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Software Project Management

Unit 3: Software Project Planning (1)

Thais Webber
Richard Lee

Unit objectives

When you have completed this unit, you will be able to:

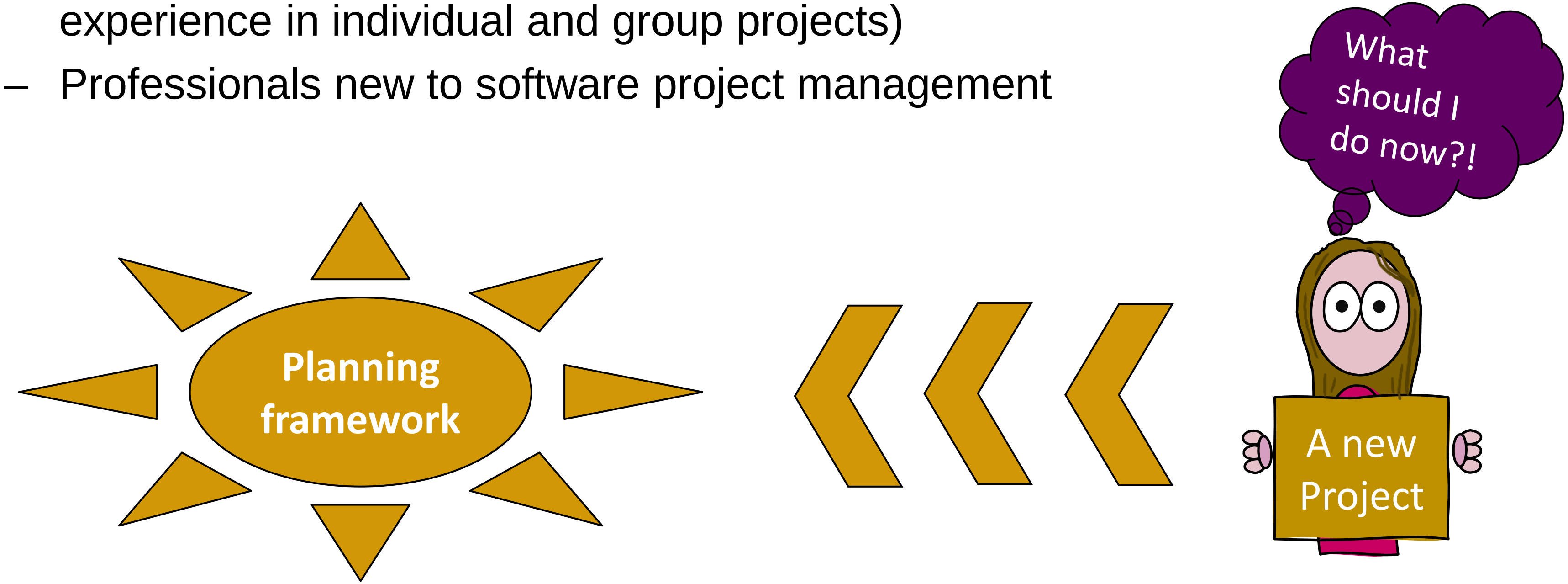
- Approach project planning in an organised, step-by-step and top-down manner
- Select an appropriate development and life cycle approach for projects
- Apply estimation techniques to predict software development effort, using bottom-up estimation to avoid unrealistic predictions
- Produce an activity plan for a project, identify required resources and devise work plans and resource schedules

Outline

- Frameworks for software project planning
  - Motivation
  - Step Wise project planning
  - PRINCE2 project planning
- Selection of software project approaches
- Effort estimation for software projects
- Activity planning and resource allocation

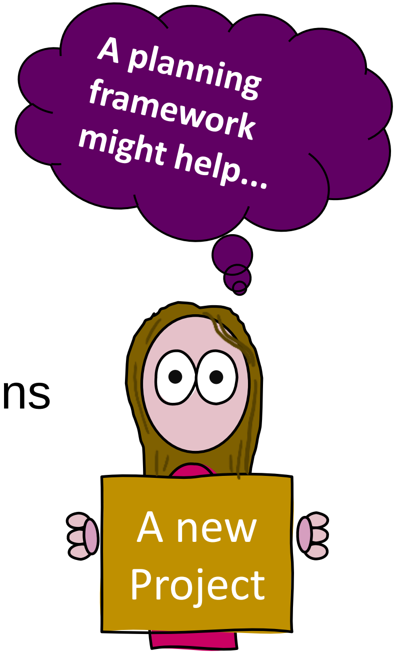
Motivation for the use of frameworks

- People are often at a loss as to where to start in project planning
  - Students involved in individual and group projects (consider your own experience in individual and group projects)
  - Professionals new to software project management



Motivation for the use of frameworks

- Structured approaches or frameworks for software project planning address the need for systematic and repeatable planning:
  - They list the main **steps** involved in project planning
  - They suggest **best practices** for carrying out these steps
  - They indicate logical **order of steps**, including possible iterations or feedback loops
  - They remain **applicable** across different application domains
  - Their concepts and techniques apply to manage **small** or **large/complex** projects



Motivation for the use of frameworks

- Two planning frameworks covered in the module
  - **Step Wise** – focuses on planning techniques
  - **PRINCE2** – focuses more on procedural aspects

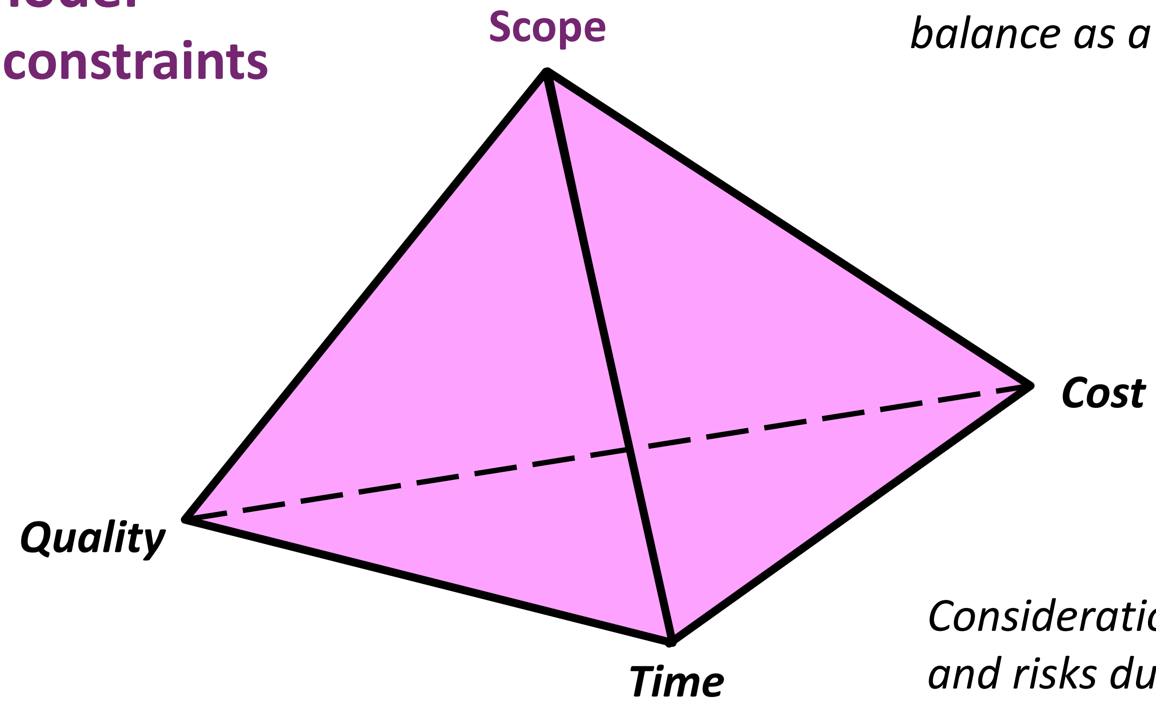
- Both <u>can be used in combination </u>with:
  - Traditional methodologies (such as Waterfall, Incremental, Iterative, Spiral, V-model, etc.)
  - Agile approaches (such as Scrum, Kanban, XP, etc.)

