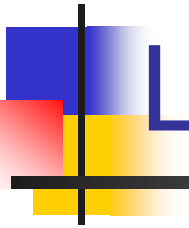
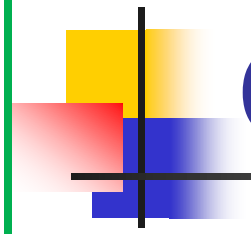
Software Project Management



Lecture 5

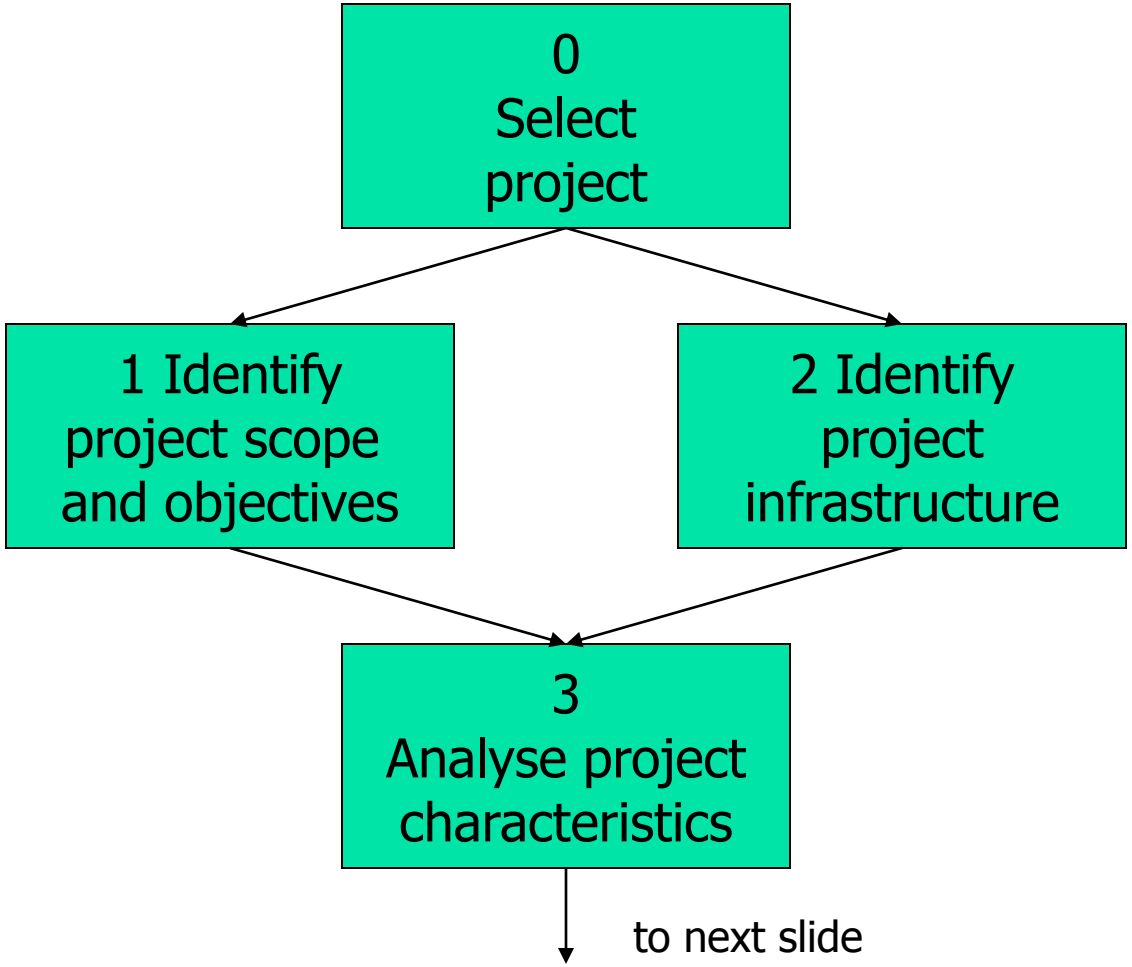
Stepwise Project Planning



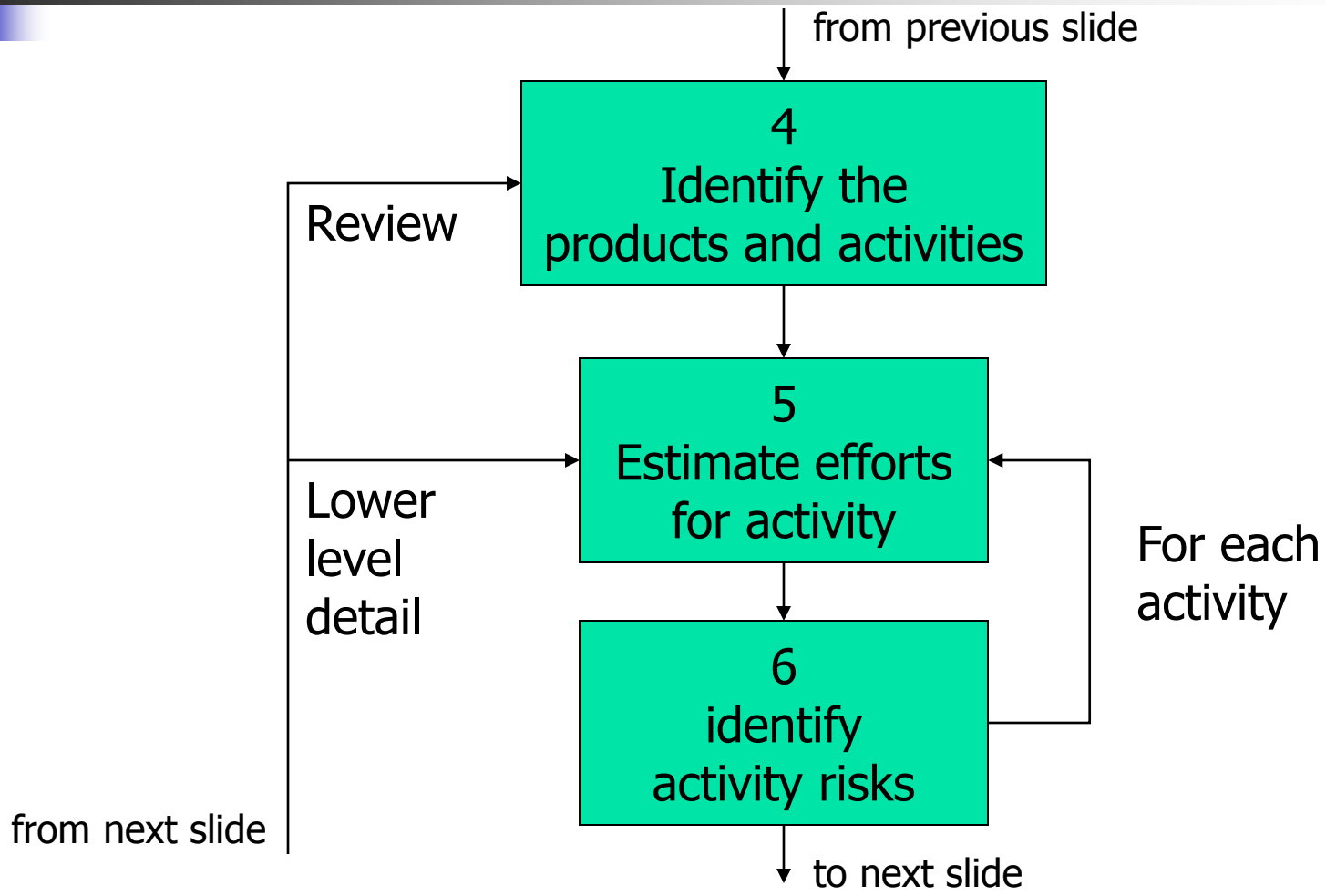
Overview

- Step Wise project planning framework
- Preparation of a software project plan
