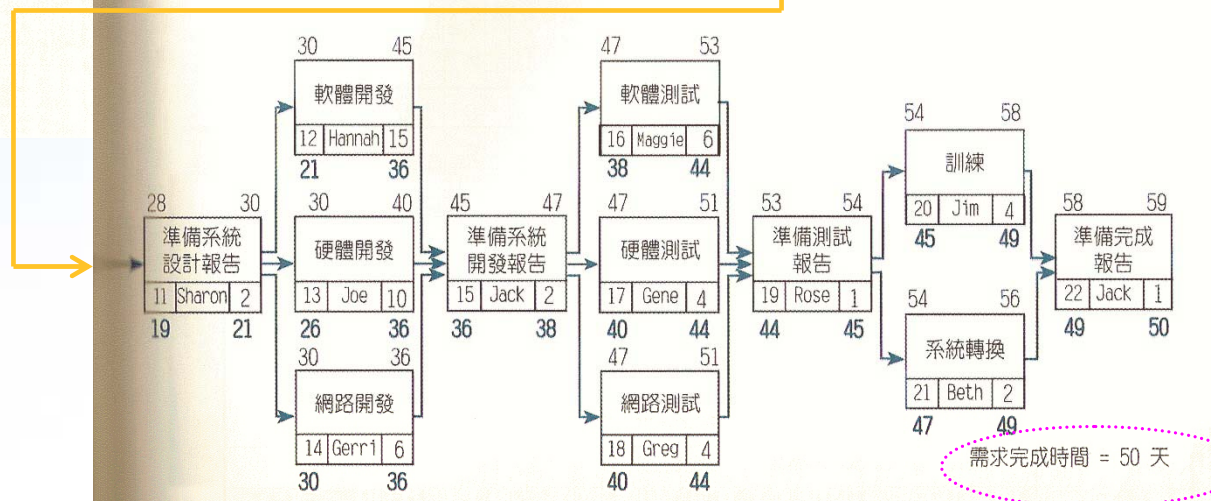
說明：



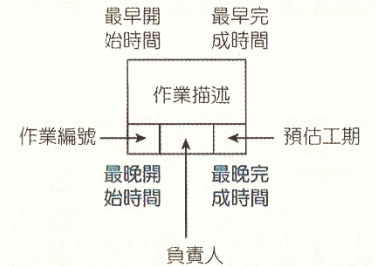




# Backward Path: LS & LF



說明：



# Summary Table

$$TF = LF - EF$$

$$= LS - ES$$

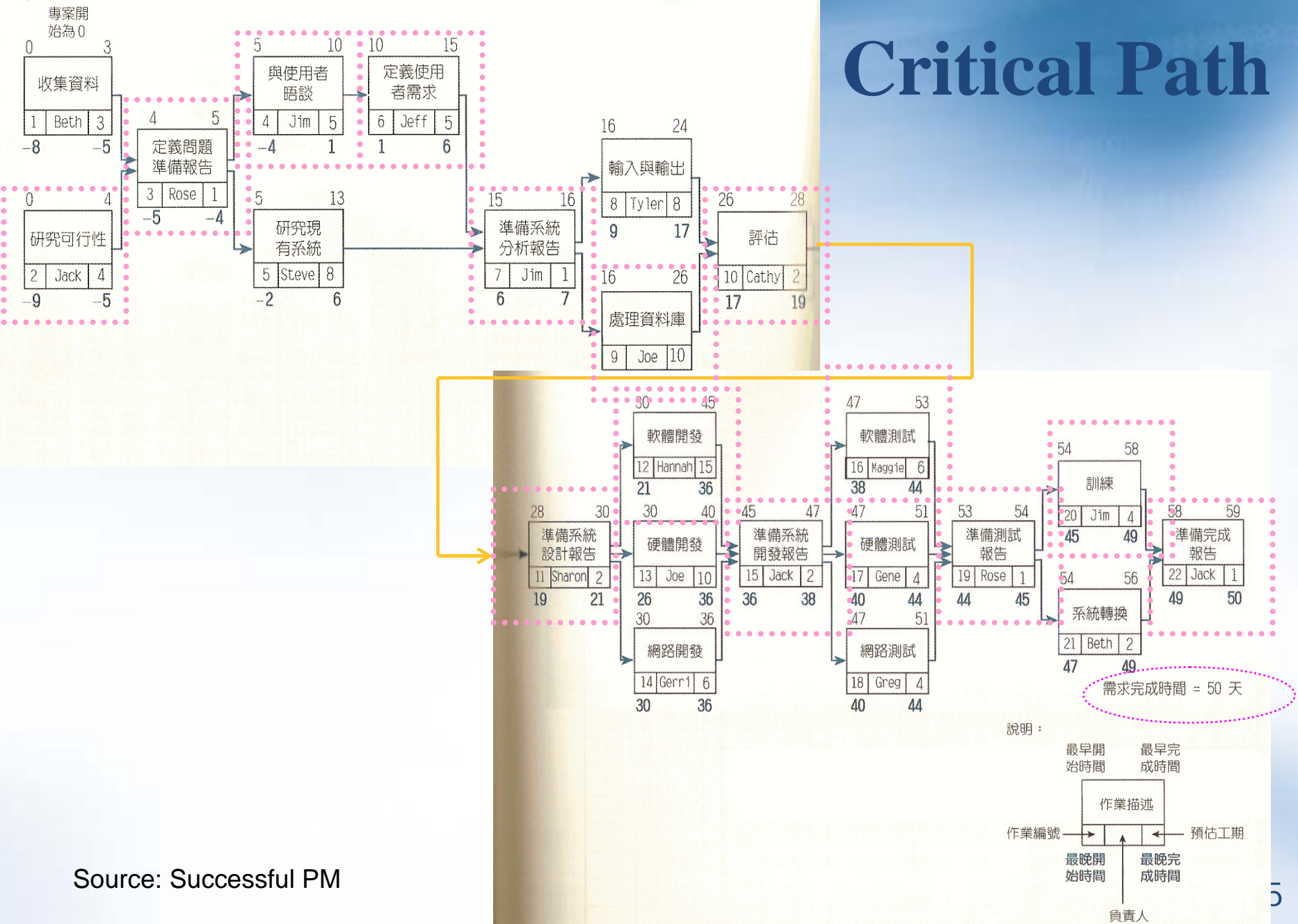
Critical path can be determined by the least TF.

This project schedule should be shortened by 9 days to meet the owner's need.