Project factors (from SPM Introduction)

QCTS model

Project constraints

Interdependent constraints to balance as a project manager



Considerations on resources and risks during planning

Success factors for project management

1. Agree on all project goals

2. Develop clearly defined plans with assigned responsibilities and accountabilities

3. Manage the project scope effectively

4. Cultivate constant effective communication

5. Make sure you have management support

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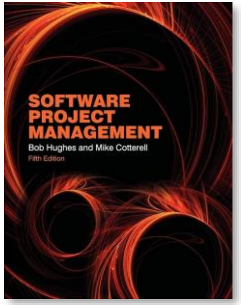
Step Wise project planning framework

- Developed and enhanced over the years by Robert Hughes at the University of Brighton

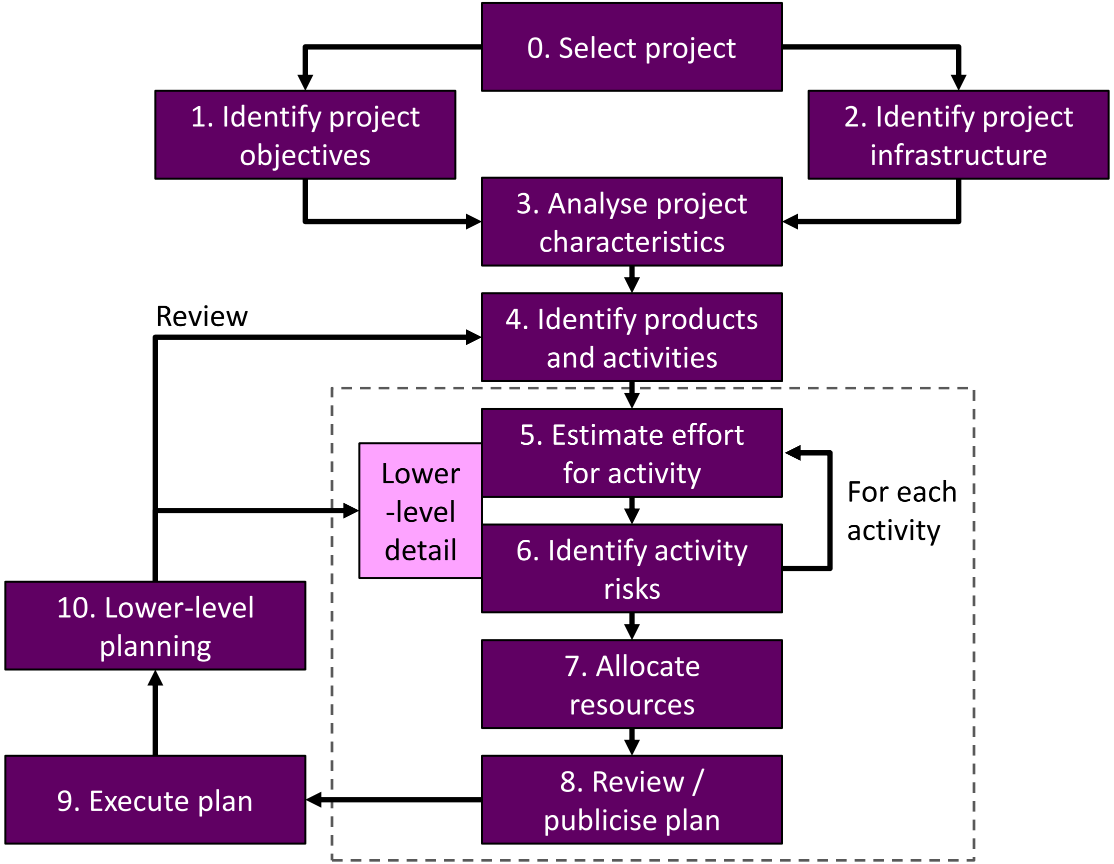
- Tries to answer the question: “What sequence of steps should we follow to produce a realistic, defensible project plan for this software project?”

- Scalability
  - useful for small project as well as large
  - range of applications including software development projects



(refer to Book SPM, Hughes & Cotterell – Ch.3)

Step Wise - an overview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(Book SPM
Hughes & Cotterell – Ch.3)

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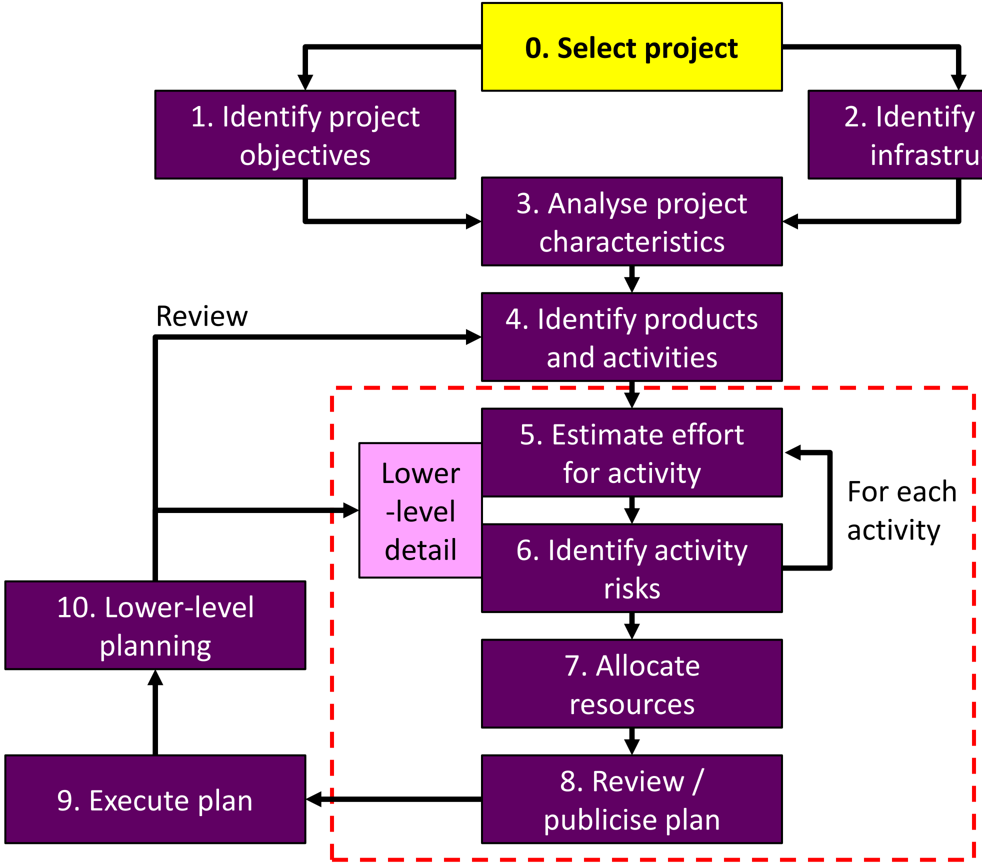
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Project scenario: college payroll system

- College currently outsources payroll processing, which is costly and limits data analysis
- Decision made to bring payroll **in-house** by acquiring an **off-the-shelf** application - supported by a new internal payroll office and small software add-ons to integrate with timetabling data.