- Planning and scheduling the activities in software project management
- Various approaches towards activity plan
- Various scheduling techniques such as sequencing and CPM

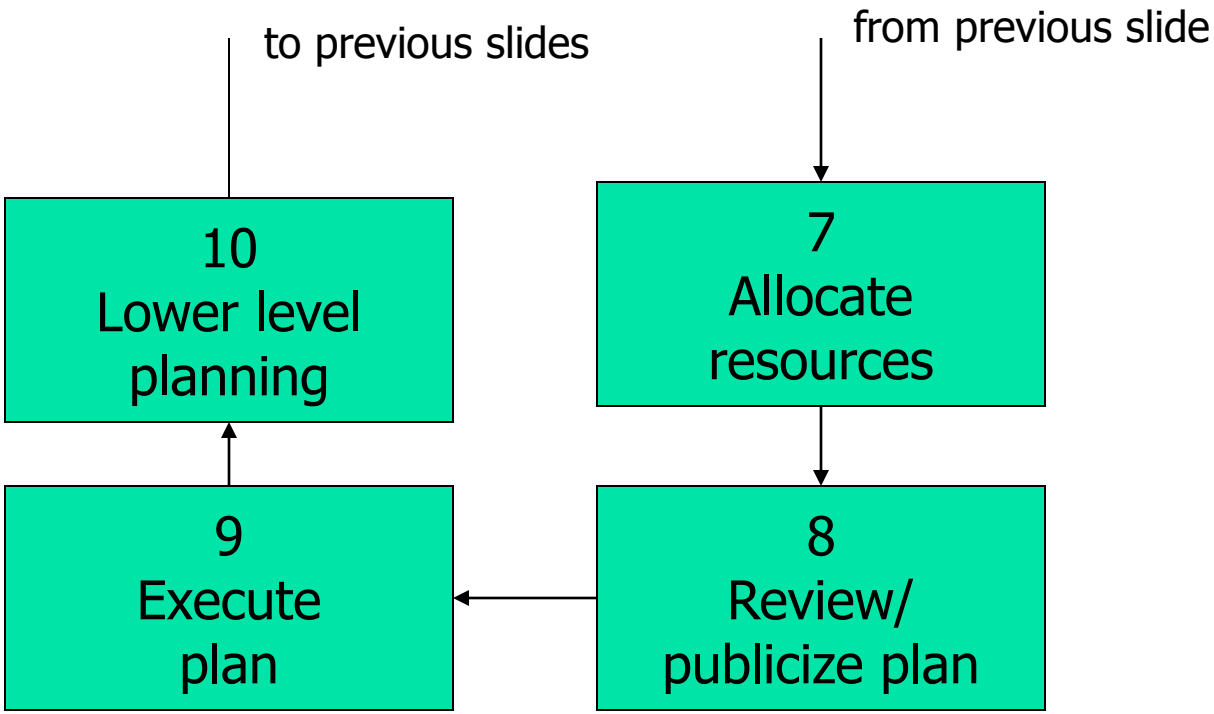
Step Wise – An Overview



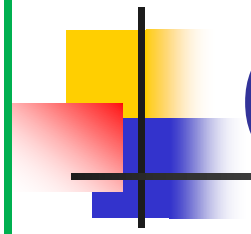
Step Wise – An Overview (cont'd)