網路報告系統專案

	作業	負責人	預估工期	最早時間		最晚時間		總寬裕時間	
				開始	完成	開始	完成		
1	收集資料	Beth	3	0	3	-8	-5	-8	
2	研究可行性	Jack	4	0	4	-9	-5	-9	←
3	定義問題準備報告	Rose	1	4	5	-5	-4	-9	←
4	與使用者晤談	Jim	5	5	10	-4	1	-9	←
5	研究現有系統	Steve	8	5	13	-2	6	-7	
6	定義使用者需求	Jeff	5	10	15	1	6	-9	←
7	準備系統分析報告	Jim	1	15	16	6	7	-9	←
8	輸入與輸出	Tyler	8	16	24	9	17	-7	
9	處理資料庫	Joe	10	16	26	7	17	-9	←
10	評估	Cathy	2	26	28	17	19	-9	←
11	準備系統設計報告	Sharon	2	28	30	19	21	-9	←
12	軟體開發	Hannah	15	30	45	21	36	-9	←
13	硬體開發	Joe	10	30	40	26	36	-4	
14	網路開發	Gerr i	6	30	36	30	36	0	
15	準備系統開發報告	Jack	2	45	47	36	38	-9	←
16	軟體測試	Maggie	6	47	53	38	44	-9	←
17	硬體測試	Gene	4	47	51	40	44	-7	
18	網路測試	Greg	4	47	51	40	44	-7	
19	準備測試報告	Rose	1	53	54	44	45	-9	←
20	訓練	Jim	4	54	58	45	49	-9	←
21	系統轉換	Beth	2	54	56	47	49	-7	
22	準備完成報告	Jack	1	58	59	49	50	-9	←

# Critical Path



# Using the Critical Path to Shorten a Project Schedule

- > Three main techniques for shortening schedules:
  - **Shortening** the duration of critical activities or tasks by adding more resources or changing their scope.
  - **Crashing** activities by obtaining the greatest amount of schedule compression for the least incremental cost.
  - **Fast tracking** activities by doing them in parallel or overlapping them.

# Words of Caution on Using Project Management Software

- > Many people misuse project management software because they don't understand important concepts and have not had training.
- > You must enter dependencies to have dates adjust automatically and to determine the critical path.
- > You must enter actual schedule information to compare planned and actual progress.

# Project Time Management Demo

How to input duration based on activity sequencing

How to establish task dependencies

Find critical path

Review CP information through

VIEW → Reports → Overview → Critical Tasks



Microsoft  
Project Document

# Project Cost Management Processes

- > **Cost estimating:** Developing an approximation or estimate of the costs of the resources needed to complete a project.
- > **Cost budgeting:** Allocating the overall cost estimate to individual work items to establish a baseline for measuring performance.
- > **Cost control:** Controlling changes to the project budget.

# Types of Cost Estimates

<b>TYPE OF ESTIMATE</b>	<b>WHEN DONE</b>	<b>WHY DONE</b>	<b>HOW ACCURATE</b>
<b>Rough Order of Magnitude (ROM)</b>	Very early in the project life cycle, often 3–5 years before project completion	Provides estimate of cost for selection decisions	–25% to +75%
<b>Budgetary</b>	Early, 1–2 years out	Puts dollars in the budget plans	–10% to +25%
<b>Definitive</b>	Later in the project, less than 1 year out	Provides details for purchases, estimates actual costs	–5% to +10%



# Cost Estimation Tools and Techniques

- > **Basic tools and techniques for cost estimates:**
  - **Analogous or top-down estimates:** Use the actual cost of a previous, similar project as the basis for estimating the cost of the current project.
  - **Bottom-up estimates:** Involve estimating individual work items or activities and summing them to get a project total.
  - **Parametric modeling:** Uses project characteristics (parameters) in a mathematical model to estimate project costs.
  - **Computerized tools:** Tools, such as spreadsheets and project management software, that can make working with different cost estimates and cost estimation tools easier.

# Sample Project Cost Estimate

Surveyor Pro Project Cost Estimate Created October 5, 2006

	# Units/Hrs.	Cost/Unit/Hr.	Subtotals	WBS Level 1 Totals	% of Total
WBS Items					
<b>1. Project Management</b>				<b>\$306,300</b>	<b>20%</b>
Project manager	960	\$100	\$96,000		
Project team members	1920	\$75	\$144,000		
Contractors (10% of software development and testing)			\$66,300		
<b>2. Hardware</b>				<b>\$76,000</b>	<b>5%</b>
2.1 Handheld devices	100	\$600	\$60,000		
2.2 Servers	4	\$4,000	\$16,000		
<b>3. Software</b>				<b>\$614,000</b>	<b>40%</b>
3.1 Licensed software	100	\$200	\$20,000		
3.2 Software development*			\$594,000		
<b>4. Testing (10% of total hardware and software costs)</b>			\$69,000	<b>\$69,000</b>	<b>5%</b>
<b>5. Training and Support</b>				<b>\$202,400</b>	<b>13%</b>
Trainee cost	100	\$500	\$50,000		
Travel cost	12	\$700	\$8,400		
Project team members	1920	\$75	\$144,000		
<b>6. Reserves (20% of total estimate)</b>			\$253,540	<b>\$253,540</b>	<b>17%</b>
<b>Total project cost estimate</b>				<b>\$1,521,240</b>	

# Cost Budgeting

- > Cost budgeting involves allocating the project cost estimate to individual work items over time.
- > The WBS is a required input for the cost budgeting process because it defines the work items.
- > Important goal is to produce a **cost baseline**:
  - A time-phased budget that project managers use to measure and monitor cost performance.

# Cost Control

## > Project cost control includes:

- Monitoring **cost performance** → EVM
- Ensuring that only appropriate **project changes** are included in a **revised cost baseline**.
- Informing project stakeholders of **authorized changes** to the project that will affect costs.

# Earned Value Management (EVM)

- > **EVM** is a project performance measurement technique that integrates **scope, time, and cost data**.
  - 源於1960年美國海軍於專案之成本管制
- > Given a **baseline** (original plan plus approved changes), you can determine how well the project is meeting its goals.
- > You must enter **actual information periodically** to use EVM.
- > More and more organizations around the world are using EVM to help control project costs.
  - (澳洲、加拿大、瑞典、英國、日本已採用EVM管理政府部門標案)

# Earned Value Management Terms

- > **Plan Value (PV):** 計劃值，即到目前為止有多少工作應完成。
- > **Earned Value (EV):** 實獲值，目前多少工作已完成。
- > **Actual Cost (AC):** 實際成本，已完成的工作耗用多少成本。
- > **Budget at Completion (BAC):** 完工總預算，原計畫的工作總成本應為多少。
- > **Estimate at Completion (EAC):** 預估完工成本，現在預估工作總成本為多少。

## Earned Value Calculations for One Activity After Week One

ACTIVITY	WEEK 1
Earned Value (EV)	5,000
Planned Value (PV)	10,000
Actual Cost (AC)	15,000
Cost Variance (CV)	-7,500
Schedule Variance (SV)	-2,500
Cost Performance Index (CPI)	33%
Schedule Performance Index (SPI)	50%

TERM	FORMULA
Earned Value	$EV = PV \text{ to date} \times RP$
Cost Variance 成本變異	$CV = EV - AC$
Schedule Variance 時程變異	$SV = EV - PV$
Cost Performance Index 成本效率	$CPI = EV/AC$
Schedule Performance Index 時程效率	$SPI = EV/PV$

# Rules of Thumb for Earned Value Numbers

- > **Negative numbers** for cost and schedule variance indicate **problems** in those areas.
- > A CPI or SPI that is **less than 100 percent** indicates problems.
- > Problems mean the project is **costing more than planned (over budget)** or **taking longer than planned (behind schedule)**.