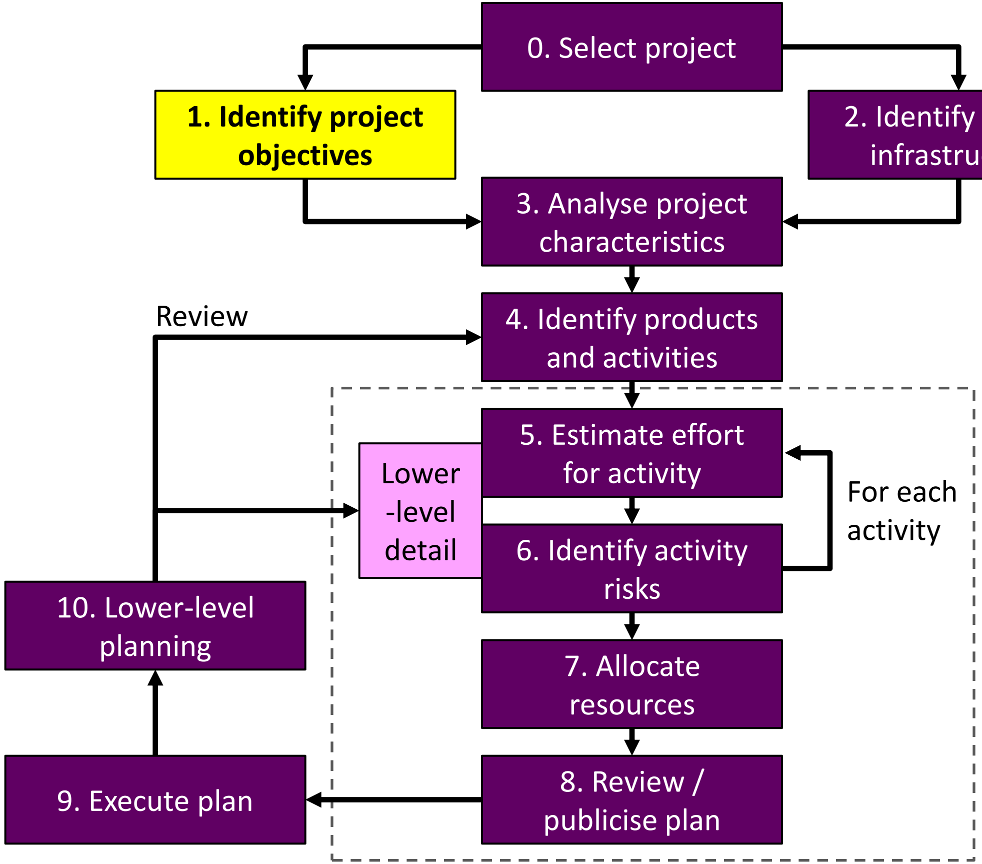
- About the decision alternatives:

  In-house *versus* outsourcing (external/third party)

  Off-the-shelf *versus* custom-developed

Assume you were hired as the project manager

Step Wise - an overview



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Step 1: identify project objectives

- 1.1 Identify objectives and measures of effectiveness
  - how do we know if we have succeeded?
  - From Unit 1: objectives must be **SMART**:
  - **S**pecific, **M**easurable, **A**chievable, **R**elevant, **T**ime-constrained

- 1.2 Establish a project authority
  - who is the boss?

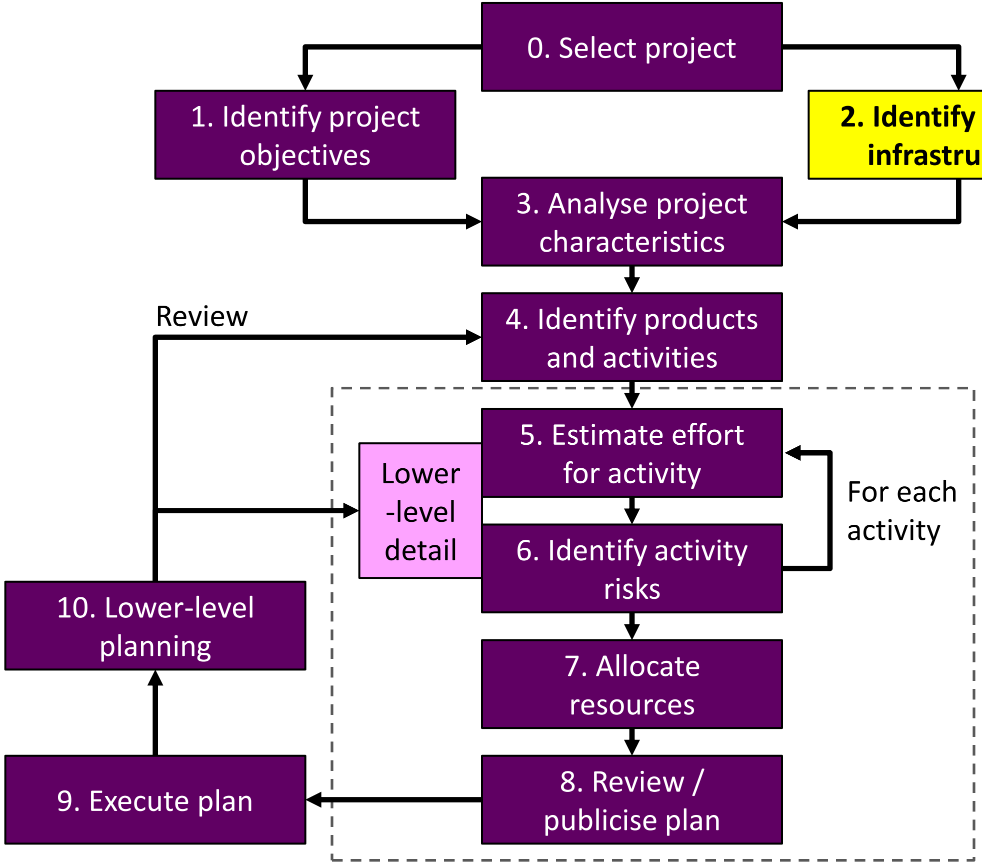
- 1.3 Identify all stakeholders in the project and their interests
  - who will be affected/involved in the project?

Step 1: identify project objectives

- 1.4 Modify objectives in the light of stakeholder analysis
  - do we need to do things to win over stakeholders?

- 1.5 Establish methods of communication with all parties
  - how do we keep in contact?