Step Wise – An Overview (cont'd)

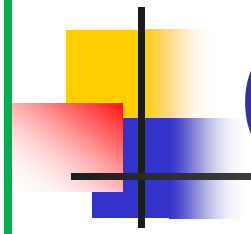


Step Wise – An Overview (cont'd)



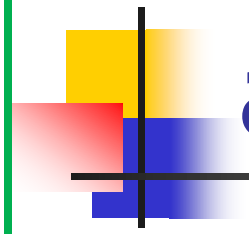
- Step 0: Select project
- Step 1: Identify project scope and objectives
- Step 2: Identify project infrastructure
- Step 3: Analyze project characteristics
- Step 4: Identify project products and activities

Step Wise - An Overview (cont'd)



- Step 5: Estimate effort for each activity
- Step 6: Identify activity risks
- Step 7: Allocate resources
- Step 8: Review/publicize plan
- Step 9: Execute plan
- Step 10: Execute lower levels of planning

Step 1: Identify Project Scope and Objectives

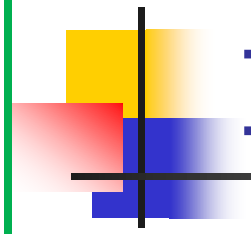


- Step 1.1 Identify objectives and practical measures of the effectiveness in meeting those objectives
- Step 1.2 Establish a project authority
  - To ensure the unity of purpose among all persons concerned

Step 1: Identify Project Scope Objectives (cont'd)

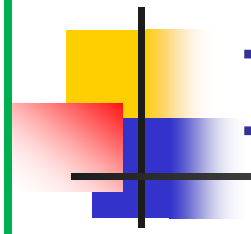
- Step 1.3 Identify all stakeholders in the project and their interests
- Step 1.4 Modify objectives in the light of stakeholder analysis
- Step 1.5 Establish methods of communication between all parties

Step 2: Identify Project Infrastructure



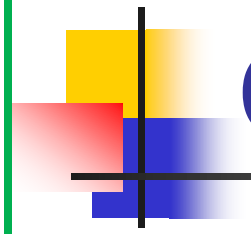
- Step 2.1 Identify relationship between the project and strategic planning
  - To determine the order of related projects (in the organization) being carried out
  - To establish a framework within which the system fits
  - To ensure the hardware and software standards are followed

Step 2: Identify Project Infrastructure (cont'd)



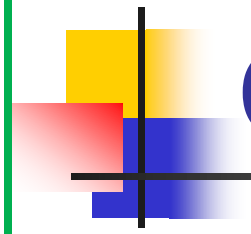
- Step 2.2 Identify installation standards and procedures
  - more appropriate name: "Identify standards and procedures related to the software project"
- Step 2.3 Identify project team organization

Step 3: Analyse Project Characteristics



- Step 3.1 Distinguish the project as either objective-driven or product-driven
- Step 3.2 Analyse other project characteristics (including quality-based ones)
- Step 3.3 Identify high level project risks
- Step 3.4 Take into account user requirements concerning implementation

Step 3: Analyse Project Characteristics (cont'd)



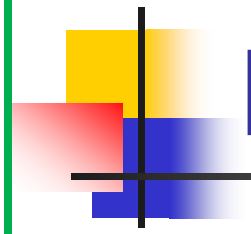
- Step 3.5 Select general lifecycle approach in the light of the above
- Step 3.6 Review overall resource estimates

  Up to this stage,

  - the major risks of the project are identified
  - the overall approach of the project is decided

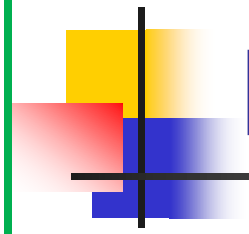
  So, it is a good place to re-estimate the required effort and other resources for the project

Step 4: Identify Project Products and Activities



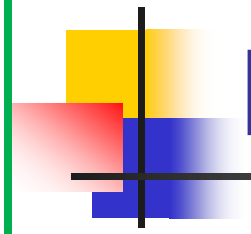
- Step 4.1 Identify and describe project products
  - Identify all the products related to the project
  - Account for the required activities
- Step 4.2 Document generic product flows
  - To document the relative order of the products
- Step 4.3 Recognize product instances

Step 4: Identify Project Products and Activities(cont'd)



- Step 4.4 Produce an ideal activity network
  - Activity network shows the tasks that have to be carried out as well as their sequence of execution for the creation of a product from another
- Step 4.5 Modify the ideal to take into account need for stages and checkpoints
  - To check compatibility of products of previous activities

Step 5: Estimate Effort for Each Activity

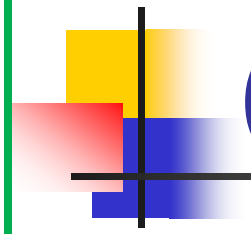


- Step 5.1 Carry out bottom-up estimates
  - need to estimate staff effort, time for each activity, and other resources
- Step 5.2 Revise plan to create controllable activities
  - need to break a task into a series of manageable sub-tasks

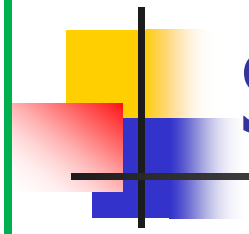
Step 6: Identify Activity Risks

- Step 6.1 Identify and quantify the risks of each activity
- Step 6.2 Plan risk reduction and contingency measures where appropriate
- Step 6.3 Adjust overall plans and estimates to take account of risks

