SWINBURNE UNIVERSITY OF TECHNOLOGY

SWE20001 Managing Software Projects

Lecture 5b

Work Breakdown Structure

Planning for Software Development

- Split items into *tasks* or *activities* using a suitable “SDLC” as an anchor
- Create a *Work-Breakdown-Structure* (WBS)
  - breaks the project down into a set of well-defined, discrete tasks
- For each task or subtask, estimate the time for completion and assess resources required

Work Breakdown Structure, WBS

- An *outcome-oriented analysis* of the work involved
- Aim: To break the work required into smaller and more manageable pieces
- Different approaches to generate a WBS
  1. Activity-based approach (focus on the different things to be done)
  2. Product-based approach (focus on the different things to be produced)
  3. *A Hybrid approach* (focus first on the different things to be produced, then for each of these, focus on the things to be done)

Different approaches of WBS

1. **Activity-based** approach

    Focus on the different things to be **done**

2. **Product-based** approach

    Focus on the different things to be **produced**

3. **Hybrid** approach

    Focus first on the different things to be **produced**

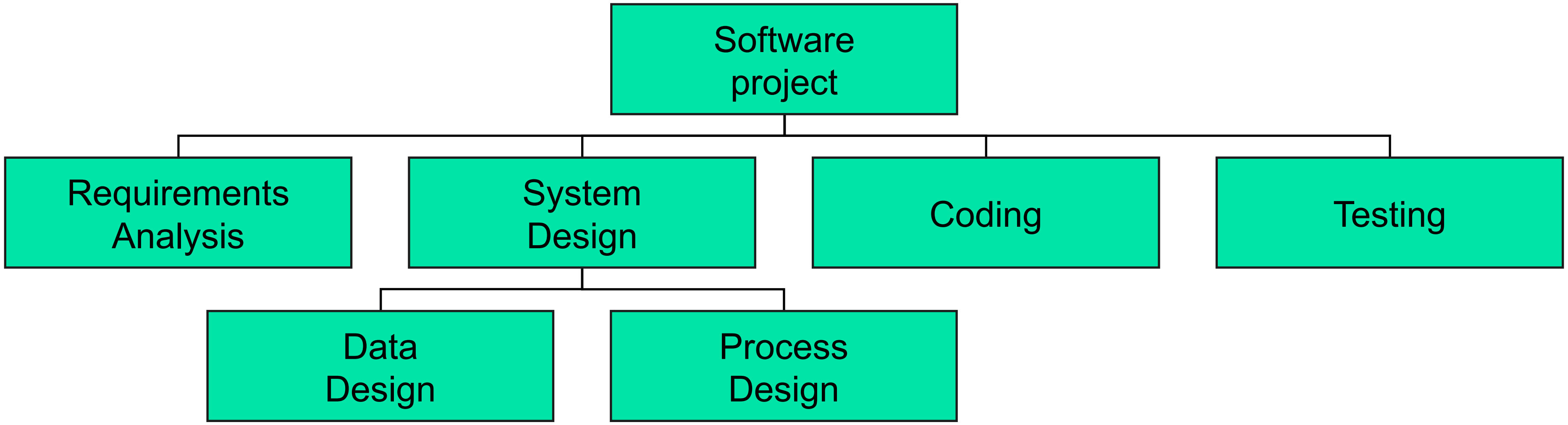
    then for each of these, focus on the things to be **done**

Activity-based Approach

- The decomposition is based on activities to be undertaken
- This involves the following steps:
  - Identify the ***main activities*** of the project
  - Break each main activity into sub-activities
  - Continue to divide each sub-activity into lower level activities until the activities *can be finished with acceptable levels of effort*

☞ The chosen software development lifecycle model should give a good sense of the top level breakdown*: analysis, detailed design, implementation, testing at some appropriate level of granularity*

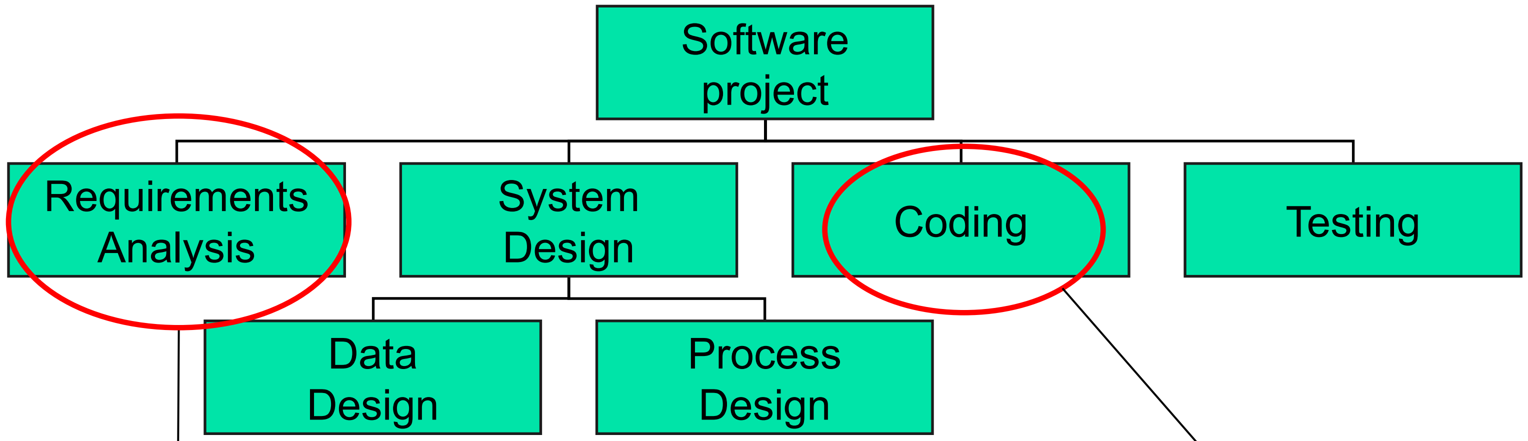
Activity-based Approach – Example



This is a very generic decomposition at a high level, applicable to many projects using a waterfall approach.