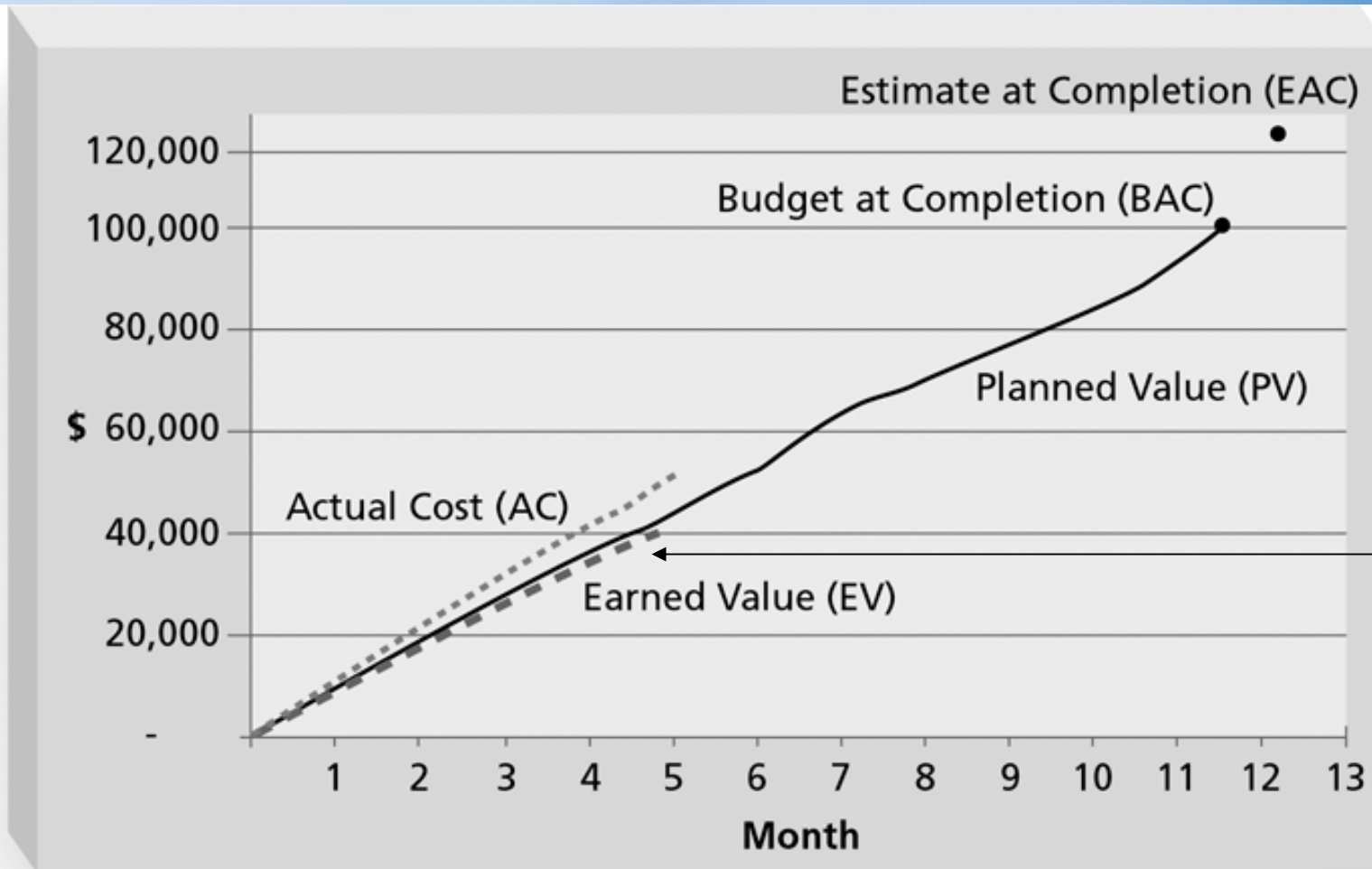


# Earned Value Calculations for a One-Year Project After Five Months

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1														To Date	Planned	Actual
2	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	PV	% Complete	% Complete
3	Plan and staff project	4,000	4,000											8,000	100	100
4	Analyze requirements		6,000	6,000										12,000	100	100
5	Develop ERDs			4,000	4,000									8,000	100	100
6	Design database tables				6,000	4,000								10,000	100	100
7	Design forms, reports, and queries					8,000	4,000							8,000	75	50
8	Construct working prototype						10,000								-	
9	Test/evaluate prototype						2,000	6,000							-	
10	Incorporate user feedback							4,000	6,000	4,000					-	
11	Test system									4,000	4,000	2,000			-	
12	Document system											3,000	1,000		-	
13	Train users												4,000		-	
14	Monthly Planned Value (PV)	4,000	10,000	10,000	10,000	12,000	16,000	10,000	6,000	8,000	4,000	5,000	5,000			
15	Cumulative Planned Value (PV)	4,000	14,000	24,000	34,000	46,000	62,000	72,000	78,000	86,000	90,000	95,000	100,000			
16	Monthly Actual Cost (AC)	4,000	11,000	11,000	12,000	15,000										
17	Cumulative Actual Cost (AC)	4,000	15,000	26,000	38,000	53,000										
18	Monthly Earned Value (EV)	4,000	10,000	10,000	10,000	9,333										
19	Cumulative Earned Value (EV)	4,000	14,000	24,000	34,000	43,333										
20	Project EV as of May 31	43,333														
22	Project PV as of May 31	46,000														
21	Project AC as of May 31	\$ 53,000														
23	CV=EV-AC	\$ (9,667)														
24	SV=EV-PV	\$ (2,667)														
25	CPI=EV/AC	81.761%														
26	SPI=EV/PV	94.203%														
27	Estimate at Completion (EAC)	\$ 122,308 (original plan of \$100,000 divided by CPI)														
28	Estimated time to complete	12.74 (original plan of 12 months divided by SPI)														