Step 7: Allocate Resources (Staffing)



- Step 7.1 Identify and allocate resources
  - type of staff needed for each activity
  - staff availabilities are identified
  - staff are provisionally allocated to task
- Step 7.2 Revise plans and estimates to take into account resource constraints
  - staffing constraints
  - staffing issues

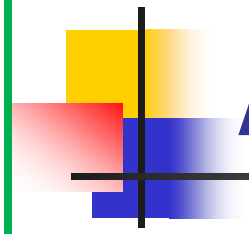


Step 8: Review/publicize Plan

- Step 8.1 Review quality aspects of the project plan
  - To ensure each activity is completed with a quality product
  - Each activity should have ‘exit requirements’.
  - This ensures the quality of the product on each activity.

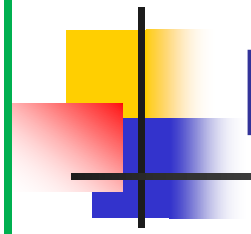
Step 8: Review/publicize Plan (cont'd)

- Step 8.2 Document plans and obtain agreement
  - all parties understand and agree to the commitments in the plan



Aside – When to plan

- Planning is an on-going process of refinement
- Planning at different stages of the project has different emphases and purposes

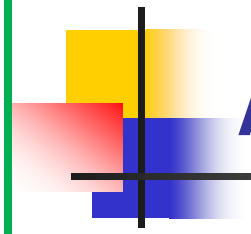


Project Vs Activity

- A project is composed of a number of related activities
- A project may start when at least one of its activities is ready to start
- A project will be completed when all of its activities have been completed

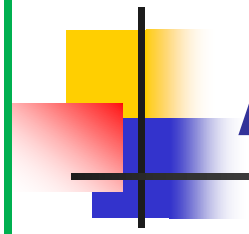
Project Vs Activity (cont'd)

- An activity must have a clear start and a clear stop
- An activity should have a duration that can be forecasted
- Some activities may require that other activities are completed before they can begin



Activity Planning

- A project plan is a schedule of activities indicating the start and stop for each activity
  - Also provide the project and resource schedules
- The start and stop of each activity should be visible and easy to measure
- Each activity should have some ‘deliverables’ for ease of monitoring

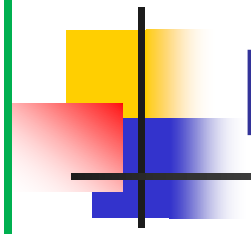


Activity Planning (cont'd)

- During planning, managers consider:
  - Resource availability
  - Resource allocation
  - Staff responsibility
  - Project Monitoring
  - Cash flow forecasting
  - Re-planning of the project towards the pre-defined goal

Other Objectives of Activity Planning

- Feasibility assessment
- Resource allocation
- Detailed costing
- Motivation
- Co-ordination



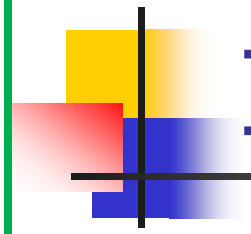
Different Levels of Plans

- Project Schedule: a plan that shows
  - 1. the dates when each activity should start and stop
  - 2. when and how much of the resources will be required
- Activity Plan: a plan that describes
  - how each activity will be undertaken

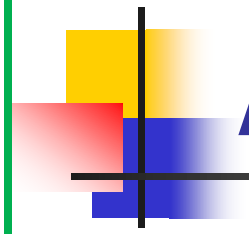
Project Schedule in 4 Stages

- Ideal Activity Plan
  - An activity plan without any constraints
- Risk consideration for each activity
- Resource consideration for whole project
- Schedule production and publication

