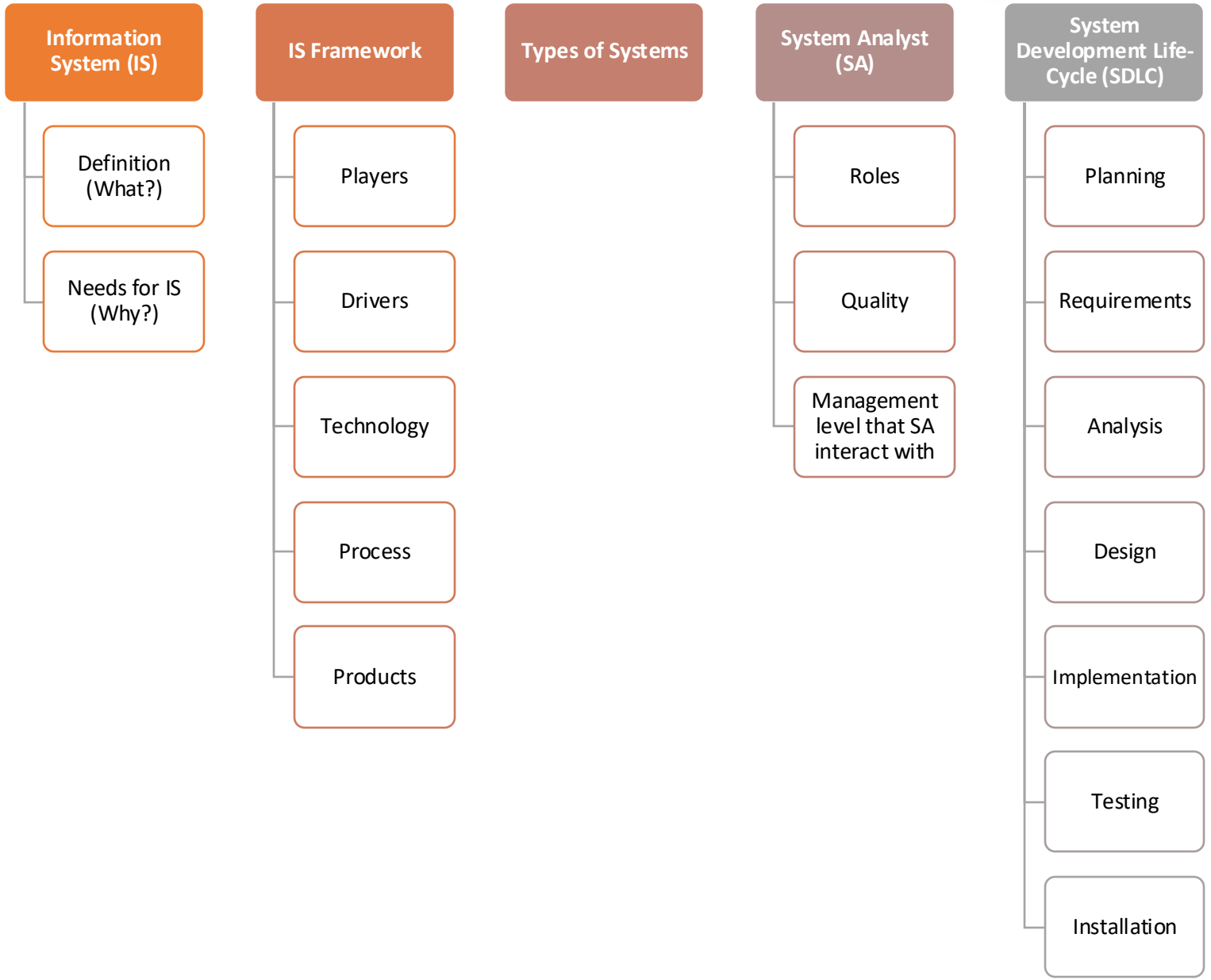
SECD2613
System Analysis and Design

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

TOPIC II
Project Planning Process

Most Important Learning Yesterday (MILY)



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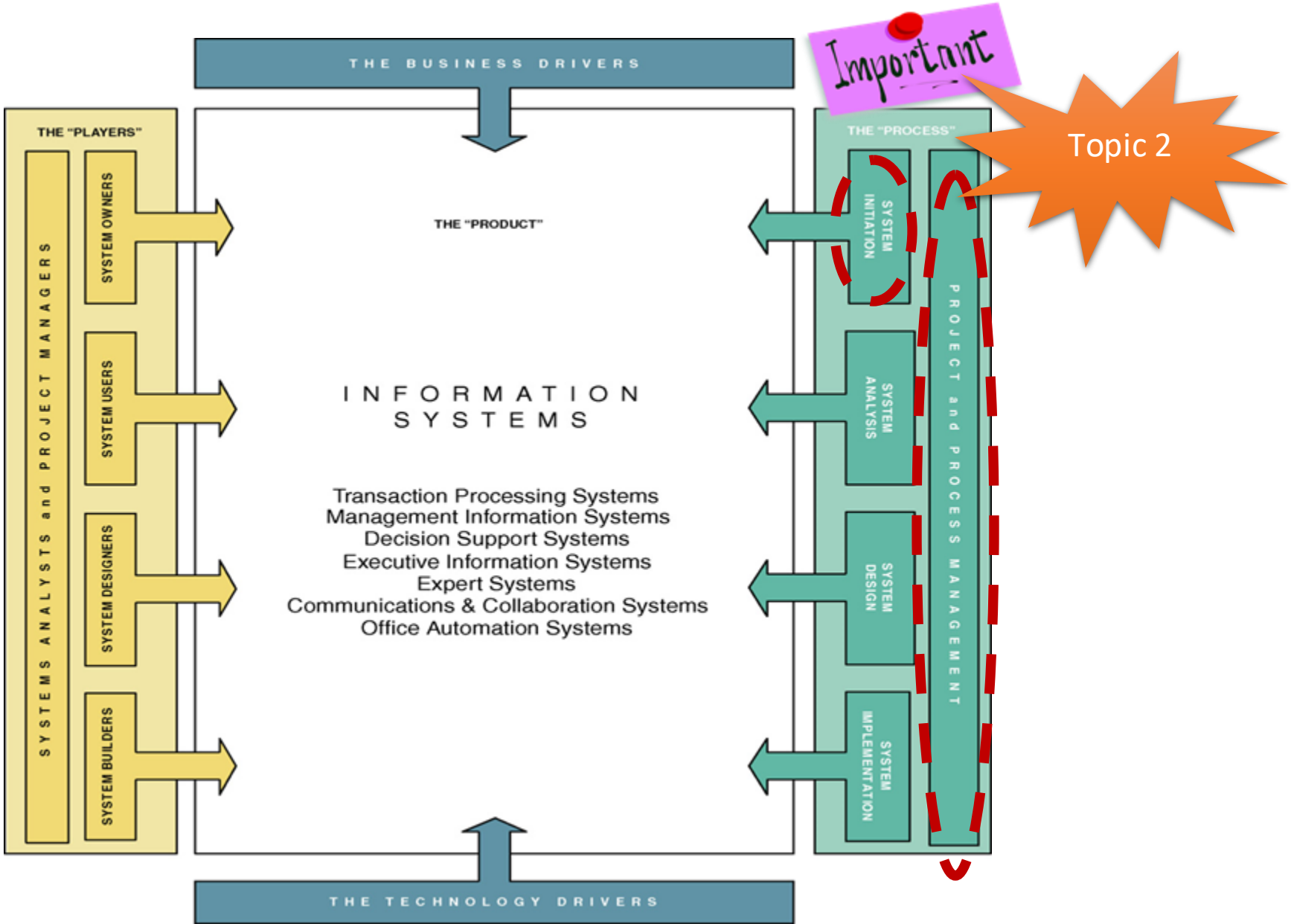
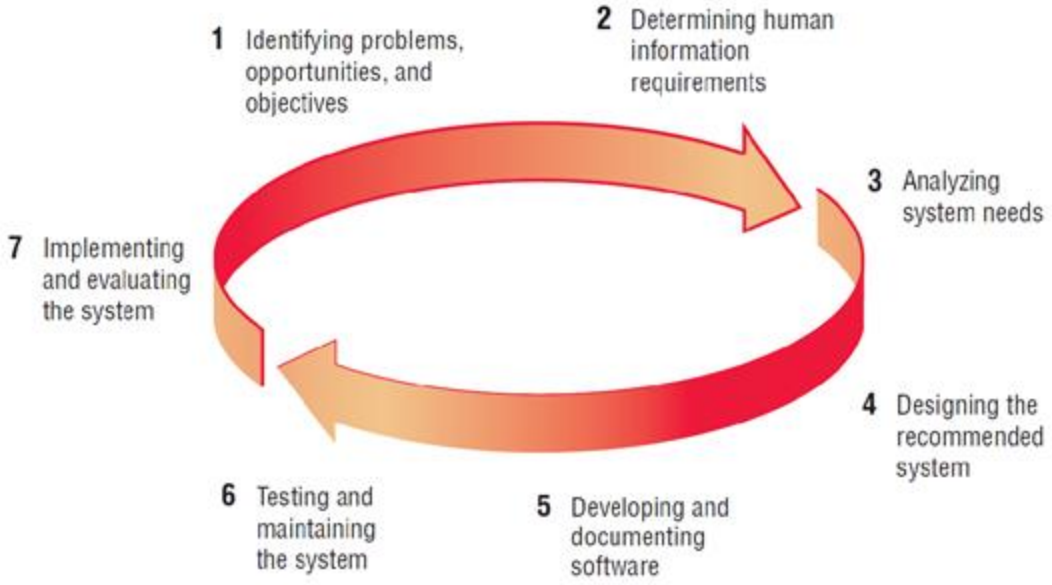
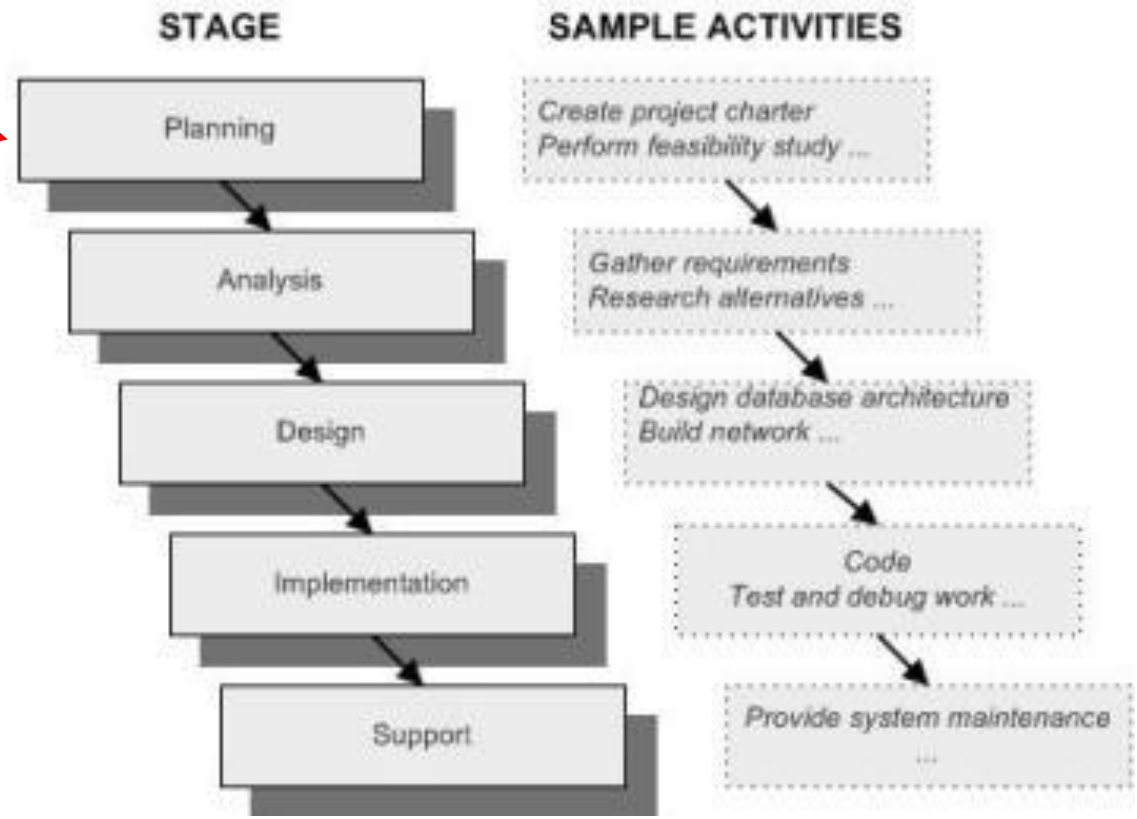