Step Wise - an overview



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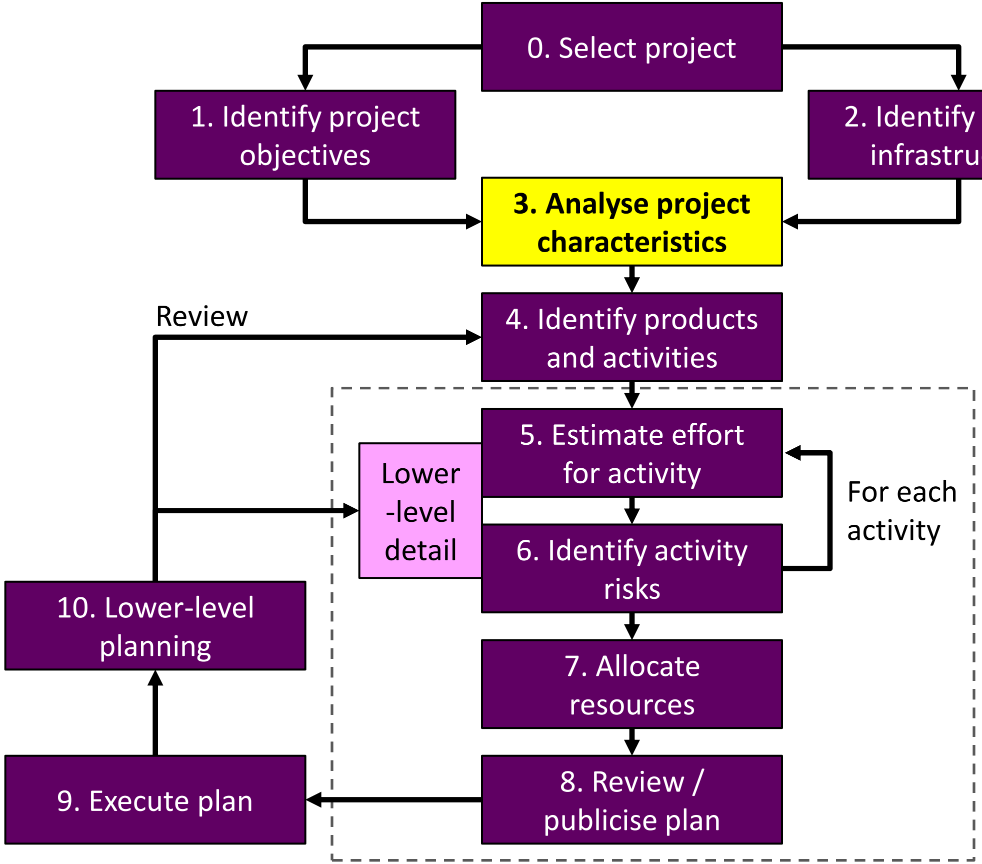
Step 2: identify project infrastructure

- 2.1 Establish link between project and any strategic plan
  - why did they want the project?
- 2.2 Identify installation standards and procedures
  - what standards do we have to follow?
- 2.3. Identify project team organisation
  - where do I fit in?
  - members roles and responsibilities

Step Wise - an overview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Size
Complexity
Risks
Constraints
Priorities

Step 3: analyse project characteristics

- 3.1 Distinguish the project as either **objective-based** or **product-based**.
  - Is there more than one way of achieving success?

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  - Is there more than one way of achieving success?

- 3.2 Analyse other **project characteristics** (e.g., quality-based)
  - what is different about this project?

Step 3: analyse project characteristics

- 3.3 Identify high level **project risks**
  - what could go wrong?
  - what can we do to stop it?

What can be a high-risk scenario in software development projects?

Step 3: analyse project characteristics

- 3.3 Identify high level project risks
  - what could go wrong?
  - what can we do to stop it?

- 3.4 Consider **user requirements** concerning implementation

Functionalities
Usability
Performance
Integration with other systems
Security, privacy, etc.

Step 3: analyse project characteristics

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- 3.4 Consider user requirements concerning implementation

- 3.5 Select **development methodology** and **life cycle** approach:
  - Waterfall? Incremental? Agile? etc.

Complexity
Changeability
Delivery

Step 3: analyse project characteristics

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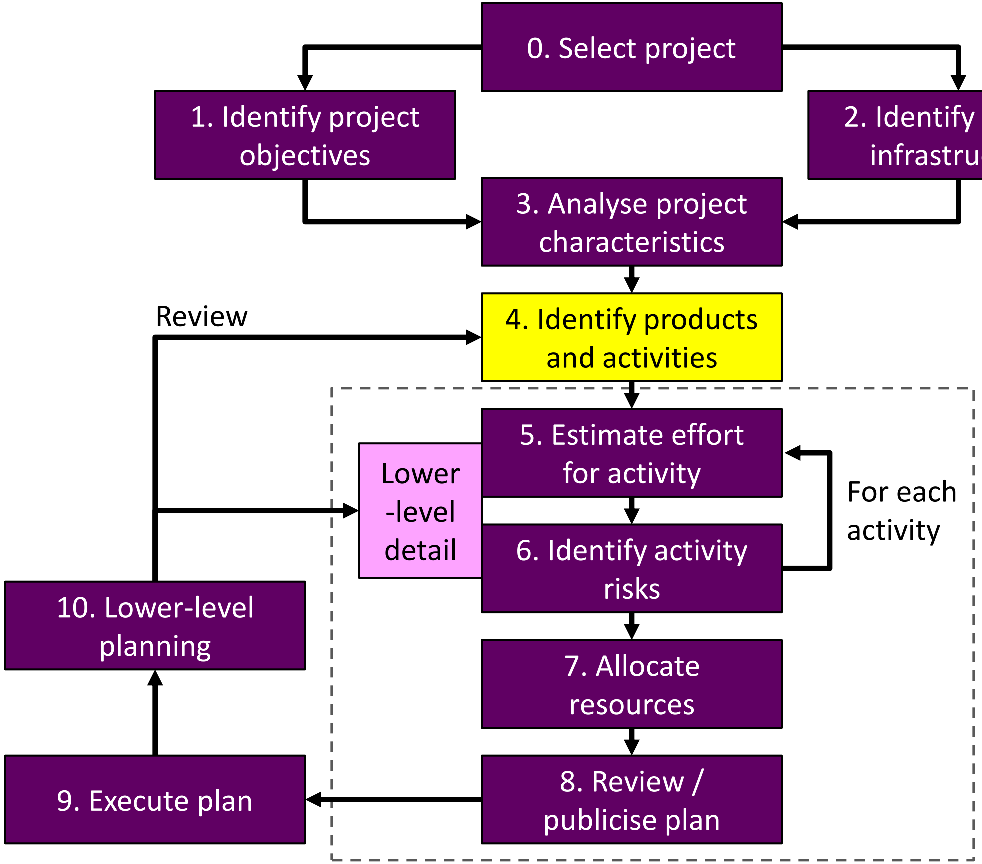
- 3.4 Consider user requirements concerning implementation

- 3.5 Select development methodology and life cycle approach:
  - Waterfall? Incremental? Agile? etc.

- 3.6 Review overall **resource estimates**
  - does all this increase the cost?