Various Approaches Towards Identifying Activity



- Activity-based approach
- Product-based approach
- Hybrid approach

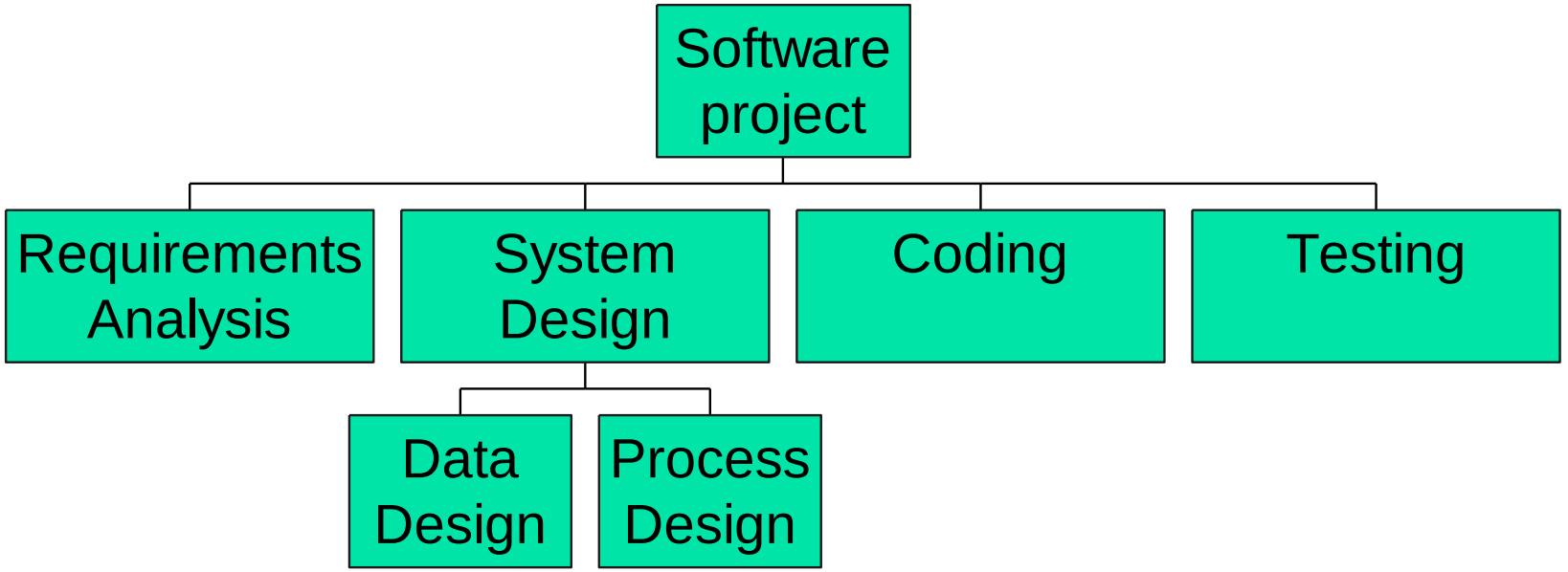


Activity-based Approach

- Use *Work Breakdown Structure* (WBS) to generate a task list
- WBS involves
  - identifying the main tasks
  - break each main task down into subtasks
  - The subtasks can further be broken down into lower level tasks.

Activity-based Approach (cont'd)

Work Breakdown Structure (an extract)

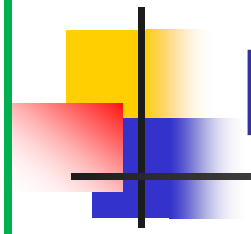


Activity-based Approach (cont'd)

- Advantages
  - More likely to obtain a task catalogue that is complete and is composed of non-overlapping tasks
  - WBS represents a structure that can be refined as the project proceeds
  - The structure already suggests the dependencies among the activities

Activity-based Approach (cont'd)

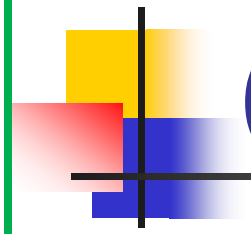
- Disadvantage
  - Very likely to miss some activities if an unstructured activity list is used



Product-based Approach

- Product Breakdown Structure (PBS)
  - To show how a system can be broken down into different products for development
- Product Flow Diagram (PFD)
  - To indicate, for each product, which products are required as ‘inputs’

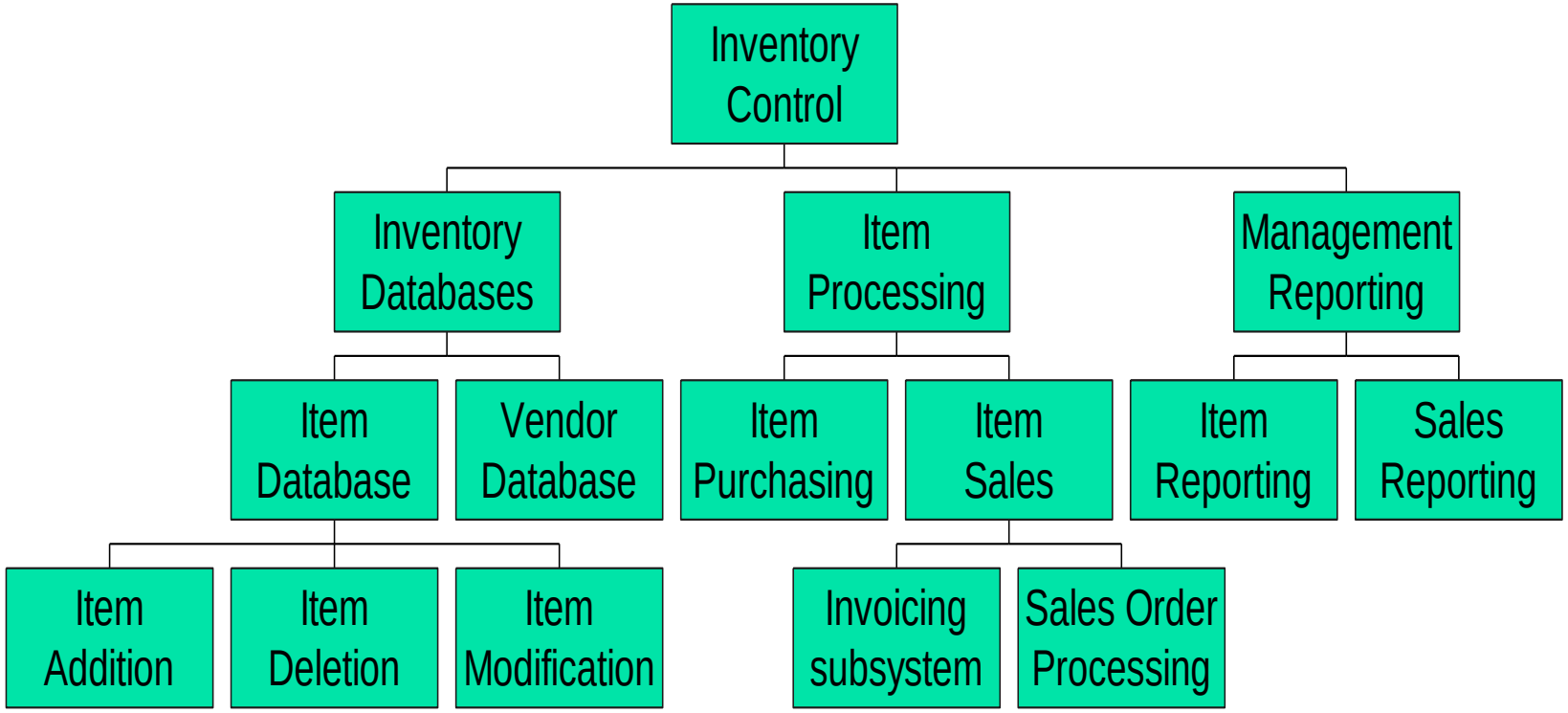
Product-based Approach (cont'd)