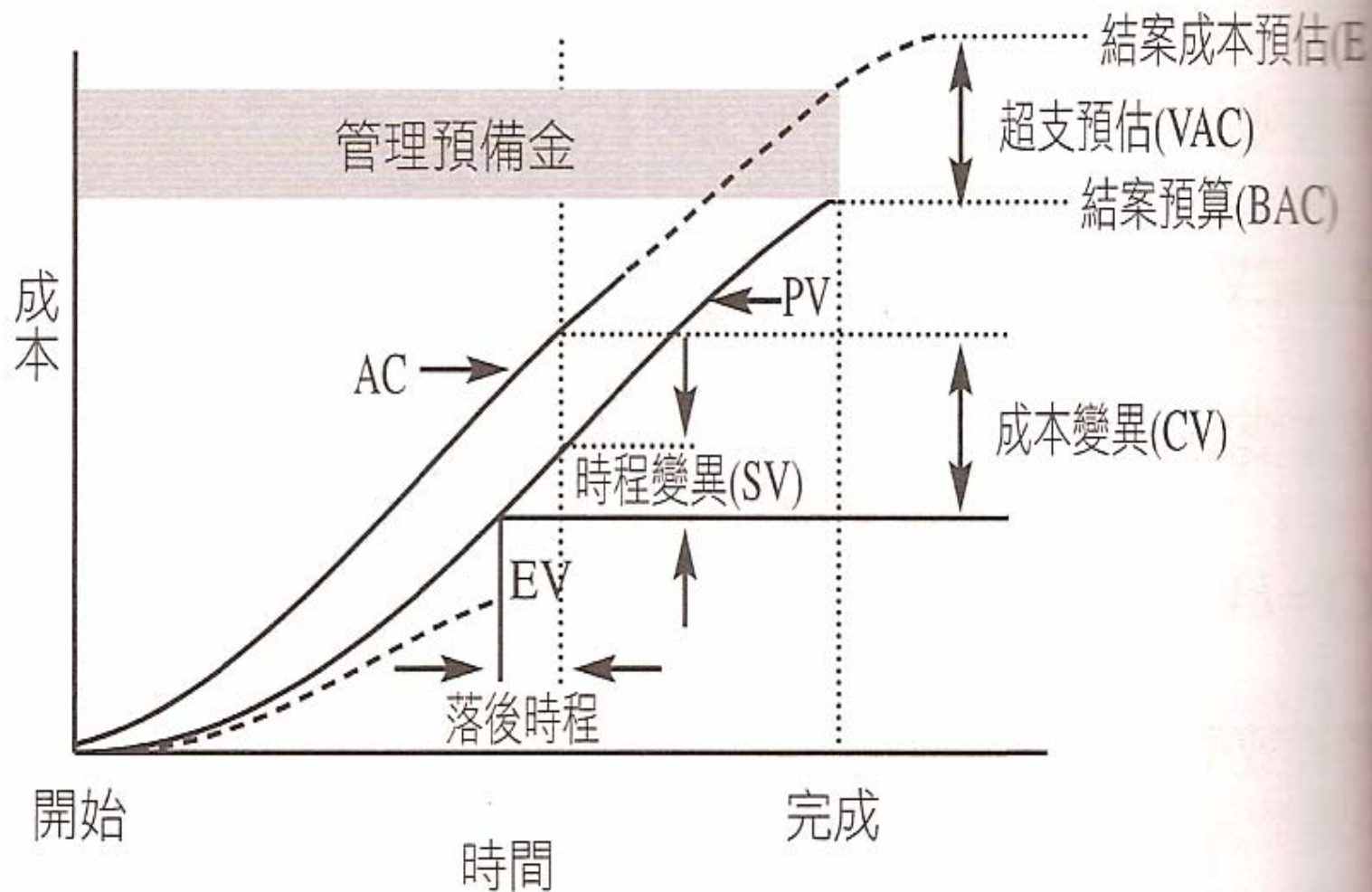
$$= 8000 * 50 / 75 + 4000$$

# Earned Value Chart for Project after Five Months



If the EV line is below the AC or PV line, there are problems in those areas.

# 實獲值管理圖 (專案管理基礎知識與應用實務, 2005, NPMA)



# Sample HR Cost Information

HR sample file

- View HR info
- Assign resources to tasks



Microsoft  
Project Document

EVM sample file



Microsoft  
Project Document

# What Is Project Quality Management?

- > Project quality management ensures that the project will satisfy the needs for which it was undertaken.
- > Processes include:
  - **Quality planning:** Identifying which quality standards are relevant to the project and how to satisfy them.
  - **Quality assurance:** Periodically evaluating overall project performance to ensure the project will satisfy the relevant quality standards.
  - **Quality control:** Monitoring specific project results to ensure that they comply with the relevant quality standards.

# Table of Contents for a Quality Assurance Plan\*

- 1.0 Draft Quality Assurance Plan
  - 1.1 Introduction
  - 1.2 Purpose
  - 1.3 Policy Statement
  - 1.4 Scope
- 2.0 Management
  - 2.1 Organizational Structure
  - 2.2 Roles and Responsibilities
    - 2.2.1 Technical Monitor/Senior Management
    - 2.2.2 Task Leader
    - 2.2.3 Quality Assurance Team
    - 2.2.4 Technical Staff
- 3.0 Required Documentation
- 4.0 Quality Assurance Procedures
  - 4.1 Walkthrough Procedure
  - 4.2 Review Process
    - 4.2.1 Review Procedures
  - 4.3 Audit Process
    - 4.3.1 Audit Procedures
  - 4.4 Evaluation Process
  - 4.5 Process Improvement
- 5.0 Problem Reporting Procedures
  - 5.1 Noncompliance Reporting Procedures
- 6.0 Quality Assurance Metrics
- Appendix
  - Quality Assurance Checklist Forms

\*U.S. Department of Energy

# Quality Assurance

- > **Quality assurance** includes all the activities related to satisfying the relevant quality standards for a project.
- > Another goal of quality assurance is **continuous quality improvement**.
- > **Benchmarking** generates ideas for quality improvements by comparing specific project practices or product characteristics to those of other projects or products within or outside the performing organization.
- > A **quality audit** is a structured review of specific quality management activities that help identify lessons learned that could improve performance on current or future projects.