Step Wise - an overview



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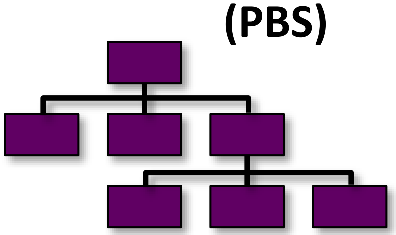
PBS

PFD

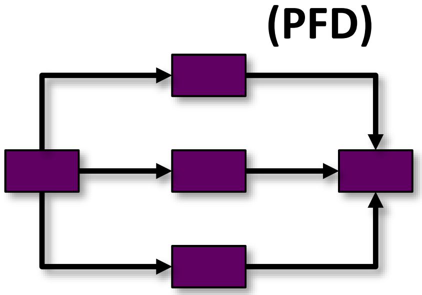
Activity Networks

Step 4: identify products and activities

- 4.1 Identify and describe project **products**
  - what do we have to produce in terms of both customer deliverables and intermediate artefacts?
  - Typically, a product hierarchy that can be documented in a Product Breakdown Structure (PBS)



- 4.2 Document generic **product flows**
  - Some products need one or several other products to exist before they can be created
  - E.g., specification must exist before design, and design before code
  - **Product Flow Diagrams (PFDs) are used to represent these relationships**

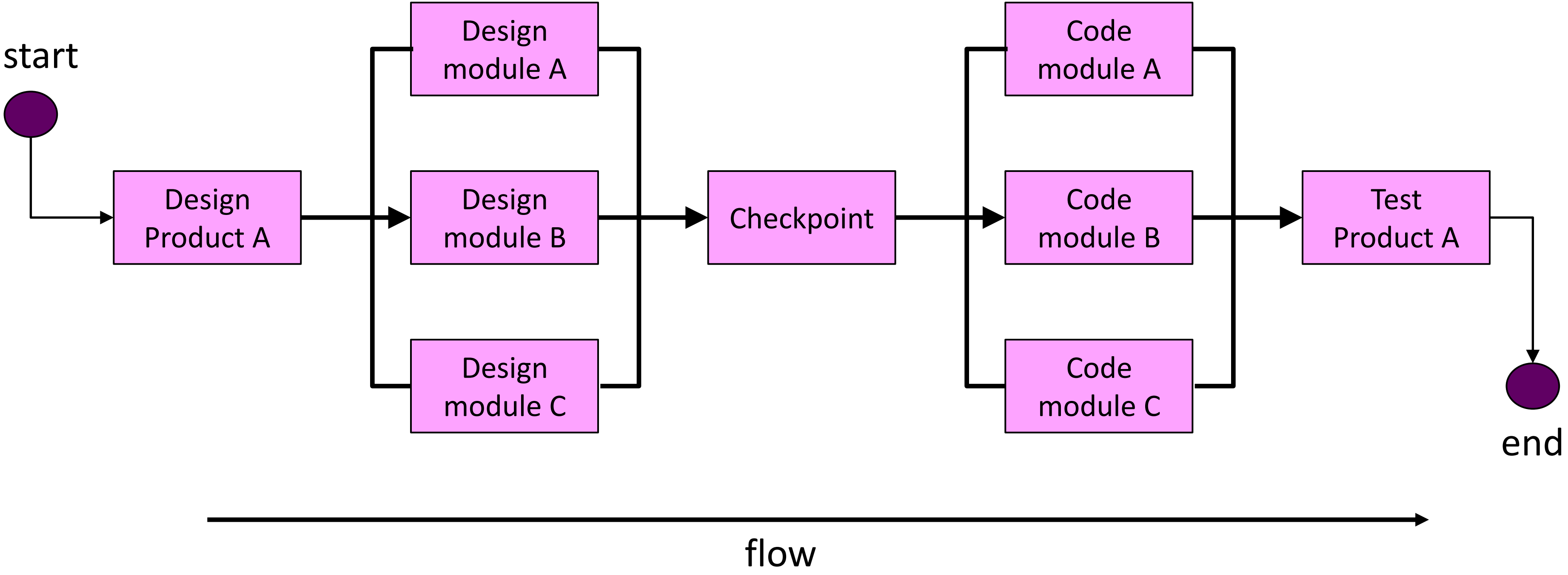


Step 4: identify products and activities

- 4.3 Recognise **product instances**
  - The PBS (Product Breakdown Structure) and PFD will probably have identified generic products (e.g. ‘software modules’) for which specific instances can be identified (e.g., ‘module A’, ‘module B’, etc.)
  - In many cases this has to be left to later, more detailed, planning
- 4.4 Produce ideal **activity network**
  - **Identify the activities** needed to create each product in the PFD (Product Flow Diagrams)
    - More than one activity might be needed to create a single product
    - Hint: Identify activities by verb + noun, avoiding ‘produce X’
  - **Draw up activity network**

Step 4: identify products and activities

An activity network: activities order and flow (arrows)



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  - Draw up activity network
- 4.5 Add **stages** & **checkpoints**/**milestones**
  - Ensure that intermediate products are compatible, and project can proceed without major incompatibility risks

Step 4: identify products and activities

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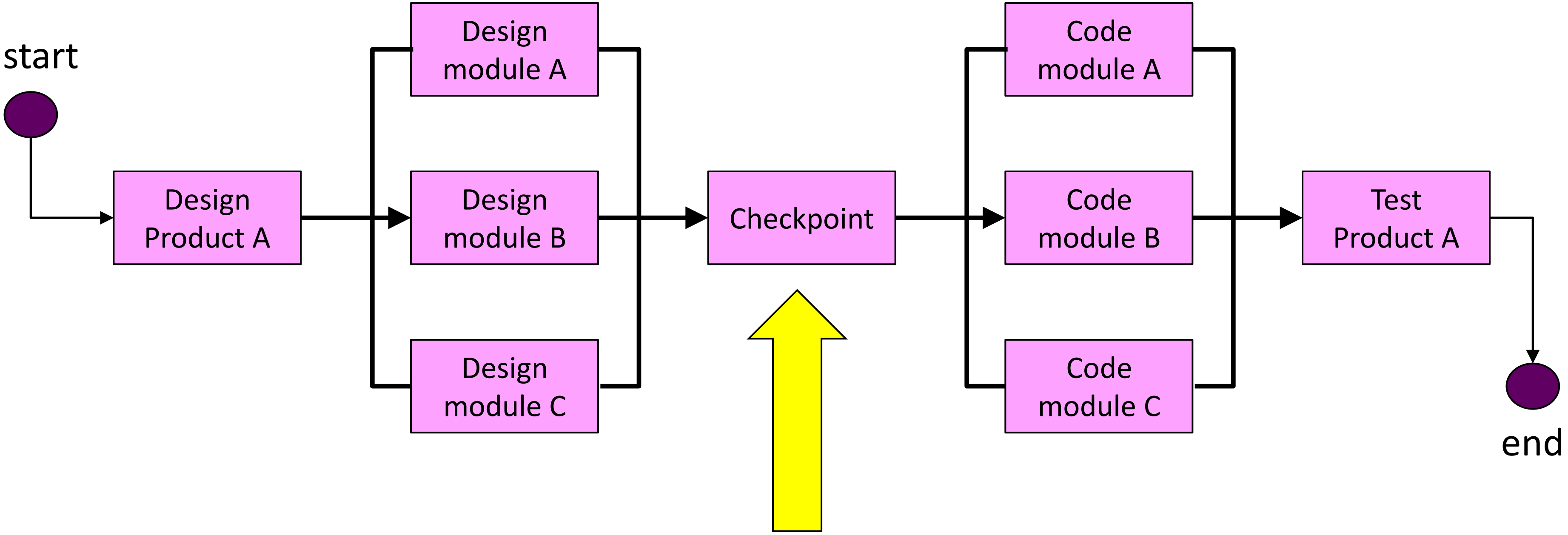
An activity network: activities order and flow (arrows)



Step 4: identify products and activities

- **Products:**
- The result of an activity
  - Could be (among other things)
    - physical thing (installed pc)
    - a document (logical data structure)
    - a person (trained user)
    - a new version of an old product (updated software)

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    - physical thing (installed pc)
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    - a person (trained user)
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- The following are normally NOT products:
  - activities (e.g. training)
  - events (e.g. interviews completed)
  - resources and actors (e.g. software developer)

Step 4: identify products and activities

- Consider a final-year project whose objective is to develop a web application that Aston students can use to advertise items for sale
- What are some of the main project products?