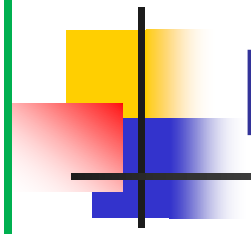


- Advantages
  - Less likely to miss a product unexpectedly from a PBS

Product-based Approach – An example

A Product Breakdown Structure (an extract)

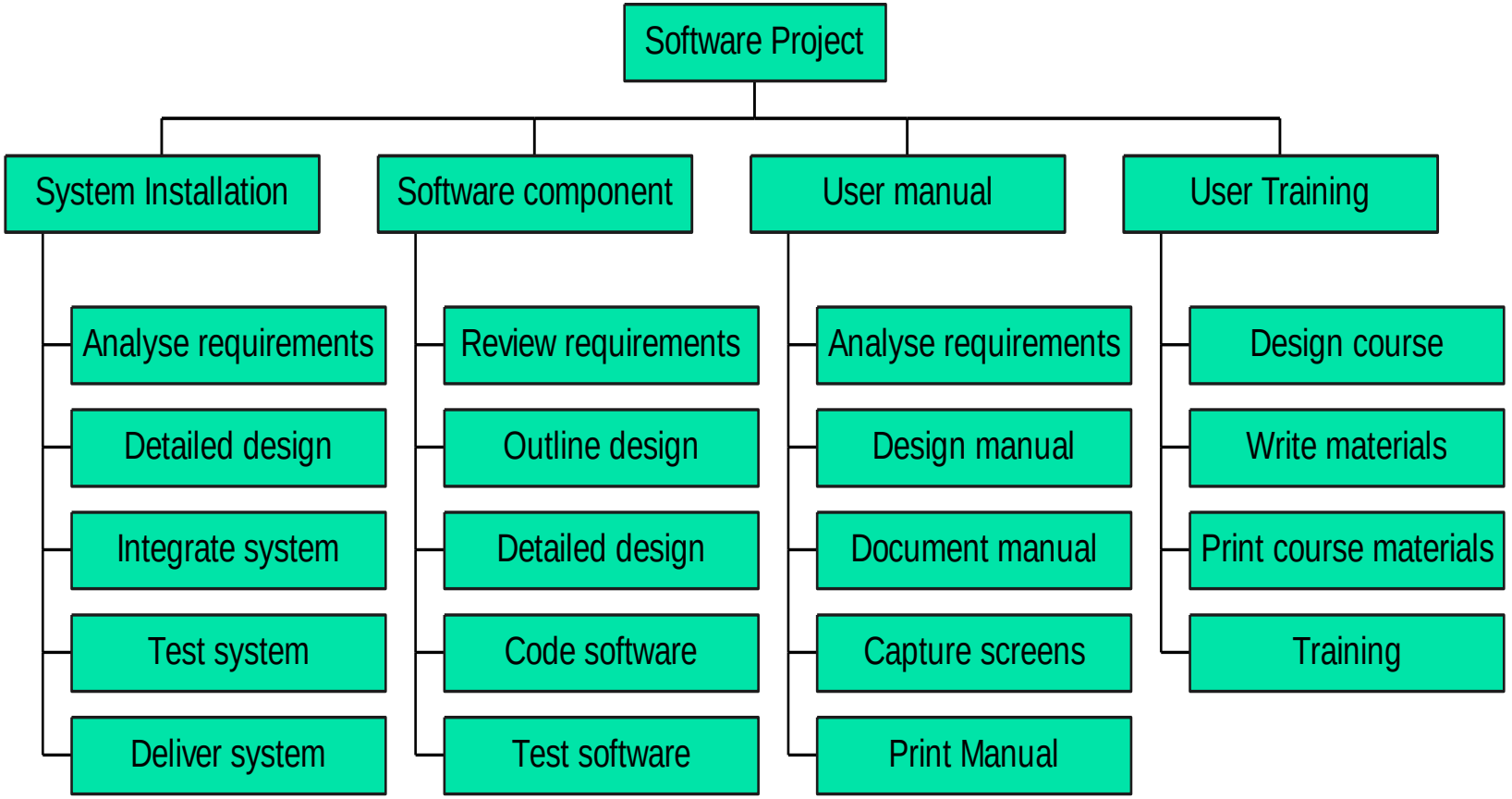


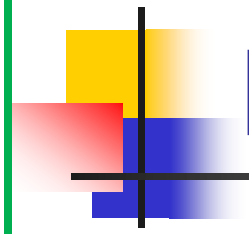


Hybrid Approach

- A mix of the activity-based approach and the product-based approach
- More commonly used approach
- The WBS consists of
  - a list of the products of the project; and
  - a list of activities for each product

Hybrid Approach (cont'd)