# Quality Control

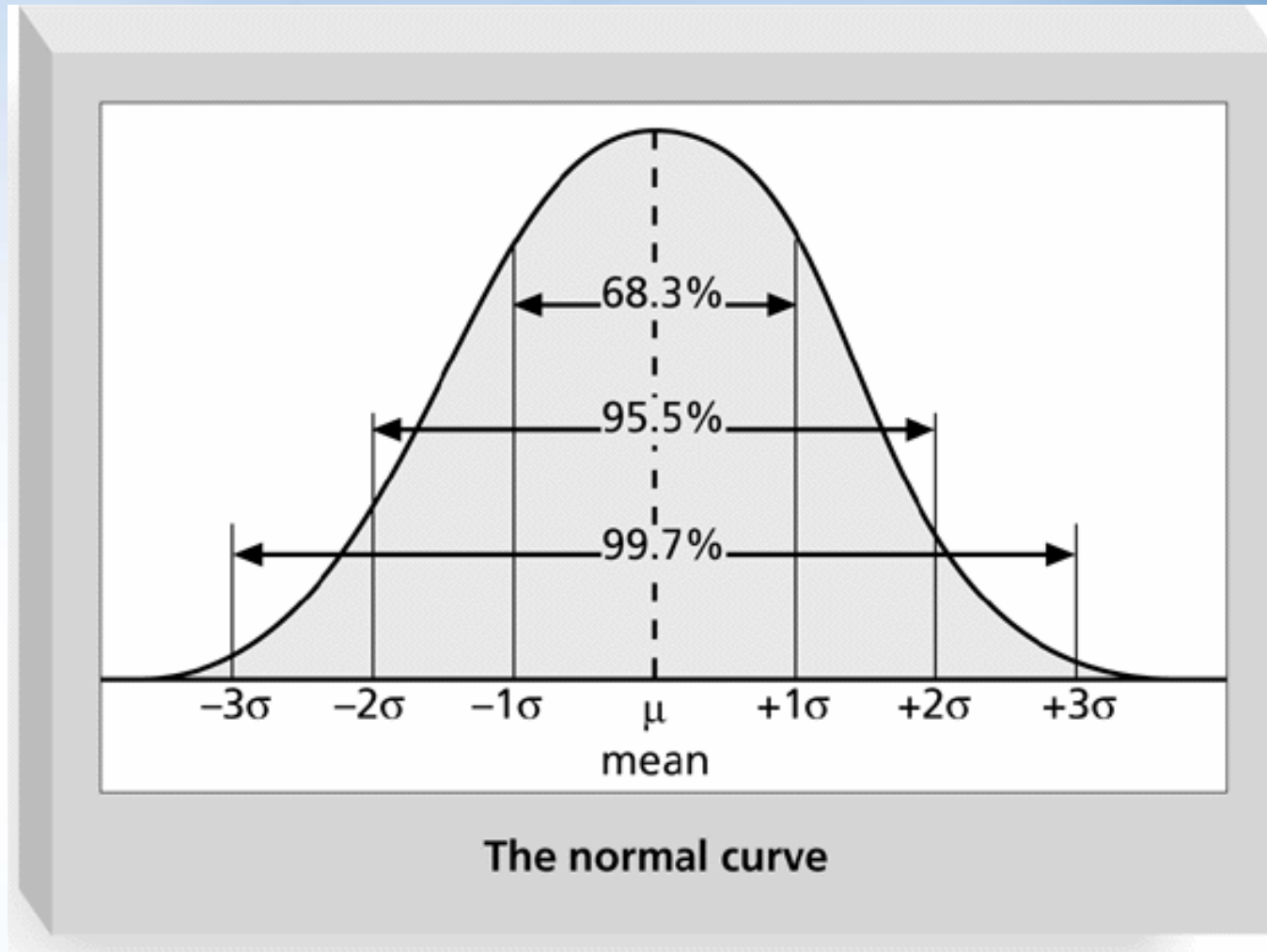
- > **The main outputs of quality control are:**
  - **Acceptance decisions**
  - **Rework**
  - **Process adjustments**
- > **Some tools and techniques include:**
  - **Statistical sampling**
  - **Six Sigma**
  - **Quality control charts**



# Statistical Sampling and Standard Deviation

- > **Statistical sampling** involves choosing part of a population of interest for inspection.
- > The size of a sample depends on how representative you want the sample to be.
- > Sample size formula:  
$$\text{Sample size} = .25 \times (\text{certainty factor}/\text{acceptable error})^2$$
- > Be sure to consult with an expert when using statistical analysis.

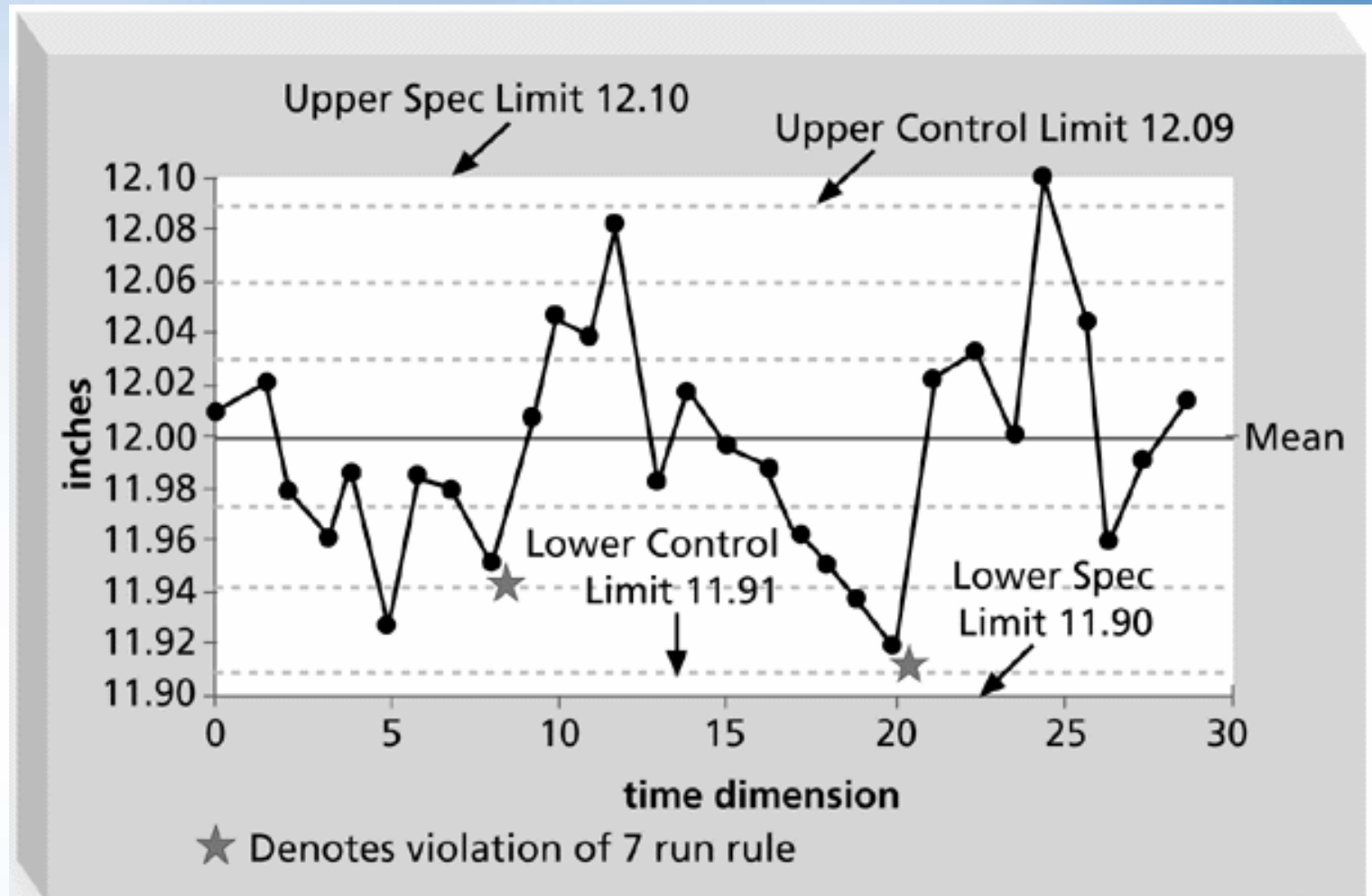
# Normal Distribution and Standard Deviation