How this Topic 2 fits into whole IS development

Topic 2





TOPIC OBJECTIVES

1. Understand how projects are initiated and selected.
2. Define a business problem and determine the feasibility of a proposed project.
3. Plan a project by identifying activities and scheduling them.
4. Manage a project - team members, analysis and design activities to ensure project objectives are met and project remains on schedule.

TOPIC OVERVIEW

1 Project Initiation	•Problems vs. Opportunities
2 Feasibility Study	•Cost Benefit Analysis (CBA)
3 Activity Planning & Control	•Work Breakdown Structure (WBS)
4 Project Scheduling	•Gantt chart, PERT diagram, Critical Path Method (CPM)
5 Team Management	•Team members, Project charter document

PART 1

- PROJECT INITIATION
- FEASIBILITY STUDIES

PROJECT INITIATION

FACTORS TO INITIATE A PROJECT

Problems in the organization

Problems that lend themselves to systems solutions

Opportunities for improvement

Caused through upgrading, altering, or installing new systems

Project Initiation Process

- Identify problems and opportunities
- Define problems statement
- Select projects

To Identify Problems	Look for These Specific Signs:
Check output against performance criteria.	• Too many errors • Work completed slowly • Work done incorrectly • Work done incompletely • Work not done at all
Observe behavior of employees.	• High absenteeism • High job dissatisfaction • High job turnover
Listen to external feedback from: Vendors. Customers. Suppliers.	• Complaints • Suggestions for improvement • Loss of sales • Lower sales

Project Initiation # 1: Identify Problems & Opportunities

Project Initiation # 2: Define Problems Statement

- Find several points that may be included in one issue.
- State the objective.
- Determine the relative importance of the issues or objectives.
- Identify which objectives are most critical.

TYPICAL INFORMATION SYSTEMS PROBLEM

Relevancy	to decision making.
Accuracy	comprising completeness, correctness and security
Timeless	to decision making needs.
Economy	resources or cost
Efficiency	expressed as amount produced per economic unit
Reliability	measuring the consistency
Usability	the human factors dimension

Problem Definition Content

PROBLEM STATEMENT

- A paragraph or two stating the problem or opportunity.

ISSUES (CURRENT SITUATION)

- Major independent pieces of the problem or opportunity.

OBJECTIVES (desired situation)

- Goals that match the issues point-by-point.

REQUIREMENTS

- The things that must be accomplished (with the possible solutions and the constraints)
- May include security, usability, government req. etc

CONSTRAINTS

- The limitation – budget, time etc.

Project Initiation # 3: Selection Of Projects

Backing from management.

Appropriate timing of project commitment.

Possibility of improving attainment of organizational goals.

Practical in terms of resources for the system analyst and organization.

Worthwhile project compared with other ways the organization could invest resources.

PROJECT FEASIBILITY STUDY

Determining Feasibility

- Defining objectives – improvement aspects
- Determining resources
- Assess the **operational, technical, and economic** merits of the proposed project.

Feasibility Studies # 1: Defining Objectives

- Many possible objectives exist including:
  - Speeding up a process
  - Streamlining a process
  - Combining processes
  - Reducing errors in input
  - Reducing redundant storage
  - Reducing redundant output
  - Improving system and subsystem integration

Feasibility Studies # 2: Determining Resources

The Three Key Elements of Feasibility

Technical Feasibility
- Add on to present system
- Technology available to meet users' needs

Economic Feasibility
- Systems analysts' time
- Cost of systems study
- Cost of employees' time for study
- Estimated cost of hardware
- Cost of packaged software or software development

Operational Feasibility
- Whether the system will operate when installed
- Whether the system will be used

Feasibility Studies # 2:
Determining Resources- **Technical Feasibility**

Assess whether the **current technical resources are sufficient** for the new system.

If they are not available, can they be upgraded to provide the level of technology necessary for the new system.

Feasibility Studies # 2:
Determining Resources - **Operational Feasibility**

Determines if the **human resources** are available to operate the system once it has been installed.

Users that do not want a new system may prevent it from becoming operationally feasible.

Feasibility Studies # 2: Determining Resources - **Economic Feasibility**

- Determines whether the **time and money** are **available** to develop the system.
- Perform **cost-benefit analysis (CBA)**.
- Includes the purchase of
    - New equipment
    - Hardware
    - Software

Cost-Benefit Analysis (CBA)

- The analysis aims to **compare costs and benefits** to see whether **investing in the development** of a **new system will be beneficial**.
- CBA techniques: Break-even analysis, payback, cash-flow analysis, present value analysis.
- There are **tangible benefits** and **intangible benefits**.
- There are two main **costs**: **development and production (operation)**

CBA Techniques

Techniques	Use if/when
Break-even analysis	the project needs to be justified in terms of cost
Cash-flow analysis	the project is expensive relative to the size of the company
Payback	the improved tangible benefits form a convincing arguments for the proposed system
Present value analysis	The payback period is long

Benefits vs Costs

Tangible Benefits

- Reduce errors.
- Increase sales.
- Reduced expenses.
- Better credit.
- Reduced credit losses.
- etc

Intangible Benefits

- Improved customer good will.
- Improved employee morale.
- Better service to the community
- Better decision making
- etc

Development Costs

- One-time installation of new system

Production Costs

- Recurring during operation of a system

Save in terms of:
- Dollars $$$
- Resources / Staff
- Time

Cost-Benefit Analysis (CBA)

e.g.:
Yearly payment value: RM28 840
Discount rate: 10%
Number of repayment year: 3 years

PV = Payment X $(1/(1+C)^n)$
= RM28 840 X $(1/(1+0.10)^{3)}$
= RM21 668 #

- Popular approach to measure the overall benefit of the system *(to be developed)*
- Present value (PV) is a dollar today is worth more than a dollar tomorrow
- PV calculation formula:
  - **$PV(n) = Payment\ X\ (1/(1+C)^n)$**
  - *Where:*