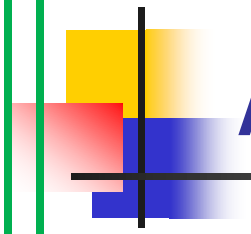




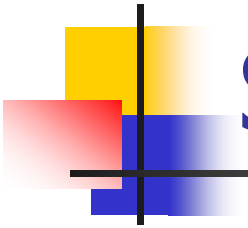
Hybrid Approach (cont'd)

- IBM in its MITP methodology suggests 5 levels
  - Level 1: Project
  - Level 2: Deliverables (software, manuals etc)
  - Level 3: Components
  - Level 4: Work-packages
  - Level 5: Tasks (individual responsibility)

Planning and Scheduling the Activities

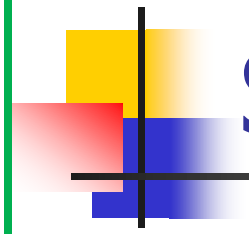


- Once we have a project plan (or, project schedule), we need to schedule the activities in a project taking into account the resource constraints



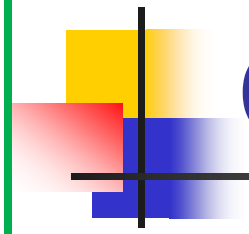
Scheduling Techniques

- Simple sequencing
  - Suitable for small projects
- Critical Path Method (CPM)
  - Suitable for large software projects
  - The most commonly used “networking” technique



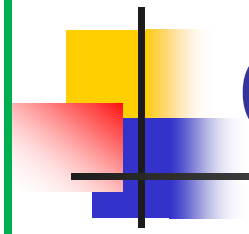
Simple sequencing

- A simple sequencing of the tasks and the responsible personnel taken into account of the resources
- Easily presented in a simple bar chart
  - see figure 6.6 in Hughes book
- Suitable for allocating individuals to particular tasks at an early stage



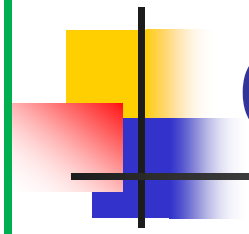
Critical Path Method (CPM)

- Primary objectives:
  - Planning the project so that it can be completed as quickly as possible
  - Identifying those activities where their delays is likely to affect the overall project completion date
- Developed by Du Pont Chemical Company and published in 1958



Critical Path Method (cont'd)

- Capture the activities and their inter-relationships using a graph
  - Lines are used to represent the activities
  - Nodes are used to represent the start and stop of activities



Critical Path Method (cont'd)

- Adding time dimension
  - The forward pass
    - calculate the earliest start dates of the activities
    - To calculate the project completion date
  - The backward pass
    - calculate the latest start dates for activities
    - identify the critical path from the graph

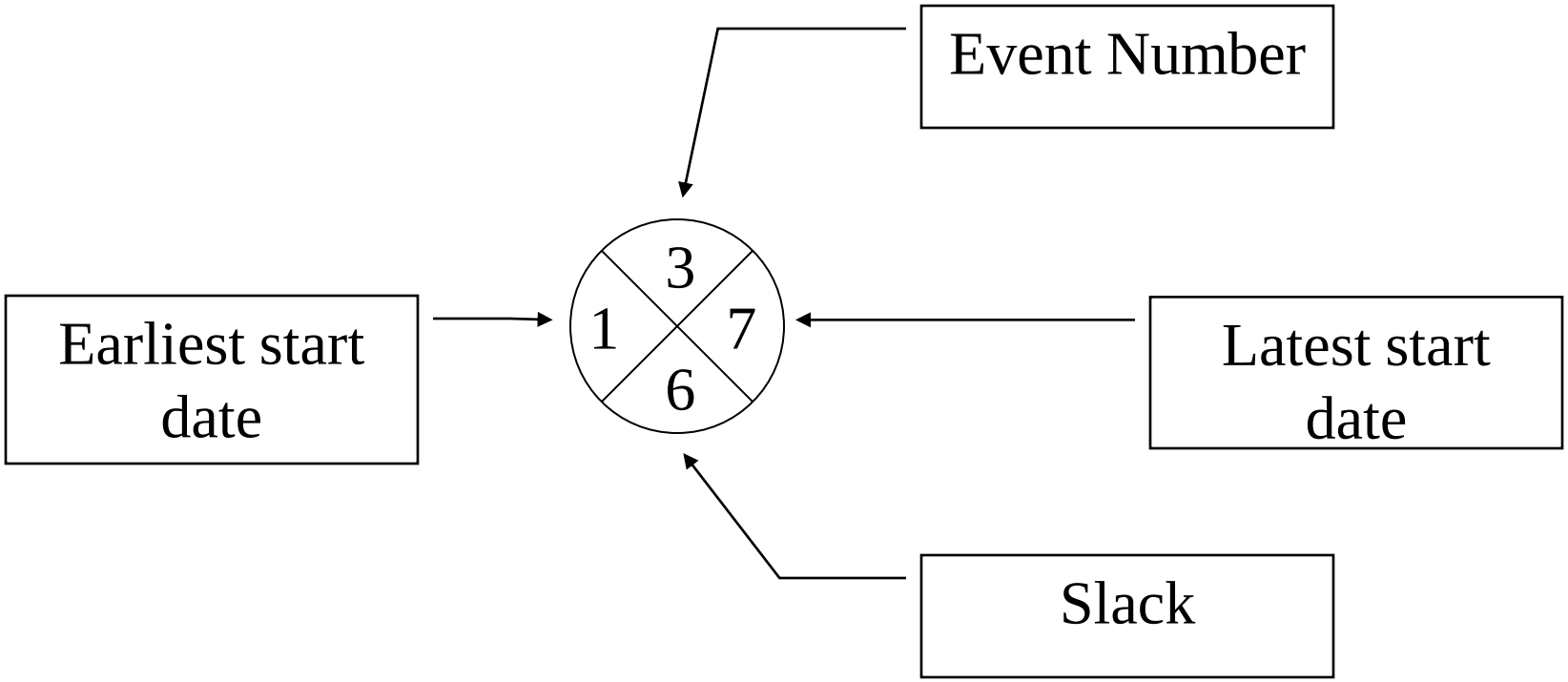
Critical Path Method (cont'd)