Step 4: identify products and activities

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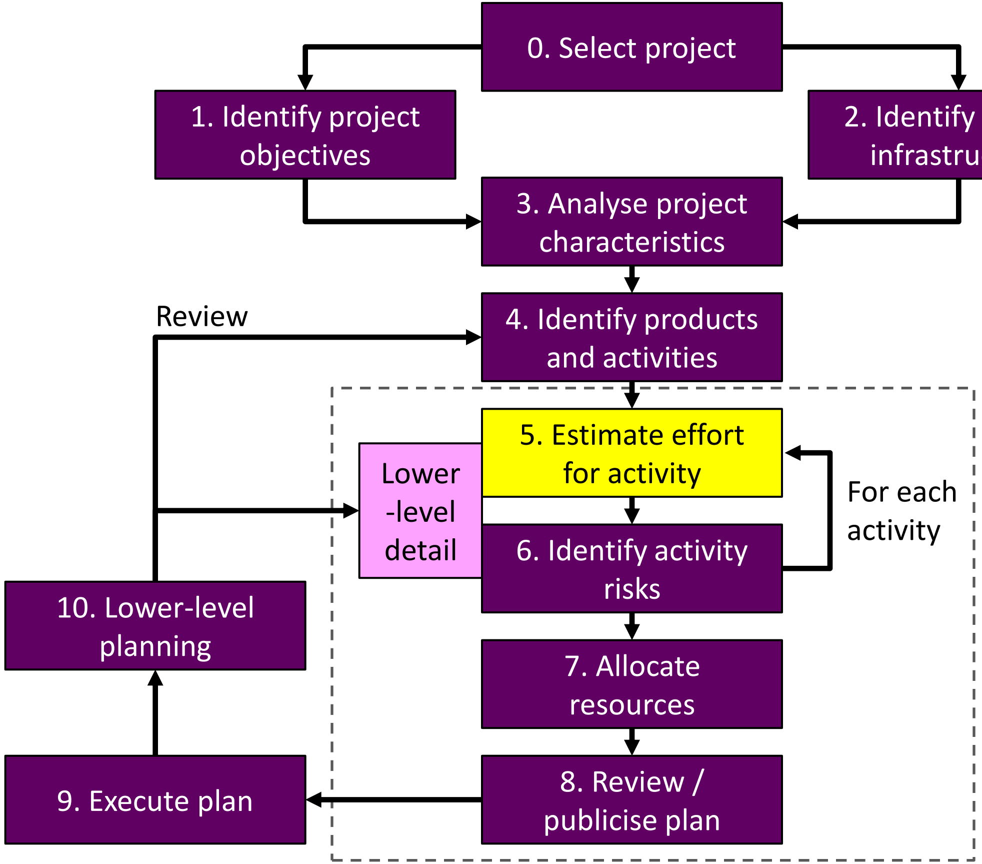
- What are some of the main project products?

- **Possible solution includes:**
  - Project definition form
  - Project objectives
  - Preliminary work plan
  - Progress report
  - Final report
  - Requirements document
  - Project diary
  - Design iteration 1
  - Design iteration 2

Step Wise - an overview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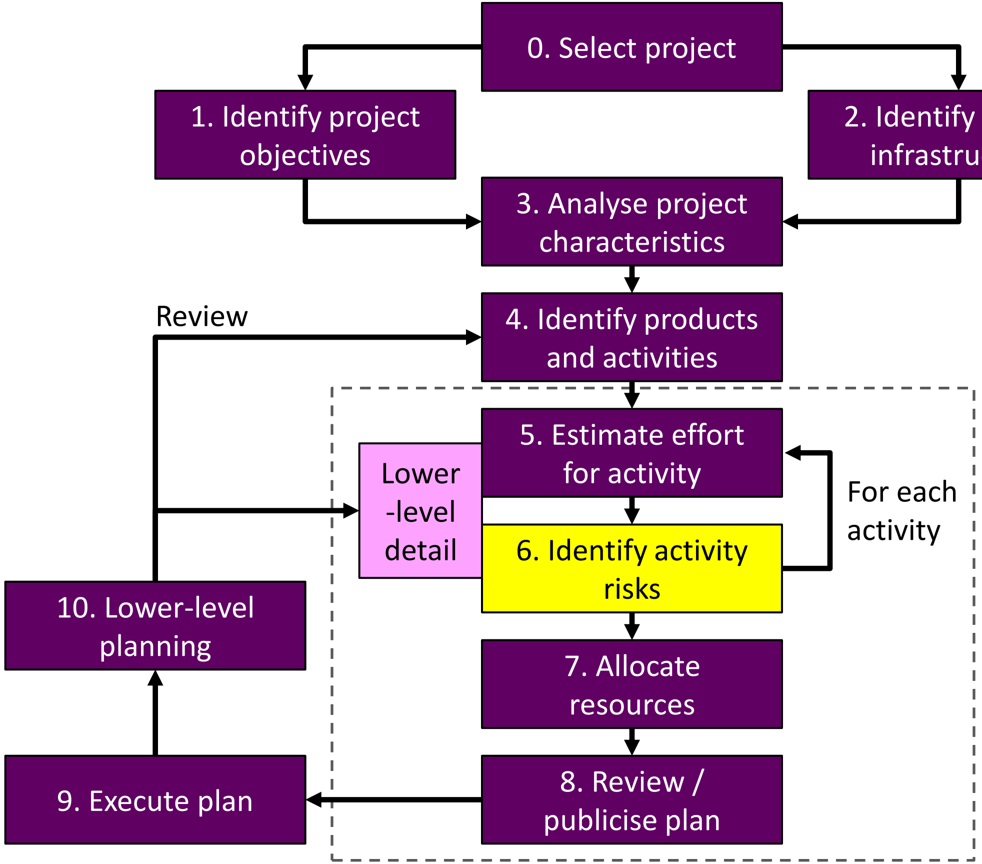
Step 5: estimate effort for each activity

- 5.1 **Carry out bottom-up estimates**
  - Distinguish carefully between effort and elapsed time
  - Effort = number of staff-days, staff-weeks, etc. required to complete a task
  - Elapsed time = calendar time between task start time and task end time
  - Example: If 2 people work on the same task for 5 days without any interruption, then the effort is 10 staff-days and the elapsed time is 5 days.
- 5.2. **Revise plan to create controllable activities**
  - break up very long activities into a series of smaller, easier to monitor & control ones
  - bundle up very short activities