See Lecture 1a SDLC for those major steps

Activity-based Approach – Example



Plausibly some coding could start before all rqts have been determined. So we may have task dependencies between subtasks of different "main tasks" – pure waterfall would not have this!

Decompose this (and other top level "tasks") into subtasks that relate to coding of various modules, where there may be some dependencies

Activity-based Approach (cont.)

- Advantages:
  - It is more likely to obtain a structure that is complete and is composed of non-overlapping activities
  - The structure can be refined as the project proceeds
  - The structure already suggests the dependencies among the activities/tasks
  - The structure can be readily used as a basis for project scheduling
  - The structure is easy to understand and can be used to communicate with project stakeholders
- Disadvantage:
  - *It is likely to miss some of the products/deliverables to be produced!*

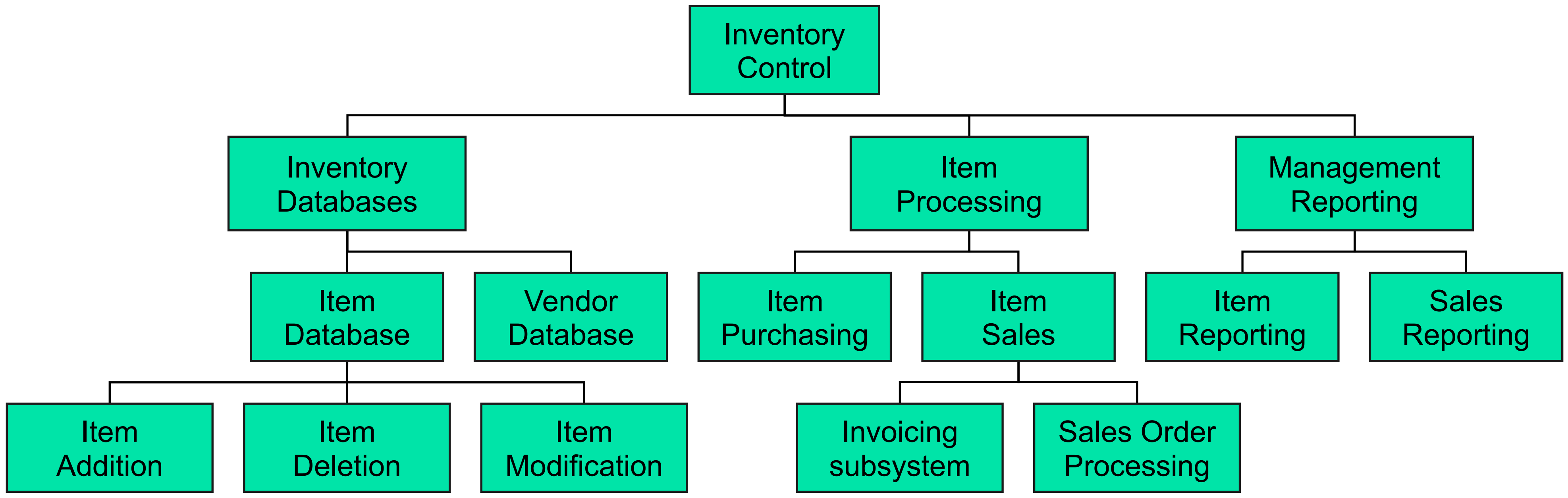
Common Issues in WBS

- If there are too many levels in WBS, there will be a large number of small tasks
- If there are too few levels (the WBS is too shallow), the details for project control will be insufficient
- Ideally, each leaf (the lowest level work) of a WBS can be finished by an individual team member within several hours of work
- The actual durations appropriate for individual tasks depend from project to project
- Getting it right is a challenge!!

Product-based Approach

- The decomposition is based on the products or deliverables to be produced
  - Examples: SRS, SDD, Source, STP, STD, User Manual, …
- Also called *Product Breakdown Structure* (PBS)
- Product Flow Diagram (PFD)
  - To indicate, for each product, which other products are required as ‘inputs’

Product-based Approach – Example



Danger is that dependencies between products is missed

Product-based Approach (cont.)

- Advantage
  - It is less likely to miss a product which is expected from the structure.
  - Good for agile projects – aim at delivering subsystems at the end of iterations
- Disadvantage
  - The activities or tasks used to create a product are not specified and may be missed, and some may be distributed amongst several products.

A Hybrid Approach

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

  NB : There may be some cross-product activity dependencies

A Hybrid Approach – Example

- MITP methodology by IBM
  (Managing the Implementation of the Total Project)
  {which partly inspired PRINCE2}
  - Level 1: Project
  - Level 2: Deliverables (software, manuals etc)
  - Level 3: Components of each deliverable
  - Level 4: Work-packages
  - Level 5: Tasks (individual responsibility)