    Payment = spent **dollar** amount

    C = **discount rate** or cost of money
    // company @ industry-specific

    n = number of **periods** projected
    // durations

CBA calculation example – given values of cost, benefit and assumptions

Estimated Cost 1	
Hardware	RM50 000
Software	RM 7 500
Consultant	RM 20 000
Training	RM 20 000
Supplies	RM 2 400 per year
IS Support	RM 18 000 per year
Maintenance	RM 2 500 per year

Estimated Benefits 2	
Inventory Savings	RM 1 500 per week

Assumptions 3	
Discount rate	10%
Sensitivity factor(cost)	1.1
Sensitivity factor(benefits)	0.9
Annual change in production costs	7%
Annual change in benefits	5%

Sensitivity factor
≈ uncertainties

Example to calculate CBA - Costs

Costs	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Costs						
· Hardware	55 000					
· Software	8 250					
· Consultant	22 000					
· Training	22 000					
Total	107 250					
Production Costs						
· Supplies		2 640	2 825	3 023	3 234	3 461
· Nwrk Personnel		19 800	21 186	22 669	24 256	25 954
· Maintenance		2 750	2 943	3 148	3 369	3 605
Annual Prod.Costs		25 190	26 954	28 840	30 859	33 020
(Present Value)		22 900	22 275	21 668	21 077	20 502
Accumulated Costs		130 150	152 425	174 093	195 170	215 672

1 **50 000*1.1**

2 **2 400*1.1**

3 **(2 640*0.07)+ 2 640**

4 **"22 900 = 25 190 X (1/(1+ 0.10)^{1})"**

5 **152 425 = 130 150 + 22 275**

Example to calculate CBA – Benefits, Gain/Loss and Profitability Index

6 **1500*52*0.9**

7 **(70 200*0.05)+ 70 200**

Benefits	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Reduced inventory costs		70 200	73 710	77 396	81 265	85 329
(Present Value)		63 818	60 917	58 148	55 505	52 982
Accumulated benefits		63 818	124 735	182 883	238 388	291 370
(Present Value)						
Gain or Loss		8 (66 332)	(27 690)	8790	43 218	75 697
Profitability Index	0.71	9				

Profitability index = 0.71, showing that it **is not good investment** because of its index **is less than one.**

0.71 = 75 697 / 107 250 → **Gain or Loss / Development Cost**

PART 2

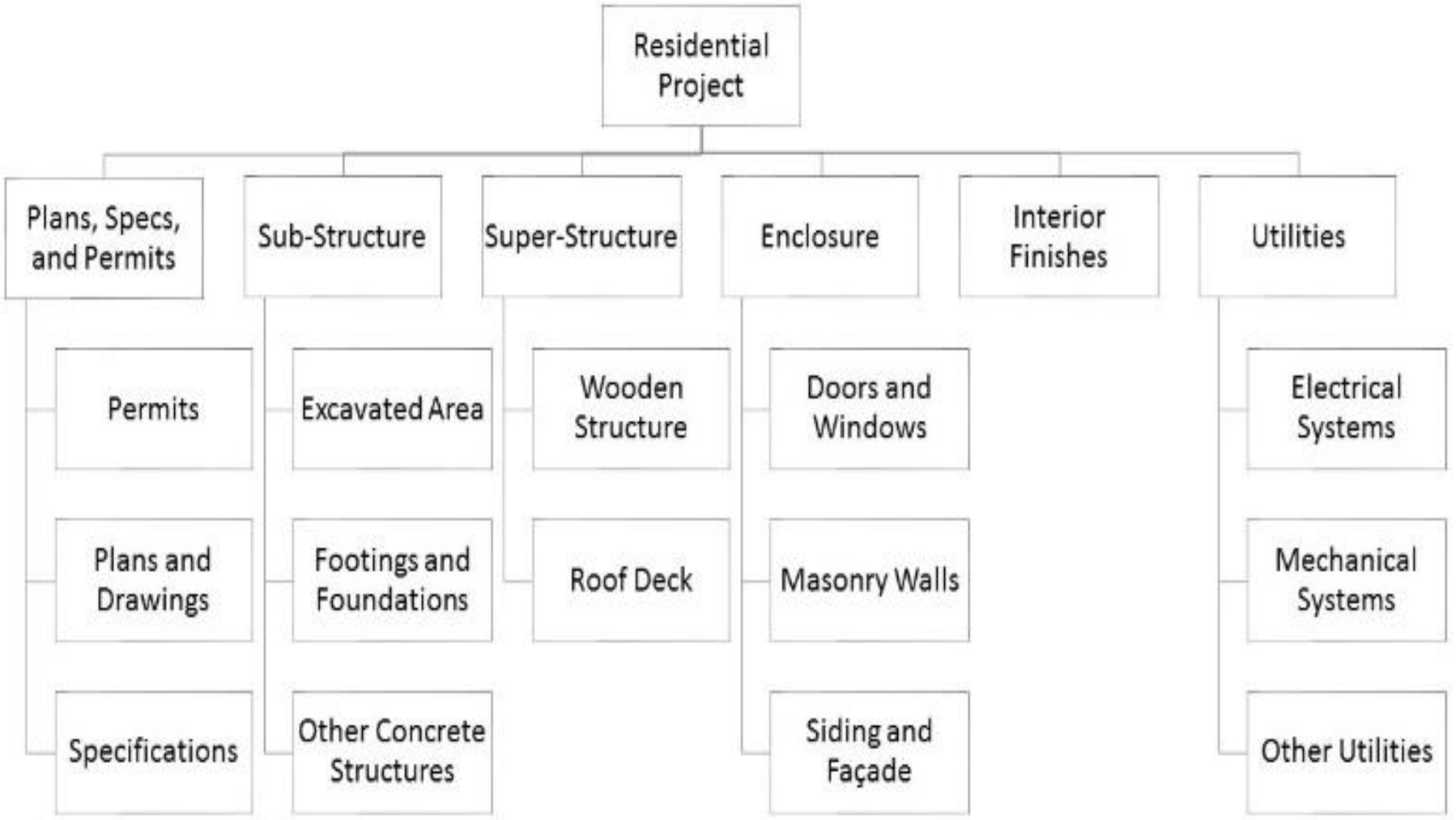
- ACTIVITY PLANNING
- PROJECT SCHEDULING & TECHNIQUES
- PROJECT CONTROL

ACTIVITY PLANNING

Managing Time and Activities

- For completing projects on time, within budget and including the features promised, a project needs to be broken down into smaller tasks or activities – **Work Breakdown Structure (WBS)**
- WBS can be **product-oriented** or **process-oriented**
- Time is estimated for each task or activity.

Product-oriented WBS



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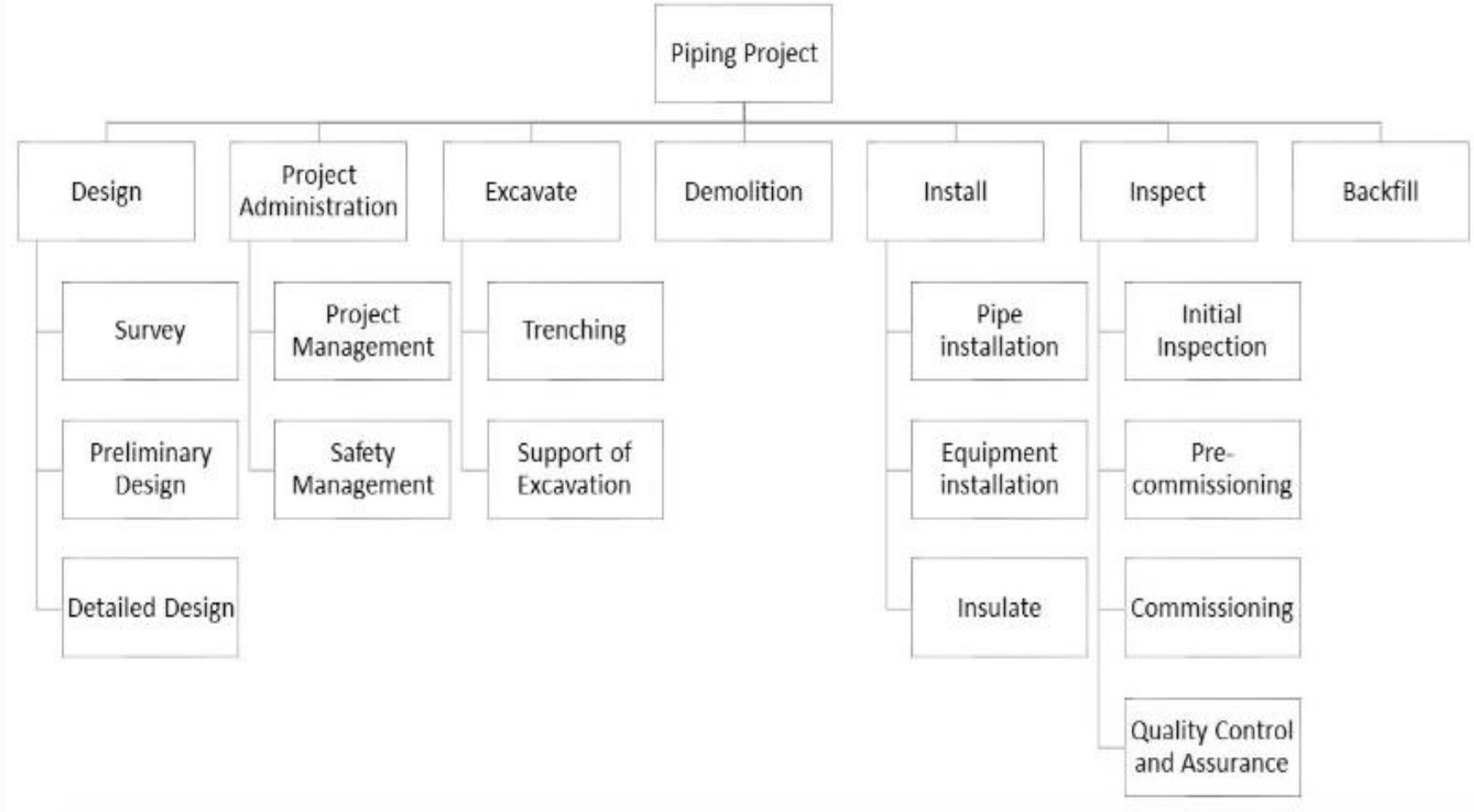
Process-oriented WBS



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Product-oriented WBS

Web-Based E-Commerce System

Product-Based WBS

This WBS **breaks down the project into physical components** (the final system deliverables).