# Sigma and Defective Units

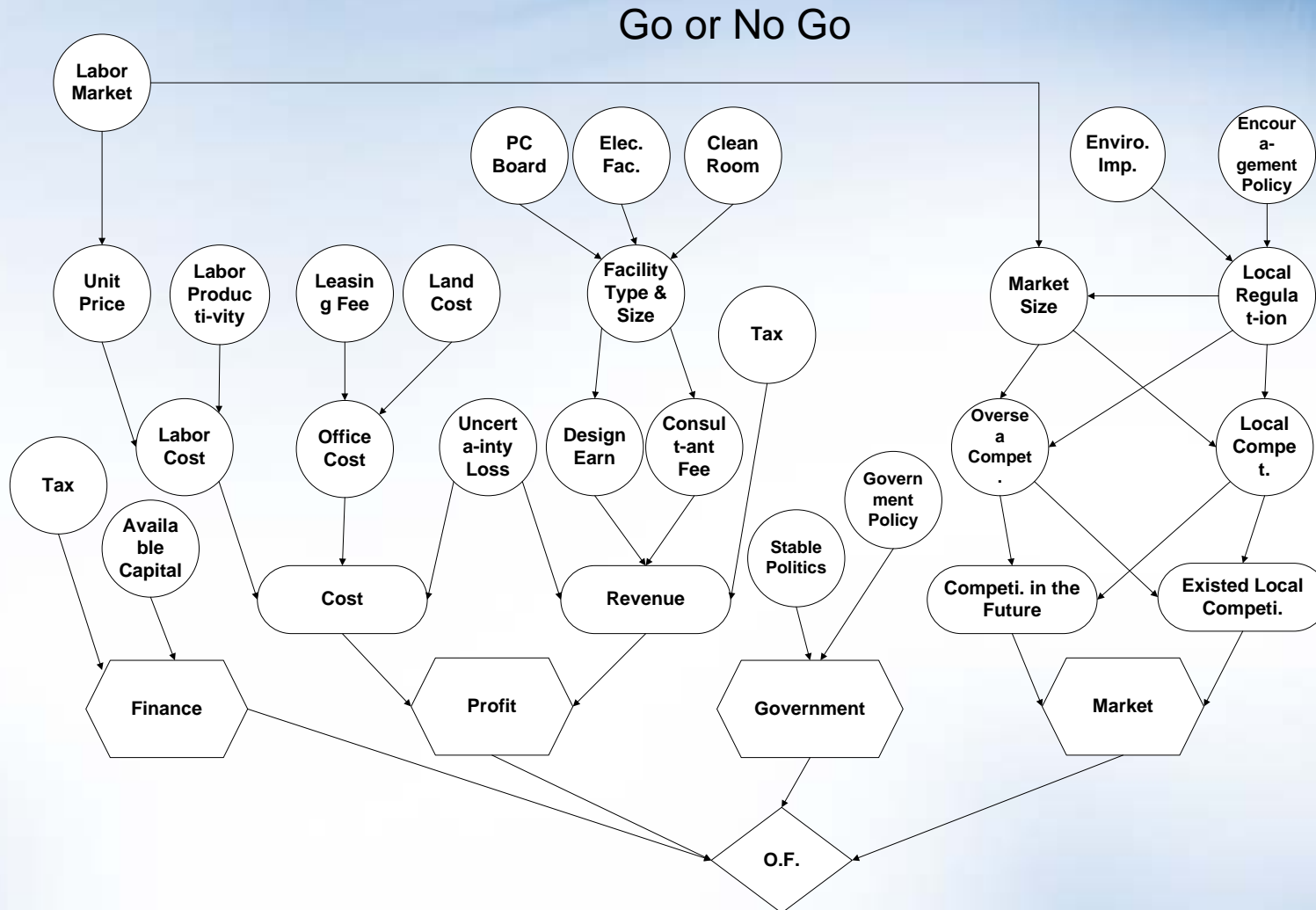
<b>Specification Range (in +/- Sigmas)</b>	<b>Percent of Population Within Range</b>	<b>Defective Units Per Billion</b>
1	68.27	317,300,000
2	95.45	45,400,000
3	99.73	2,700,000
4	99.9937	63,000
5	99.999943	57
6	99.9999998	2