Step Wise - an overview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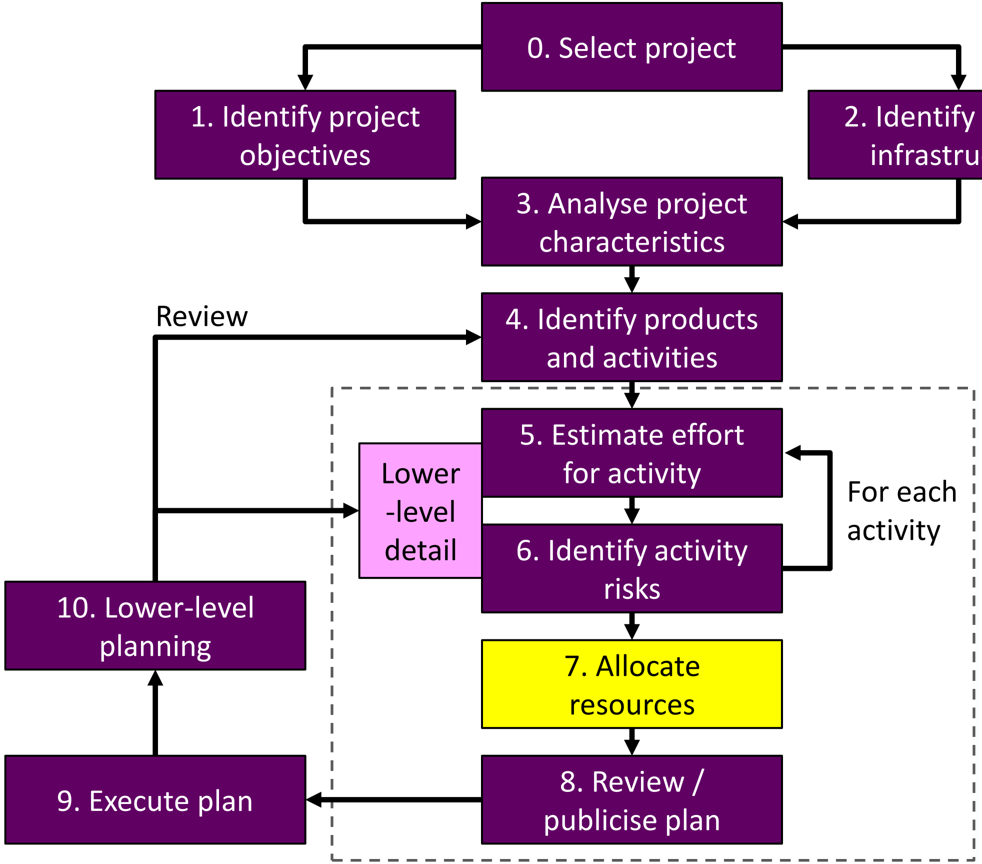
Step 6: identify activity risks

(to be studied in more detail later in the module)

- 6.1.Identify and quantify risks for activities
  - Estimate damage if risk occurs (measured in time lost or money wasted)
  - Estimate likelihood of risk occurring
- 6.2. Plan risk reduction and contingency measures
  - **risk reduction**: activity to eliminate/reduce likelihood of risk occurring
  - **contingency**: action to take if risk does occur in order to reduce impact

Step Wise - an overview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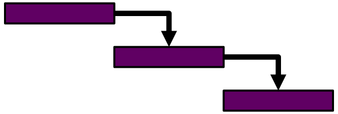
Step 7: allocate resources

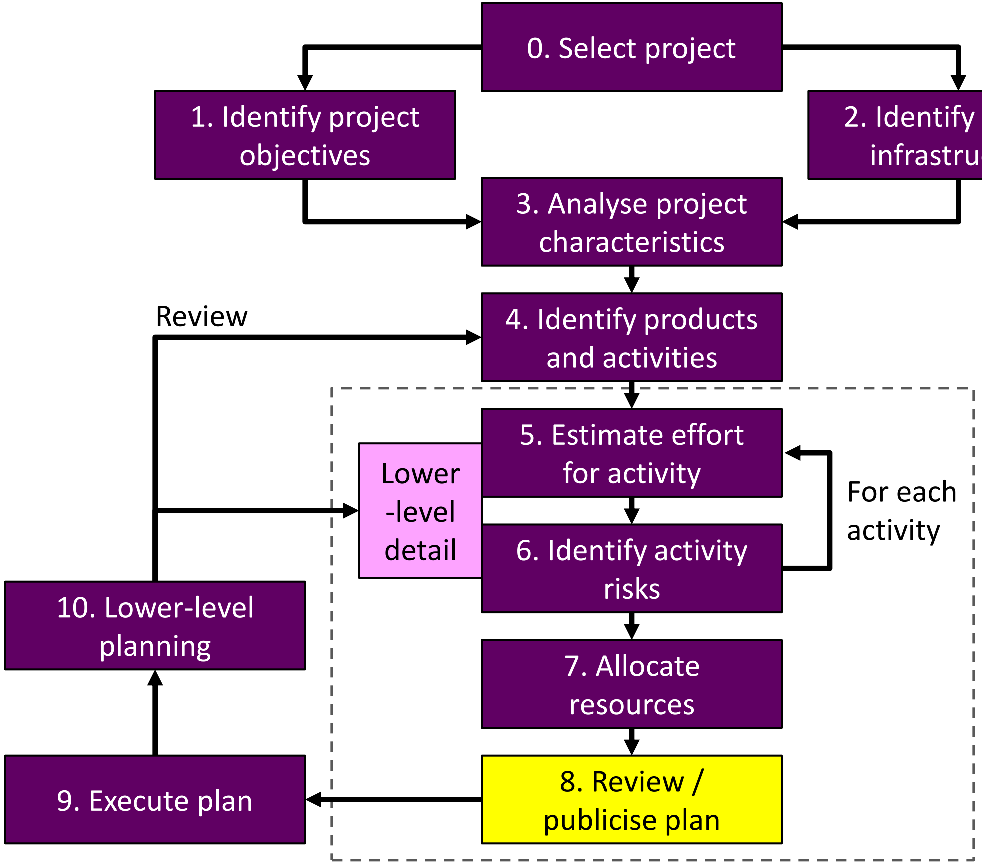
(to be studied in more detail later in the module)

- 7.1 Identify and allocate resources to activities
  - Record type of staff needed for each activity
  - Identify staff available and allocate to tasks provisionally
- 7.2 Revise plans and estimates to take into account resource constraints
  - Staff not being available until a later date
  - Staff needed for other, non-project activities

The result of these steps is typically a ***Gantt chart*** *(devised in the 1910s by American management consultant Henry Gantt)*



Step Wise - an overview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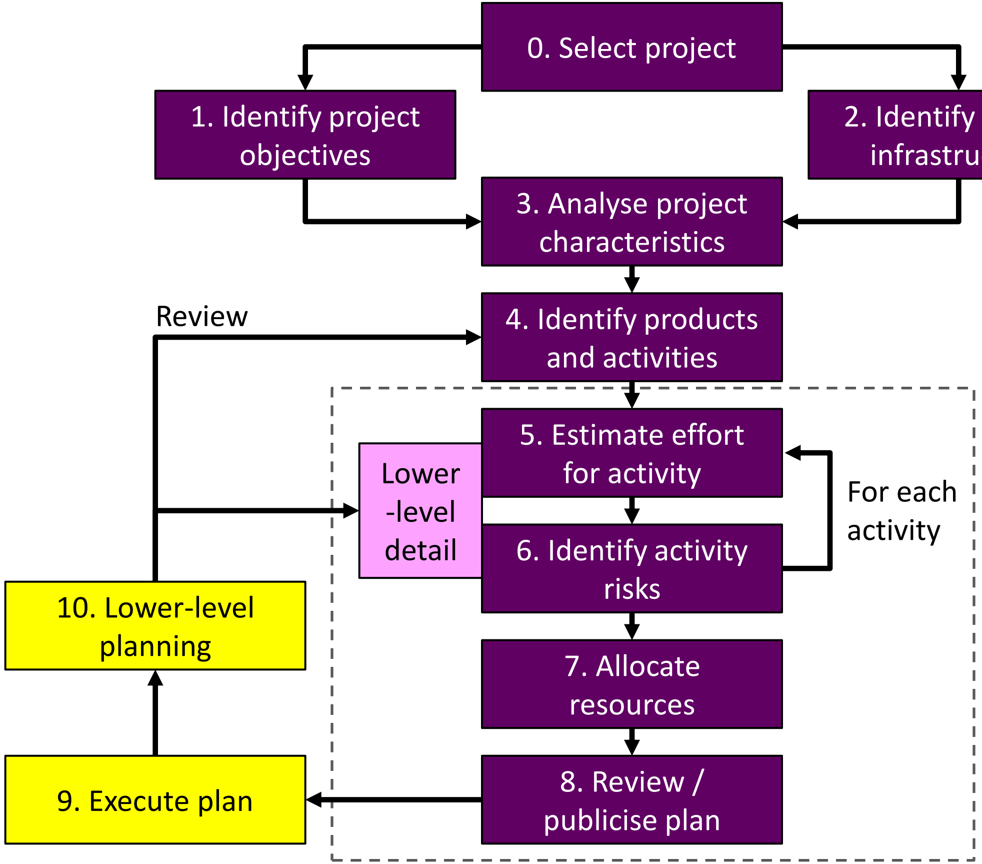
Step 8: review / publicise plan