Level 1: Web-Based E-Commerce System

📌 **Level 2: Core System Components**

1. User Interface (Frontend)

- 1.1 Homepage & Navigation
- 1.2 Product Catalog
- 1.3 Shopping Cart
- 1.4 Checkout & Payment
- 1.5 User Account & Profile

2. Backend System

- 2.1 Database Design
- 2.2 User Authentication System
- 2.3 Order Processing
- 2.4 Inventory Management
- 2.5 Admin Dashboard

3. Payment & Security

- 3.1 Payment Gateway Integration
- 3.2 Fraud Detection & Prevention
- 3.3 Data Encryption & SSL
- 3.4 User Data Privacy Compliance

4. Testing & Quality Assurance

- 4.1 Unit Testing
- 4.2 Integration Testing
- 4.3 Performance Testing
- 4.4 Security Testing

5. Deployment & Maintenance

- 5.1 Server Setup & Deployment
- 5.2 Domain & SSL Configuration
- 5.3 Bug Fixing & Updates
- 5.4 User Training & Documentation

This WBS is useful for teams focusing on **software deliverables** and **functional components** of the system.

Process-oriented WBS

Web-Based E-Commerce System

This WBS **focuses on project phases** (how the project progresses over time).

Level 1: Web-Based E-Commerce System Development

📌 **Level 2: Project Phases**

1. Project Initiation
- 1.1 Define Scope
- 1.2 Identify Stakeholders
- 1.3 Feasibility Study
- 1.4 Project Approval

2. Planning
- 2.1 Develop Project Plan
- 2.2 Define Budget
- 2.3 Set Timeline & Milestones
- 2.4 Resource Allocation

3. Requirements Analysis
- 3.1 Gather Business Requirements
- 3.2 Conduct User Research
- 3.3 Define Functional & Non-Functional Requirements
- 3.4 Stakeholder Sign-off

4. System Design
- 4.1 System Architecture
- 4.2 UI/UX Wireframes
- 4.3 Database Schema
- 4.4 API & Integration Planning
- 4.5 Security Framework

5. Development
- 5.1 Backend Development
- 5.2 Frontend Development
- 5.3 Database Setup
- 5.4 Payment Gateway Integration
- 5.5 System Integration

6. Testing & QA
- 6.1 Unit Testing
- 6.2 System Testing
- 6.3 User Acceptance Testing (UAT)
- 6.4 Performance Testing

7. Deployment & Maintenance
- 7.1 Deploy to Production Server
- 7.2 Configure SSL & Security Policies
- 7.3 User Training
- 7.4 Ongoing Bug Fixes & Support

This WBS is useful for teams following a **structured project approach** (Waterfall or Hybrid methodologies).

Key Differences Between Product-Based & Process-Based WBS

Aspect	Product-Based WBS	Process-Based WBS
Focus	Software deliverables & components	Project phases & processes
Structure	Functional modules (UI, Backend, etc.)	Development lifecycle (Initiation, Design, etc.)
Best for	Teams building a complex system with clear deliverables	Teams managing the project from start to finish
Example Usage	Agile teams, feature-focused development	Waterfall projects, structured planning

Project Planning And Control

- Planning includes:
  - Selecting a systems analysis team, assign members.
  - Estimating time required to complete each task.
  - Scheduling the project.

- Control means using feedback to monitor project, including:
  - Comparing the plan for the project with its actual evolution.
  - Taking appropriate action to expedite or reschedule activities.

Planning Steps

1.  Project is broken down into phases.
2.  Further project is broken down into tasks or activities.
3.  Finally project is broken down into steps or even smaller units.
4.  Time is estimated for each task or activity.
5.  Most likely, pessimistic, and optimistic estimates for time may be used.

Planning Step #1 & #2

Phase	Activity
Analysis	Data gathering Data flow and decision analysis Proposal preparation
Design	Data entry design Input design Output design Data organization
Implementation	Implementation Evaluation

Planning
Step #3 & #4

Activity	Detailed Activity	Weeks Required
Data gathering	Conduct interviews	3
	Administer questionnaires	4
	Read company reports	4
	Introduce prototype	5
	Observe reactions to prototype	3
Data flow and decision analysis	Analyze data flow	8
Proposal preparation	Perform cost/benefit analysis	3
	Prepare proposal	2
	Present proposal	2

PROJECT SCHEDULING

Project Management Software

Classic Project Management Software (e.g., Microsoft Project)

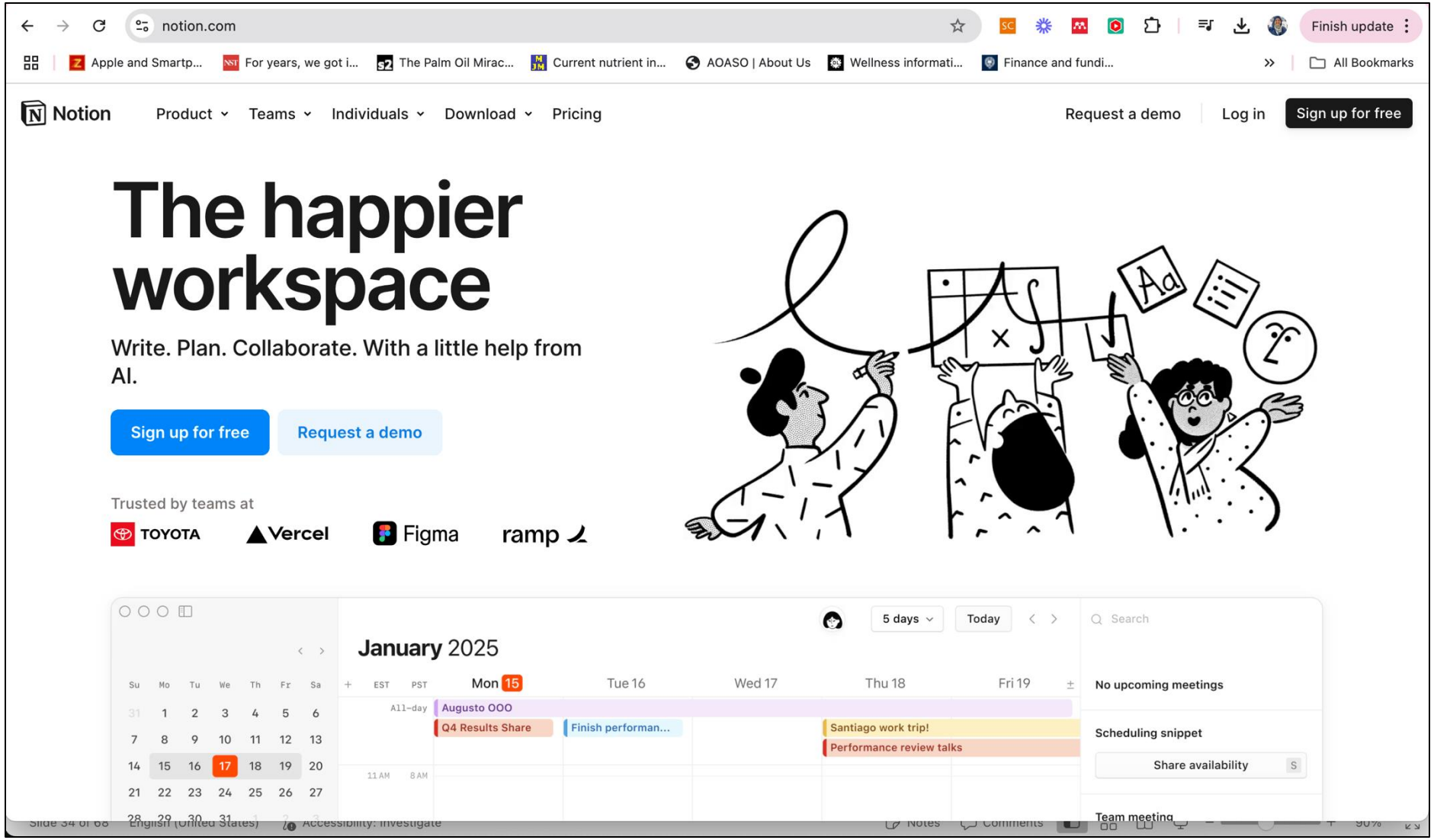
- **Designed for structured, traditional project management** methodologies such as **Waterfall**.
- Focuses on **detailed planning, task dependencies, resource allocation, and Gantt charts**.
- Best suited for **large-scale, enterprise-level projects** requiring **rigid structure and forecasting**.
- **Requires more expertise** to use effectively.
- Often **integrated with legacy systems** and used in corporate environments.