# Sample Quality Control Chart

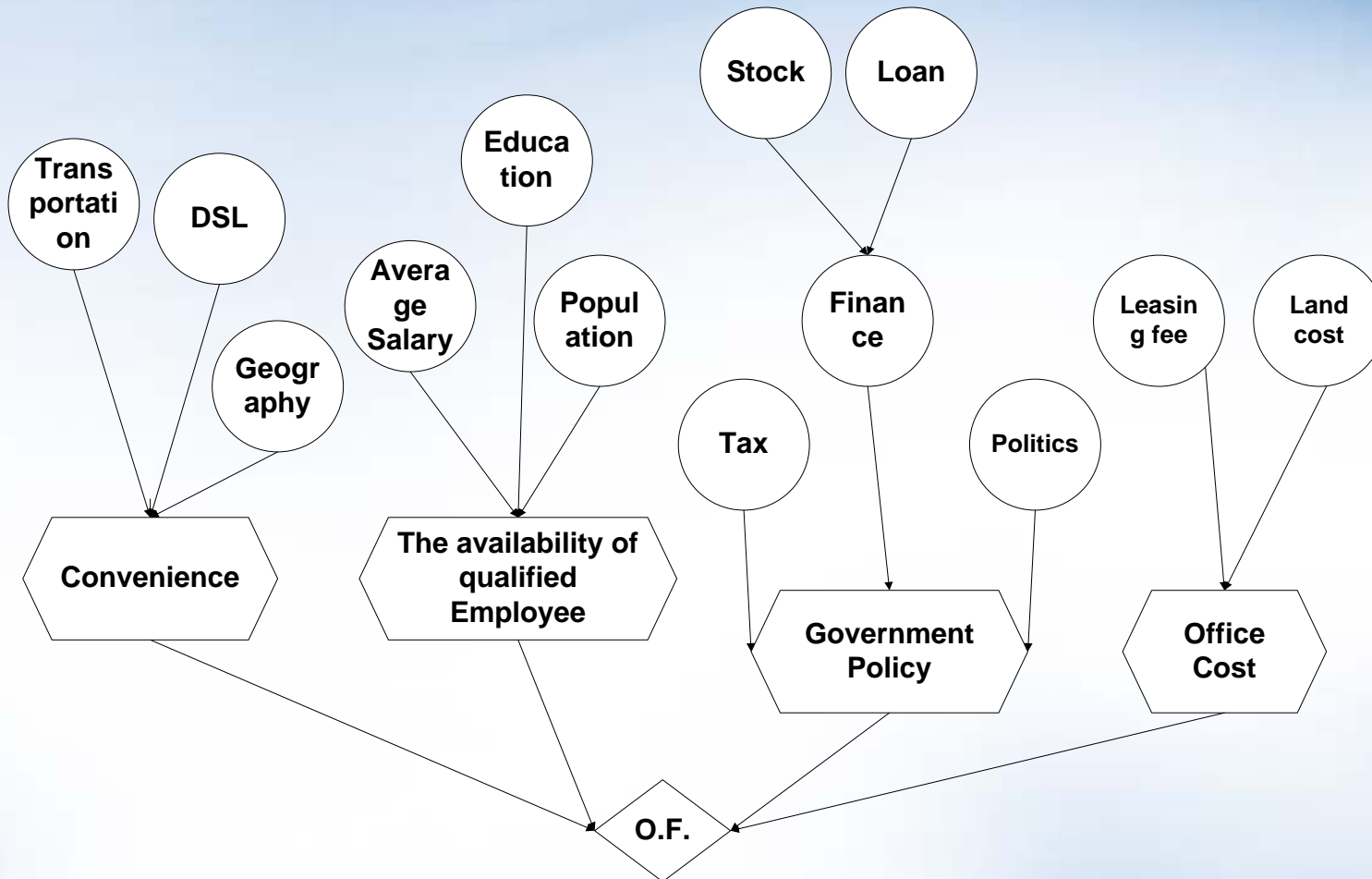


# 影響圖 (Influence Diagram)

Alternative of fishbone diagram



# Decide Where to locate the office



# **Project HR Management**

# Responsibility Assignment Matrixes

- > **A responsibility assignment matrix (RAM)** is a matrix that maps the work of the project, as described in the WBS, to the people responsible for performing the work, as described in the OBS.



# Sample Responsibility Assignment Matrix (RAM)

**WBS activities** →

**OBS units** ↓

	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7	1.1.8
Systems Engineering	R	RP					R	
Software Development			RP					
Hardware Development				RP				
Test Engineering	P							
Quality Assurance					RP			
Configuration Management						RP		
Integrated Logistics Support							P	
Training								RP

**R = Responsible organizational unit**  
**P = Performing organizational unit**

# RAM Showing Stakeholder Roles

Items	Stakeholders				
	A	B	C	D	E
Unit Test	S	A	I	I	R
Integration Test	S	P	A	I	R
System Test	S	P	A	I	R
User Acceptance Test	S	P	I	A	R