- Identifying critical path and critical event
  - Critical event: an event that has zero *slack*
  - Critical path: a path joining those critical events

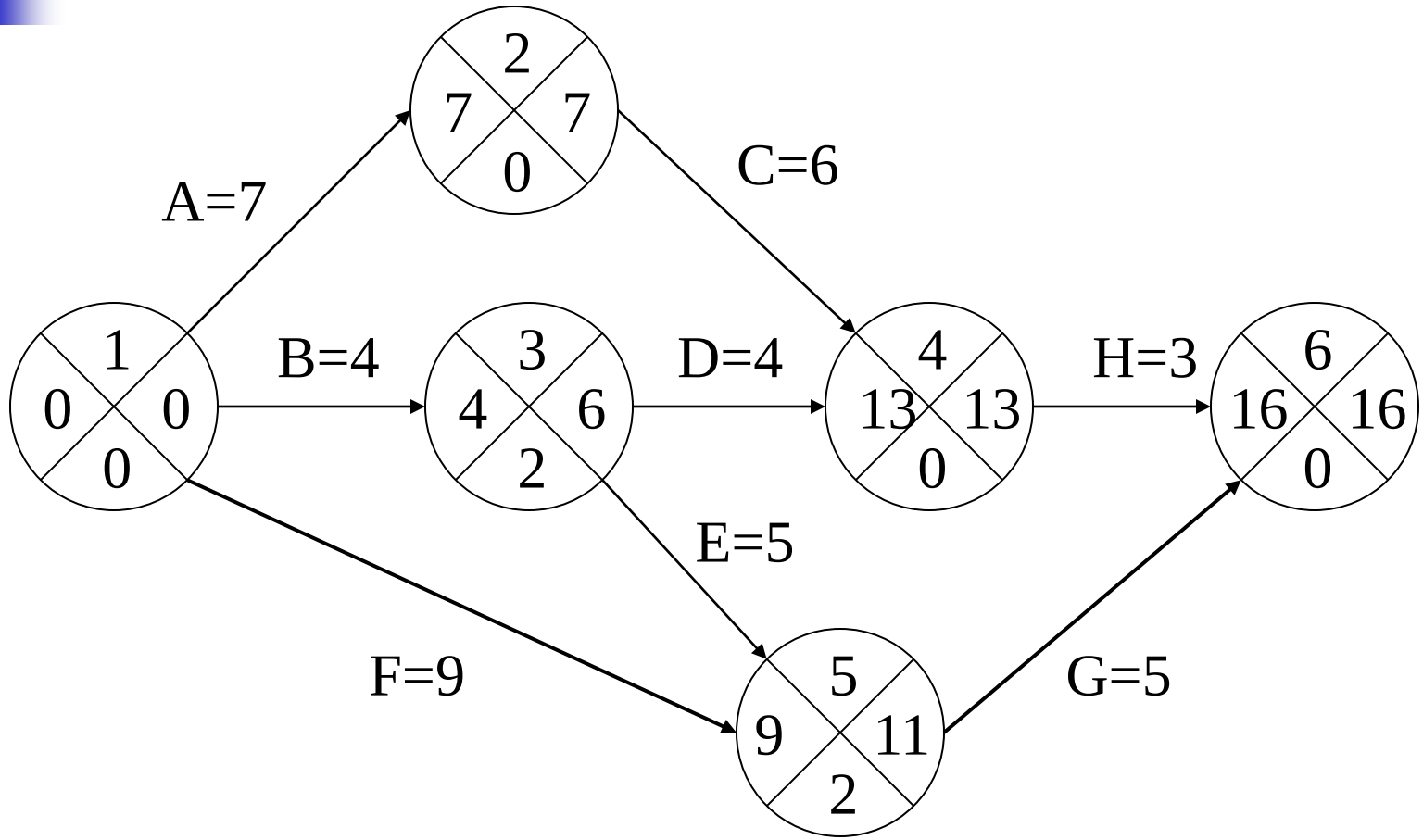
Example to construct a CPM

Id.	Activity Name	Duration (weeks)	Precedents
A	Hardware selection	7	
B	Software design	4	
C	Hardware Installation	6	A
D	Coding	4	B
E	Data Preparation	5	B
F	User Documentation	9	
G	User Training	5	E,F
H	System Installation	3	C,D

Example to construct a CPM (cont'd)



Example to construct a CPM (cont'd)



Activity Float

- Time allowed for an activity to delay
- 3 different types:
  - Total float (without affecting the completion of the project)

    = latest start date – earliest start date
  - Free float (without affecting the next activity)

  = earliest start date of *next* activity – latest end date of *previous* activity
  - Interfering float (= total float - free float)

Significance of critical path

- During planning stage
  - Shortening the critical path will reduce the overall project duration
- During management stage
  - Pay more attention to those activities which fall in the critical path