Project Management Software

Modern Project Management Software (e.g., Notion, Monday, ClickUp, Trello)

- Built for **agile and flexible workflows**, often used in **Agile, Scrum, or Kanban** methodologies.
- Emphasizes **collaboration, visual task tracking, and ease of use**.
- More **intuitive and lightweight**, making them accessible to a wider audience, including startups and SMEs.
- Focuses on **real-time updates, cloud-based access, and integrations with other productivity tools**.
- Often **modular and customizable**, allowing teams to adapt the software to different use cases.

Project Management Software



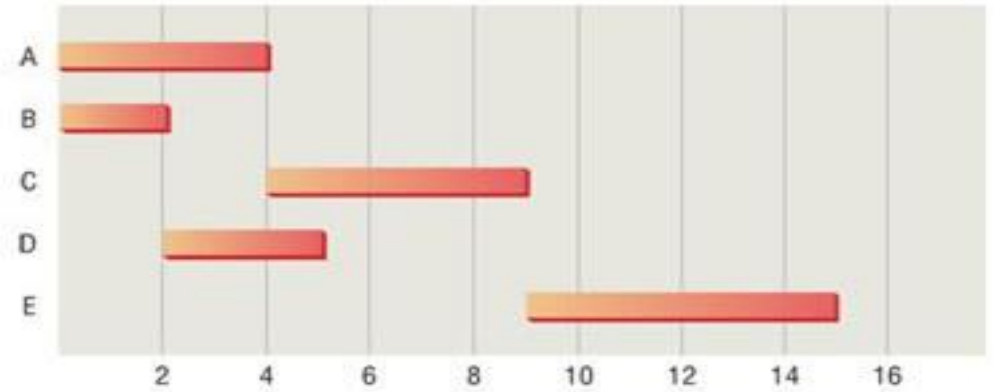
Trello

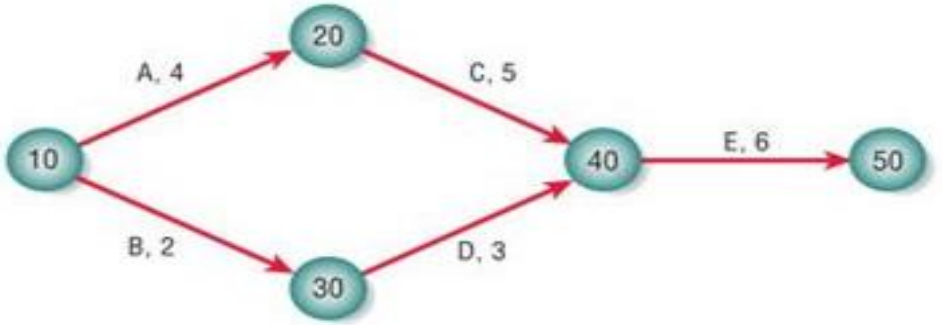
monday.com

ClickUp

Project Scheduling Techniques

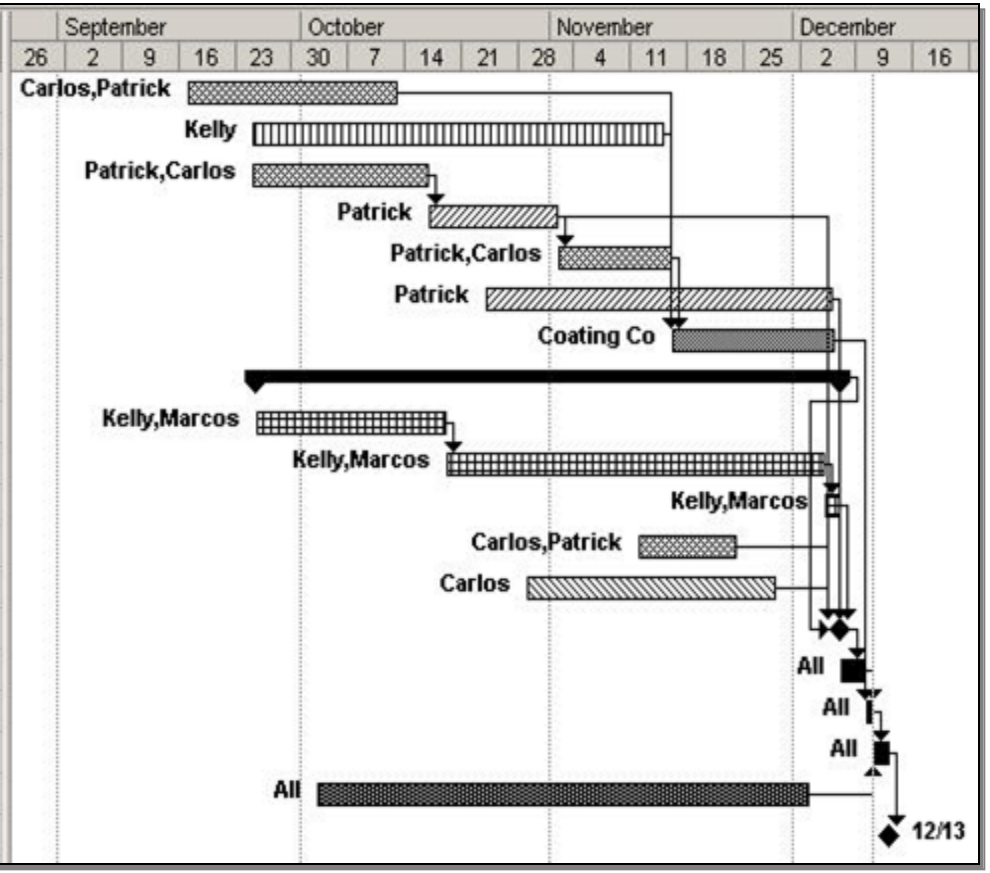
- Gantt Charts
- PERT diagrams
- Critical Path Method





Project Scheduling Techniques #1: Gantt Chart

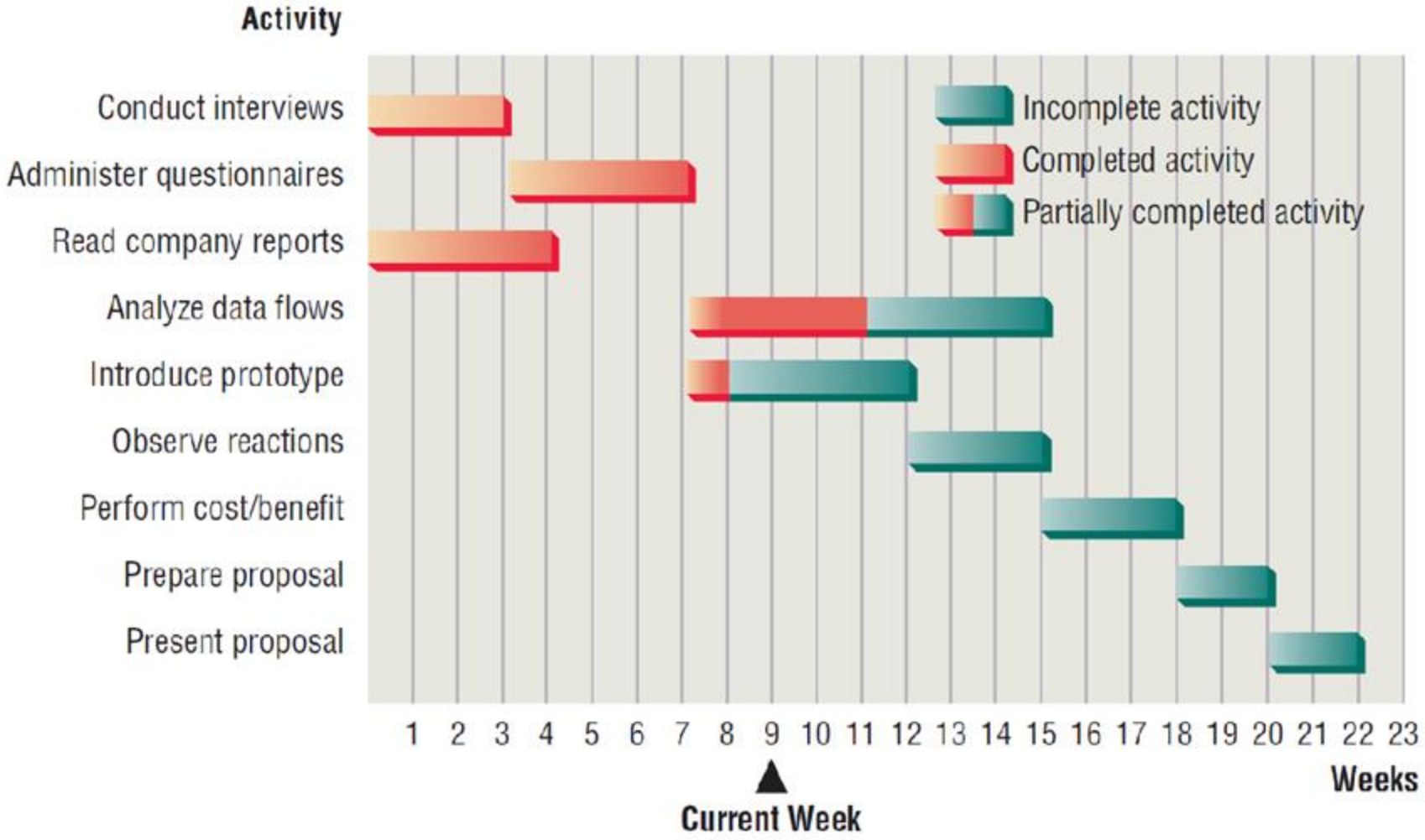
Task Name	Duration
Research and choose coatings	2.86 wks
Get canoe balls ready	5.29 wks
Design washers	2.29 wks
Detailed washer repeatability analysis	1.71 wks
Make washers	1.43 wks
Make washer and canoe grooves	33 days
Have parts coated (max)	2.29 wks
Test rig development	**54.5 days**
Design	2.5 wks
Build	5 wks
Troubleshoot	0.29 wks
Research and chose lubricants	1.43 wks
Design Test and Test Automation	3.29 wks
Start testing	0 days
Test	3 days
Analyze data	1 day
Finish report and presentation	2 days
Write up analysis and results	6.43 wks
End of term	0 days