- 8.1 Review quality aspects of project plan
  - Ensure that quality criteria are defined for all activities, i.e., criteria that need to be fulfilled to sign off an activity as completed
  - Helps identify and correct problems with individual activities at an early stage
- 8.2 Document plan and obtain agreement
  - Ensure that all parties involved understand and “sign up” to the commitments required of them in the plan

Step Wise - an overview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Steps 9 & 10

- Step 9: execute plan
- Step 10: lower-level planning

- Detailed plans are required and feasible for the current activities
- Detailed plans for later project stages are often not possible
  - Estimates of effort, start dates, etc. are associated with confidence intervals that are too large

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  - **PRINCE2 project planning**
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Overview of PRINCE2

- **PRINCE2** acronym: **PR**ojects **IN** **C**ontrolled **E**nvironments, version **2**

- Standardised set of process-based project management procedures, originally intended for ICT projects

- Devised under the sponsorship of UK's Office of Government Commerce, and used primarily in the UK

- 1996 revision of earlier 1989 PRINCE framework – recently in 2017, emphasis on agility

Overview of PRINCE2

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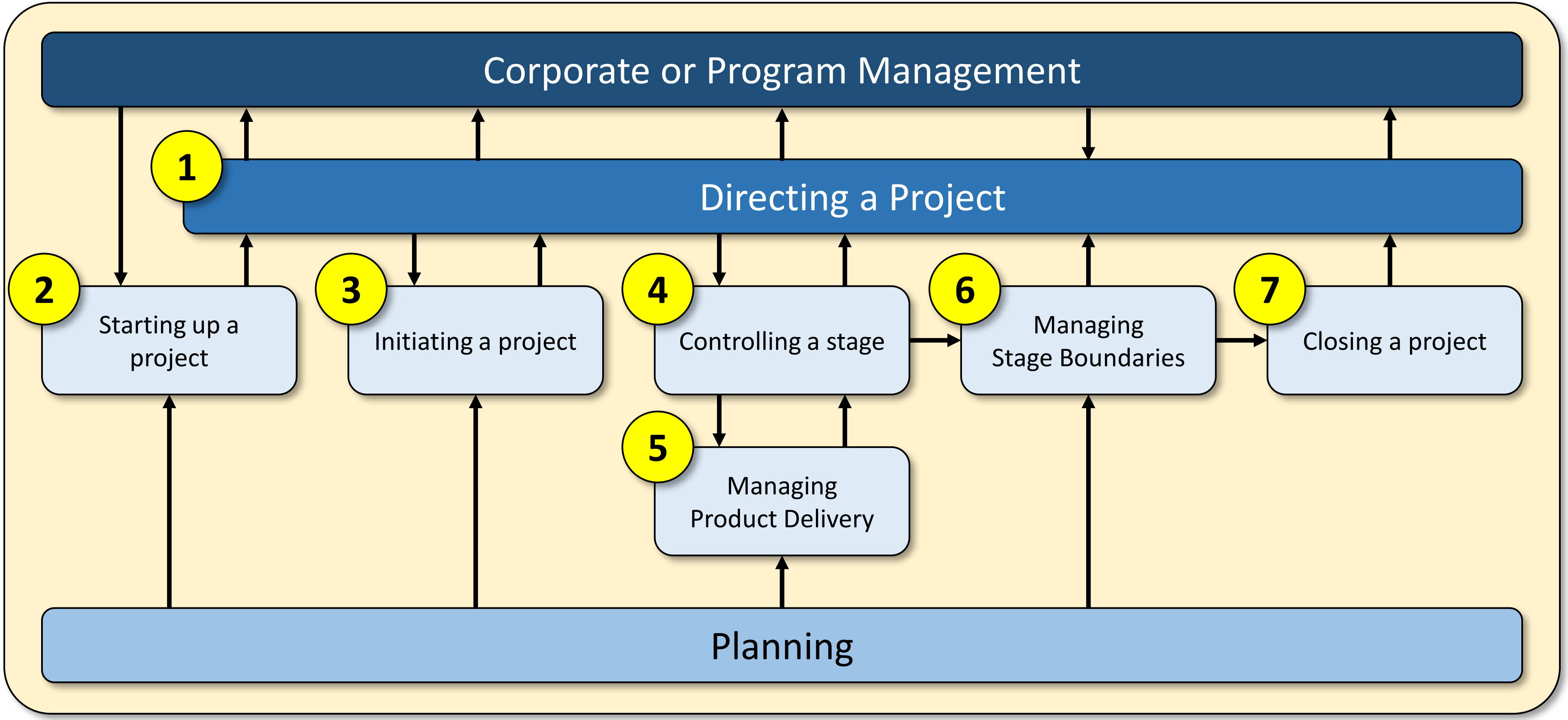
- Large projects are divided into subsets of project activities organised into stages
  - Stages are managed as a sequence of individual units
  - Project Board authorises project manager to execute a stage only after the plans for that stage are approved
  - The end of a stage is a decision point when the Project Board reviews progress to data and decides that project remains feasible and is worth continuing
- Project planning activities are placed into seven processes

PRINCE2 processes

1. Directing a Project covers activities by the Project Board
2. Starting up a Project comprises activities concerned with reaching a position where detailed project planning can begin
3. Initiating the Project refers to activities associated with producing an overall plan for the project
4. Controlling a Stage includes the activities carried out by the project manager once a stage has been authorised
5. Managing Product Delivery covers activities that involve communication between the project manager and team managers
6. Managing Stage Boundaries includes activities associated with the creation of next stage plans & updates to overall project plan
7. Closing the Project includes end-of-project activities

PRINCE2 processes



Comparison to Step Wise

- Both PRINCE2 and Step Wise focus on **how the project is organised and controlled** — defining roles, stages, and planning activities.

- Both are originally **product-based** approaches

- PRINCE2 is process-based, while Step Wise places more emphasis on techniques used in project planning
  - Techniques similar to those employed by Step Wise can be used in PRINCE2, but they are not prescribed by the framework

- Often also compared to PMBOK - *Project Management Body of Knowledge* (PMI, PMP certification)

What’s next…

- Frameworks for software project planning (Week 4 lecture)
  - Step Wise vs Prince 2 (further reading and knowledge check quiz)
  - This week’s tutorial (Week 4) – Planning activities
    - Introduction to activities and deliverables (products)

- Next week (Week 5 lecture)
  - Selection of software development approaches
  - Activity networks (theory and practice)
    - Critical path analysis (CPA)
    - Resource allocation considerations

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