A = Accountable

P = Participant

R = Review Required

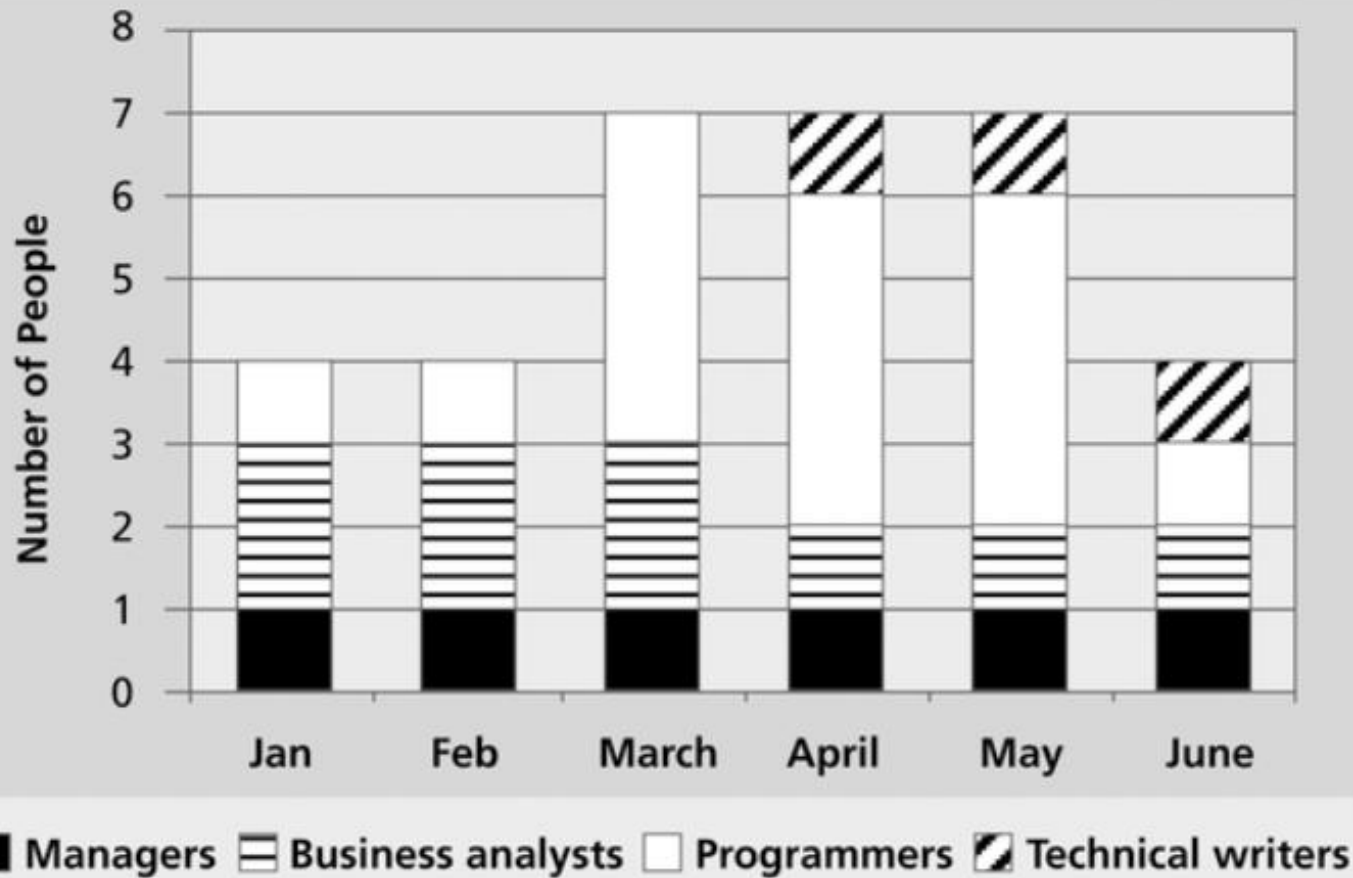
I = Input Required

S = Sign-off Required

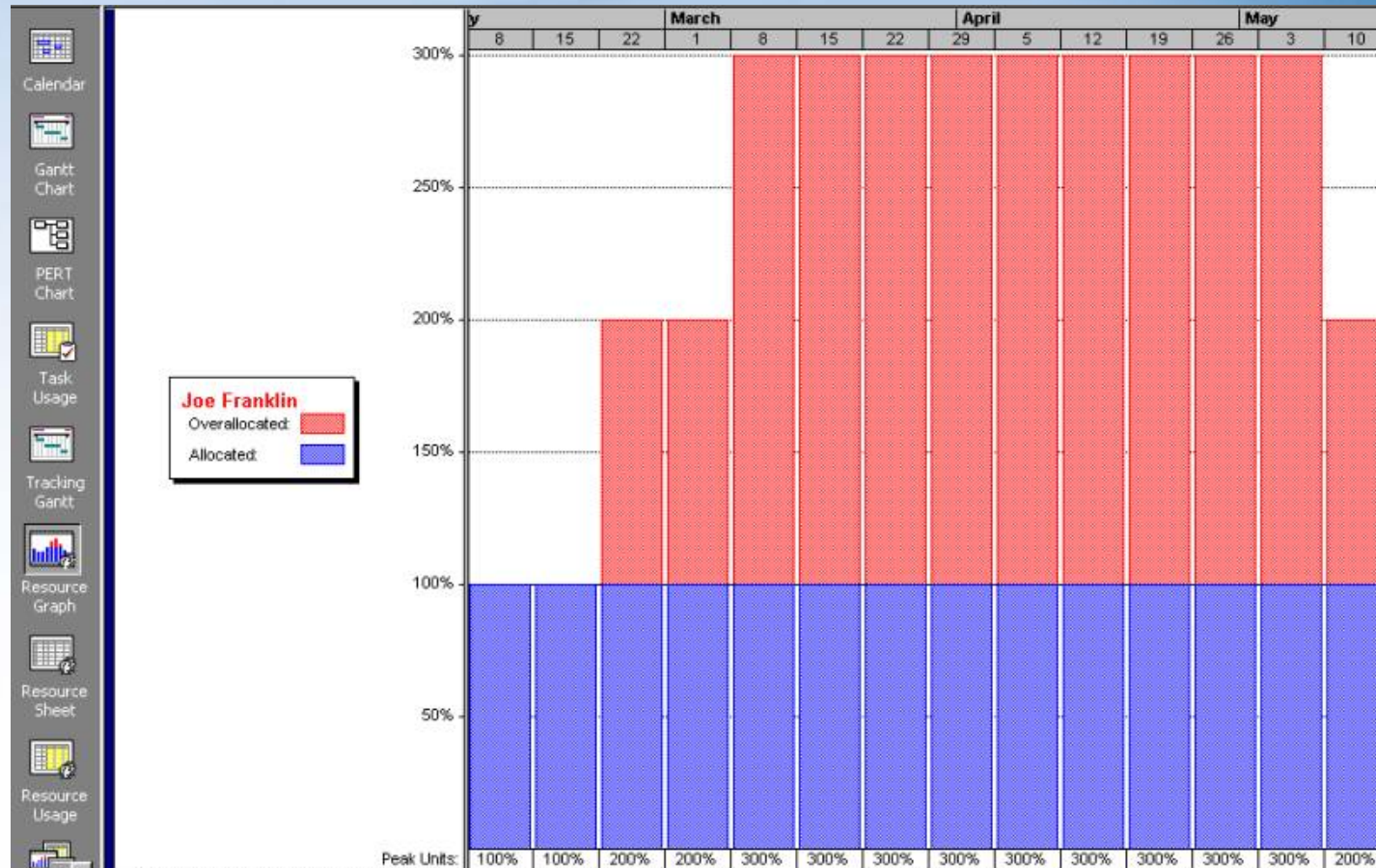
# Staffing Management Plans and Resource Histograms

- > A **staffing management plan** describes when and how people will be added to and taken off the project team.
- > A **resource histogram** is a column chart that shows the number of resources assigned to a project over time.

# Sample Resource Histogram

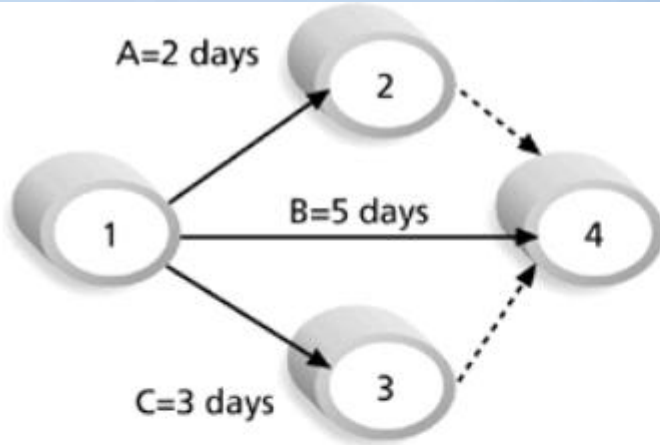


# Sample Histogram Showing an Overallocated Individual

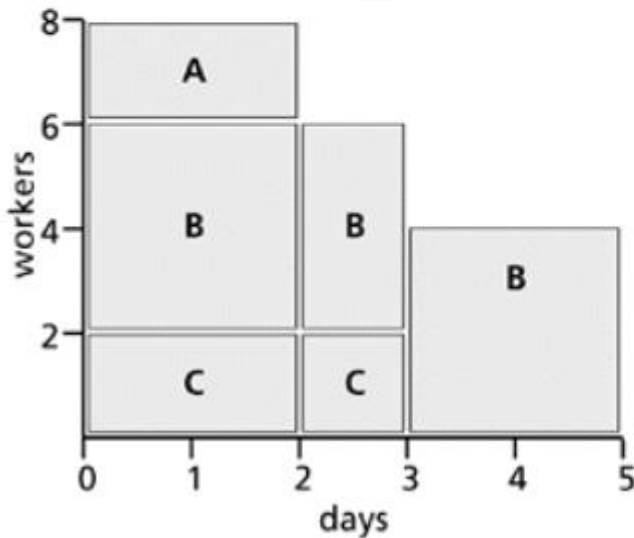


What's wrong with this picture? Assume 100 percent means Joe is working eight hours per day.

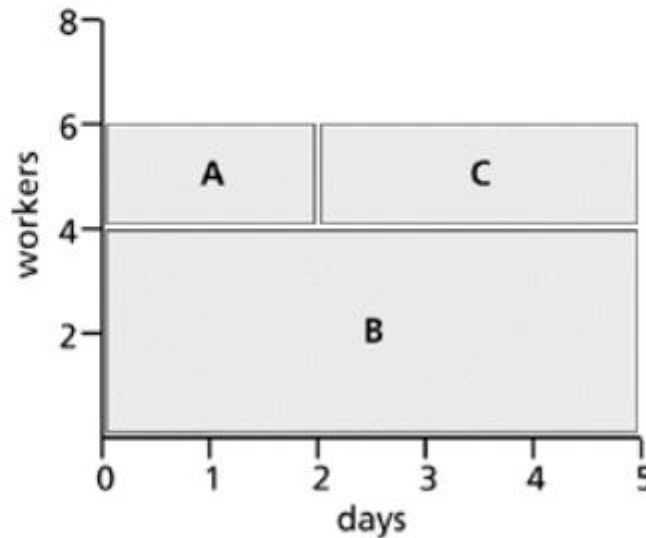
# Resource Leveling Example



The project network with Activities A, B, and C and durations as shown. Activity A has 3 days of slack, and Activity C has 2 days of slack. Assume Activity A has 2 workers, B has 4 workers, and C has 2 workers.



Resource usage if all Activities start on day one



Resource usage if Activity C is delayed 2 days, its total slack

此處總時程並未拉長，但並非非常態。

# Sample Resource Leveling

Cash flow:

View → Reports → Costs → Cash flow

Cost table: View → Table:Cost



resource

# Project Tracking

Output to PowerPoint:

View → Toolbars → Analysis → Copy Picture to Office Wizard



Microsoft  
Project Document



tracking



# 專案實例分析及探討