- Chart in which **bars** represent **tasks or activities**
- Advantages:
  - Simple : easy to understand
  - Worthwhile communication with end user.
  - Drawn to scale : sequence of activities/tasks with length durations

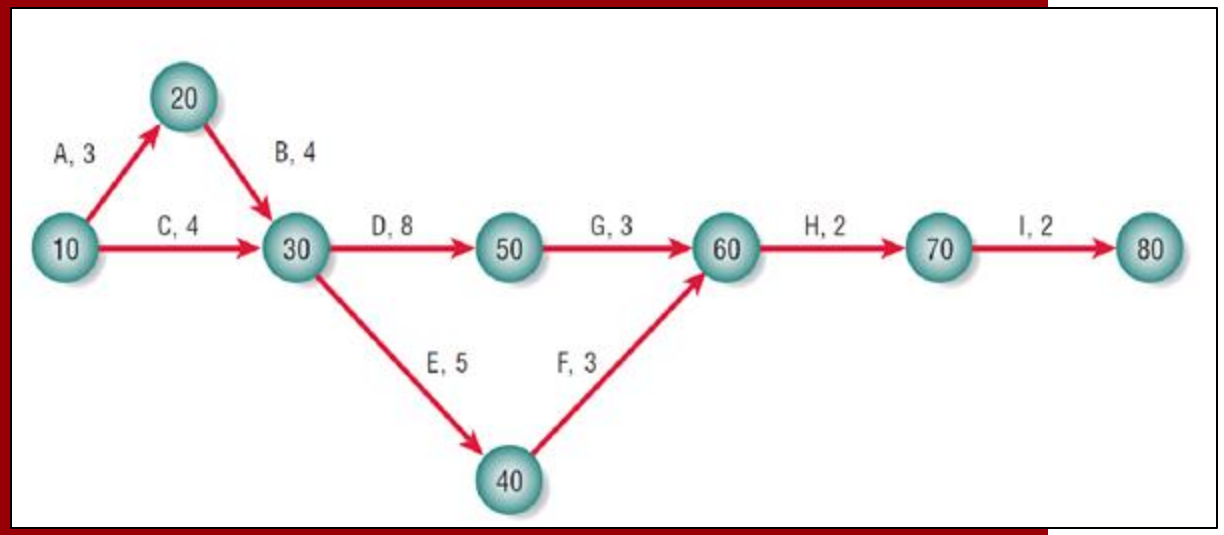
** Assign more than 1 roles to specific task names*

Gantt Chart (2 Dimensions)



** Using a two-dimensional Gantt chart for planning activities that can be accomplished in parallel*

Project Scheduling Techniques #2: PERT diagram



A,3 - means Activity A has a duration of 3 days/weeks

- Program Evaluation and Review Technique (PERT)
  - Program = project
- Useful when **activities can be done in parallel** rather than sequence.
- sometimes known as ***Network*** *diagram*
  - Represented by a **network of nodes and arrows -** *- nodes denote events & arrows denote activities*
  - Nodes
    - called event, identified by numbers, letters etc
    - To recognize that an activity is completed
    - Indicate which activities need to be completed before new activities maybe undertaken (*precedence*)

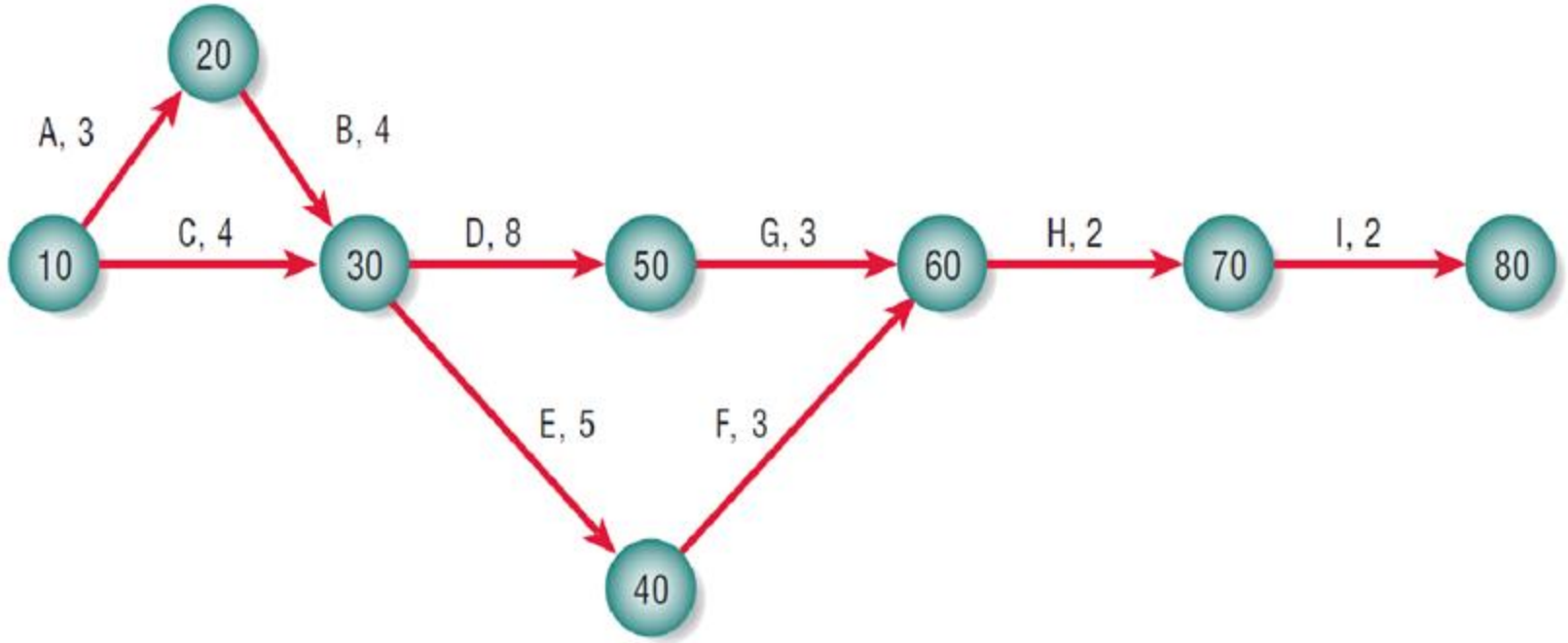
Project Scheduling Techniques #2: PERT diagram

- Advantages:
  - Easy identification of the order of precedence.
  - Easy identification of the critical path and thus critical activities.
  - Easy determination of slack time.
- Occasionally, PERT Diagram need pseudo-activities, referred to as dummy activities
- It is used to preserve the logic or clarify the diagram.

Example: How to develop PERT diagram for the following activities in Analysis Phase?

Activity		Predecessor	Duration
A	Conduct interviews	None	3
B	Administer questionnaires	A	4
C	Read company reports	None	4
D	Analyze data flow	B, C	8
E	Introduce prototype	B, C	5
F	Observe reactions to prototype	E	3
G	Perform cost/benefit analysis	D	3
H	Prepare proposal	F, G	2
I	Present proposal	H	2

Example of developed PERT diagram

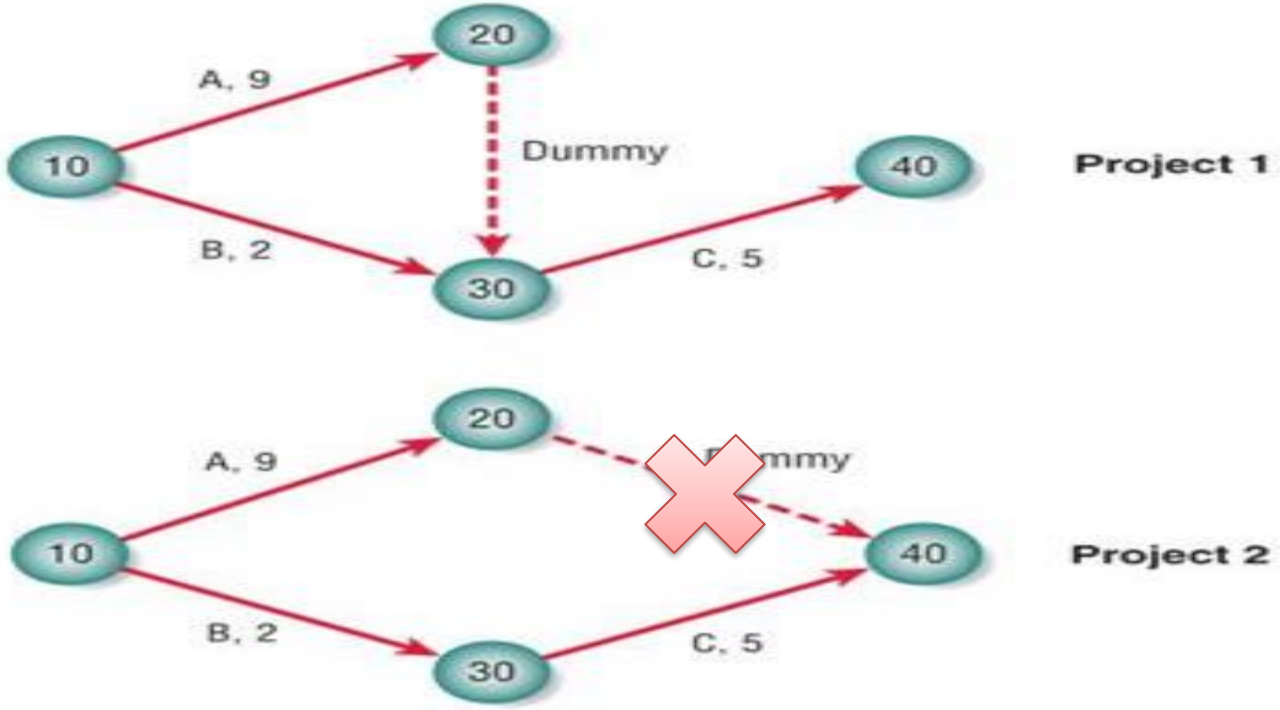


** A completed network diagram for the analysis phase of a systems project*

Project Scheduling Techniques #2: PERT diagram – Dummy activities

- Occasionally, PERT Diagram need pseudo-activities, referred to as **Dummy activities**
- It is used to preserve the logic or clarify the diagram.

Project Scheduling Techniques #2: PERT diagram example – inserting Dummy



* C can only be started if both A and B are finished

* C only requires B's completion & could be under way while A is still taking place.

** Insert dummy to show logical sequence of the activity.*

Project Scheduling Techniques #3: Critical Path Method (CPM)

- CPM is a project network analysis technique used to predict total project duration.
- The critical path is the *longest path* through the network diagram and has the least amount of slack or float.
- A critical path for a project is the series of activities that determines the *earliest time* by which the project can be completed.

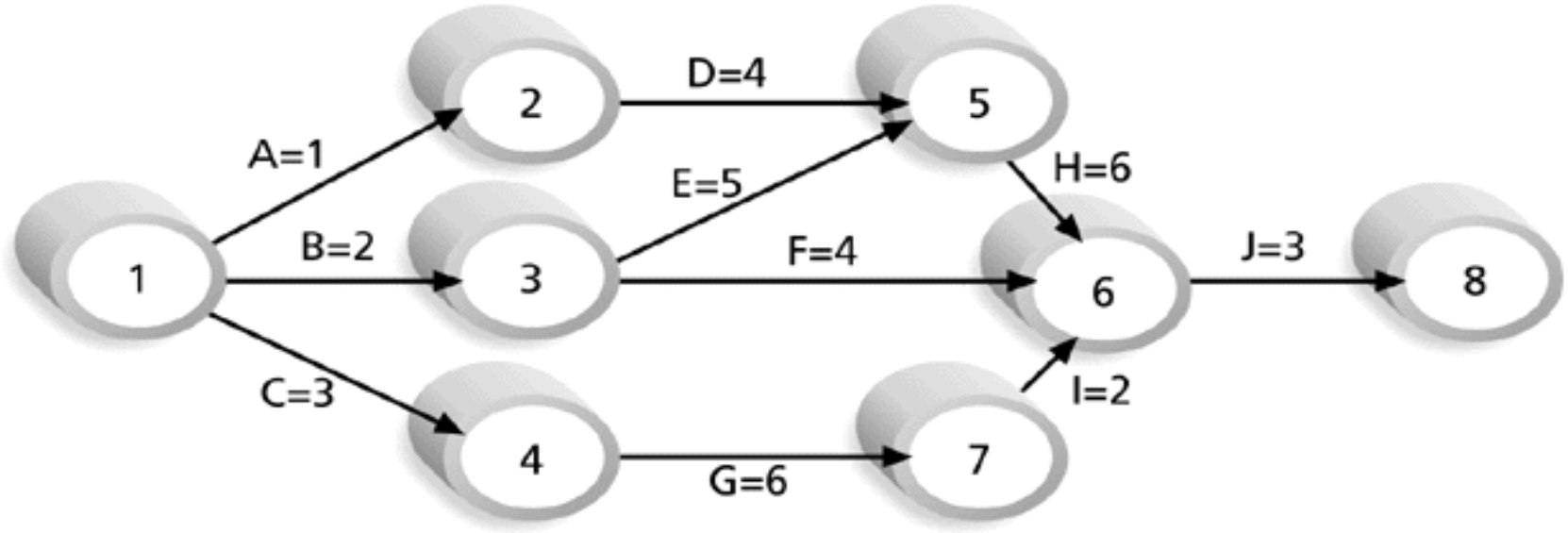
Finding The Critical Path

- First develop a good project PERT diagram.
- Add the durations for all activities on each path through the project network diagram.
- The longest path is the critical path.

•Note: *If one or more activities on the critical path takes longer than planned, the whole project schedule will slip unless corrective action is taken.*

- *There can be more than one critical path if the lengths of two or more paths are the same.*
- *The critical path can change as the project progresses.*

Determining the Critical Path for Project X

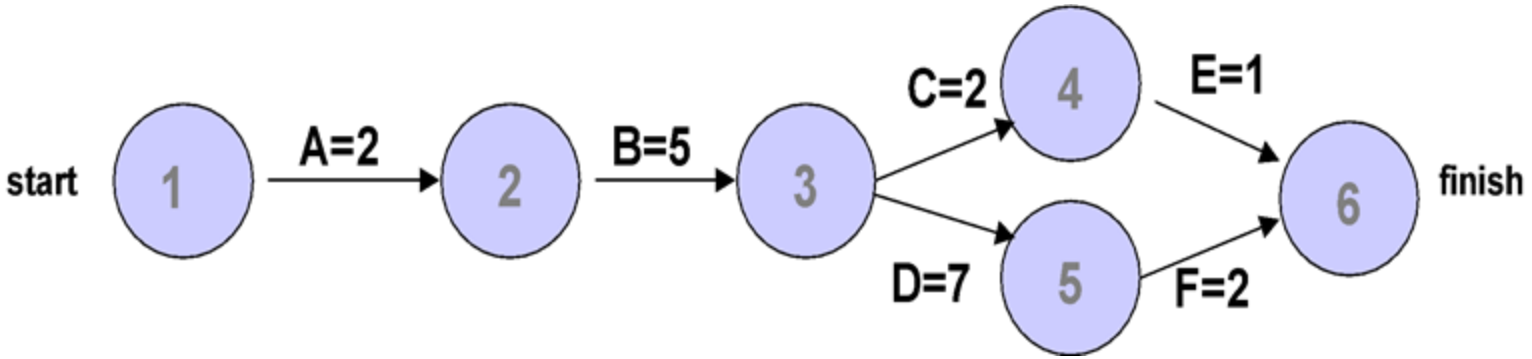


Note: Assume all durations are in days.

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.

CPM Example



Consider the following project network diagram. Assume all times are in days:

a) How many paths are on this network diagram?

b) How long is each path?

c) Which is the critical path?

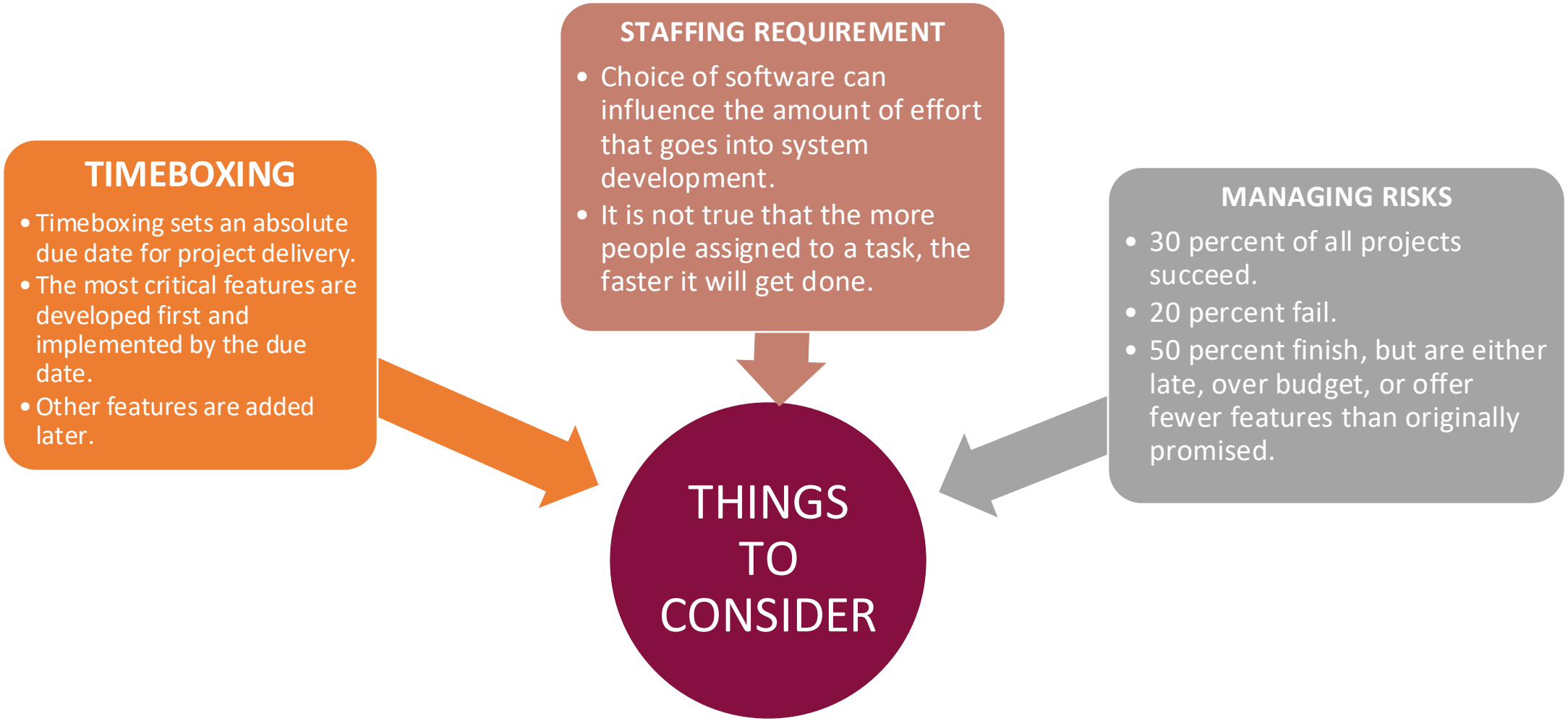
d) What is the shortest amount of time needed to complete this project?

PROJECT CONTROL

Controlling Changes to the Project Schedule

- Perform reality checks on schedules.
- Allow for contingencies.
- Don’t plan for everyone to work at 100% capacity all the time.
- Hold progress meetings with stakeholders and be clear and honest in communicating schedule issues.

Controlling Changes to the Project Schedule



Timeboxing Technique

Managing Risk

Potential Problem That May Risk Completion of the Entire Project	Problem Probability	Delay if Problem Occurs	Budgeted Delay
Team is delayed because they are finishing another project.	0.50	60 days	30 days
Executives are not present during requirements phase.	0.25	20 days	5 days
Time budgeted to compensate delays to the project			**35 days**

PART 3

- TEAM MANAGEMENT

Managing Teams

Team Management #1: Assembling a Team

- Shared value of team work
- Good work ethic
- Honesty
- Competency
- Readiness to take on leadership based on expertise
- Motivation
- Enthusiasm for the project
- Trust of teammates

Team Management #2: Communication Strategies

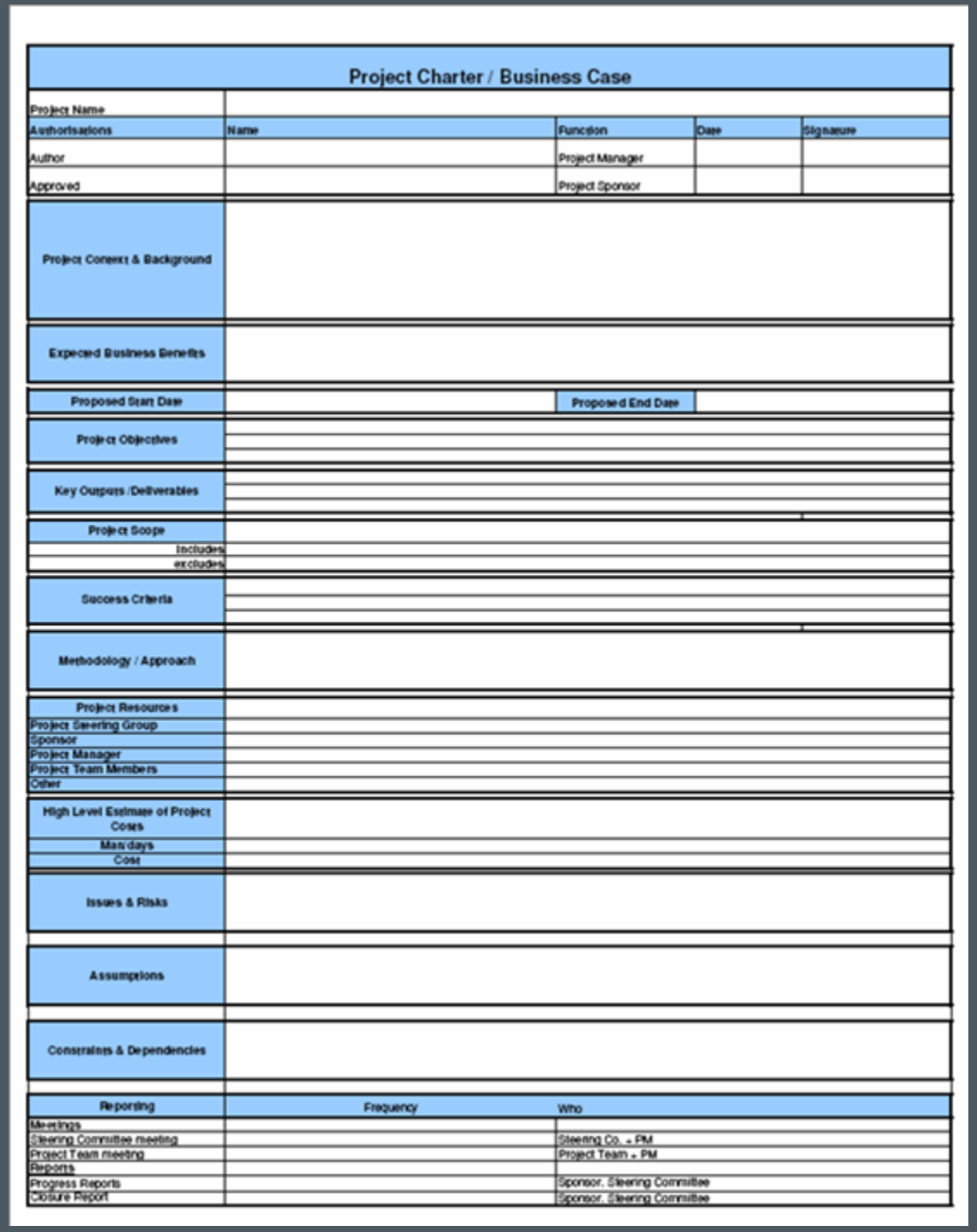
- Teams often have two leaders:
  - One who leads members to accomplish tasks.
  - One concerned with social relationships.
- The systems analyst must manage:
  - Team members.
  - Their activities.
  - Their time and resources.

Team Management #3 & #4: Project Productivity Goals and Motivation

- Successful projects require that reasonable productivity goals for tangible outputs and process activities be set.
- Goal-setting helps to motivate team members.

Project Charter

- Describes in a written document what the expected results of the systems project are and the time frame for delivery.
- Written narrative that clarifies several questions such as:
  - What does the user expect of the project?
  - What is the scope?
  - What analysis methods will be used?
  - Who are the key participants?
  - What are the project deliverable?



Project Charter / Business Case

Project Name				
Authorisations	Name	Function	Date	Signature
Author		Project Manager		
Approved		Project Sponsor		
Project Context & Background				
Expected Business Benefits				
Proposed Start Date		Proposed End Date		
Project Objectives				
Key Outputs /Deliverables				
Project Scope				
Includes				
excludes				
Success Criteria				
Methodology / Approach				
Project Resources				
Project Steering Group				
Sponsor				
Project Manager				
Project Team Members				
Other				
High Level Estimate of Project Costs				
Man'days				
Cost				
Issues & Risks				
Assumptions				
Constraints & Dependencies				

Reporting	Frequency	Who
Meetings		
Steering Committee meeting		Steering Co. + PM
Project Team meeting		Project Team + PM
Reports		
Progress Reports		Sponsor, Steering Committee
Closure Report		Sponsor, Steering Committee

PROJECT CHARTER

AVOIDING PROJECT FAILURES

- Project failures may be prevented by:
  - Training.
  - Experience.
  - Learning why other projects have failed.

REFERENCES

Kendall, K.E. & Kendall, J.E., 2019. *System Analysis and Design*. 10th Ed. Essex:Pearson.

TOPIC OVERVIEW

1 Project Initiation	•Problems vs. Opportunities
2 Feasibility Study	•Cost Benefit Analysis (CBA)
3 Activity Planning & Control	•Work Breakdown Structure (WBS)
4 Project Scheduling	•Gantt chart, PERT diagram, Critical Path Method (CPM)
5 Team Management	•Team members, Project charter document

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Thank You

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