IT2403 SOFTWARE PROJECT MANAGEMENT

UNIT 1

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Software Definition

- Software is instructions (computer programs) that when executed provide desired features, Function and performance
- Data structures that enable the programs to adequately manipulate information.
- Documents that describe the operation and use of the programs.
- Software is a program that is the product of a project

Project Definition

- Project is a specific plan or design
- Project is a planned undertaking/activity
- Project is a large undertaking e.g. a public works scheme
- Project determines how to carry out a task before starting the task
- Project is a new endeavor to accomplish a unique purpose.
- In the broadest sense, a **project** is a specific, finite task to be accomplished. Any activity that results in a deliverable or a product.
- Projects always begin with a problem. The project is to provide the solution to this problem.
- When the project is finished it must be evaluated to determine whether it satisfies the objectives and goals.

Jobs versus projects

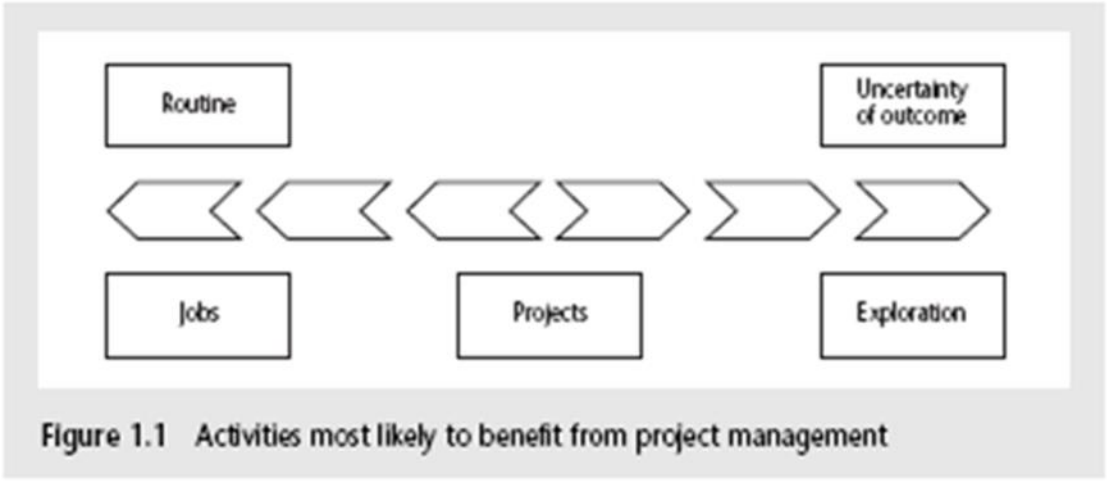


Figure 1.1 Activities most likely to benefit from project management

'Jobs' – repetition of very well-defined and well understood tasks with very little uncertainty
'Exploration' – e.g. finding a cure for cancer: the outcome is very uncertain
'Projects' – in the middle!

Characteristics of projects

A task is more 'project-like' if it is:

- Non-routine tasks are involved
- Planning is required
- Specific objectives are to be met or a specified product is to be created.
- The project has a predetermined time span
- Work is carried out for someone other than yourself
- Work involves several specialisms
- Work is carried out in several different phases
- Resources that are available for use on the project are constrained.
- Project is large and/or complex

Management Definition

- Management can be defined as all activities and tasks undertaken by one or more persons for the purpose of planning and controlling the activities of others in order to achieve objectives or complete an activity that could not be achieved by others acting independently.
- Management is to manage to forecast and plan to organize, to command, to co-ordinate and to control.
- "Management is getting things done through the efforts of other people".
- "It is process towards the attainment of desired goals".

This involves the following activities:

- Planning is deciding what is to be done
- Organizing is making arrangements
- Staffing is selecting the right people for the job
- Directing is giving instructions
- Monitoring is checking on progress
- Controlling is taking action to remedy hold-ups
- Innovating is coming up with solutions when problems emerge
- Representing is liaising with clients, users, developers and other stakeholders

PROJECT MANAGEMENT

- Project management is the discipline of planning, organizing, and managing resources to bring about the successful completion of specific projects goals and objectives.
- A project is a planned undertaking to present results at a specified time. Here ' undertaking' means 'making' new product or 'changing' old product.
- Task : A piece of work assigned or done as part of one's duties.
- Activity : Activity definition refers to the process of parsing a project into a number of individual tasks which must be completed before the deliverables can be considered completed.
- Activity definitions rely on a number of specific input processes.
- Activities can be subdivided into tasks.
- Phase: a group of activities/tasks, producing a significant deliverable work product.
- Project : A unique, goal-oriented, time-bound and constrained undertaking.
- System: an organized element acting as a whole.

SOFTWARE PROJECT MANAGEMENT

- Software project management is the art and science of planning and leading software projects. It is a sub-discipline of project management in which software projects are planned, monitored and controlled.

PROGRAMME

- A programme is a portfolio comprised of multiple projects that are managed and coordinated as one unit with the objective of achieving (often intangible) outcomes and benefits for the organization.
- A programme is a group of related projects managed to obtain collective benefits ,often with a strategic goal, which may involve a series of repetitive or cyclic undertaking
- A programme is a group of related projects managed in a coordinated way

PROCESS

Process is a structured set of activities required to develop a software system

- Specification;
- Design;
- Validation;
- Evolution.

A software process model is an abstract representation of a process. It presents a description of a process from some particular perspective.

PROJECT Vs PROCESS

- Process is a repetitive collection of interrelated tasks aimed at achieving a certain goal.
- Project is a unique endeavor with a beginning and an end undertaken to achieve a goal.

- Process is a set of related resources and activities transforming inputs into outputs (from example Risk management process_
- Project: Is an endeavor with a defined start date and end date, to meet specific objectives.

Difference between a Project and a Programme

	Project	**Programme**
Objectives	Outputs – tangible; relatively easy to describe, define and measure; tending towards objective.	Outcomes – often intangible; difficult to quantify; benefits often based on changes to organizational culture and behaviors; introducing new capabilities into the organization; tending towards subjective.
Scope	Strictly limited; tightly defined; not subject to change during the life of the project.	Not tightly defined or bounded; likely to change during the life cycle of the program.
Duration	Relatively short term; typically three to six months.	Relatively long term typically eighteen months to three years.
Risk profile	Project risk is relatively easy to identify and manage. The project failure would result in relatively limited impact on the organization relative to program risk.	Program risk is more complex and potentially the impact on the organization if a risk materializes will be greater relative to project risk. Programme failure could result in material financial, reputational or operational loss.
Nature of the problem	Clearly defined.	Ill-defined; often disagreement between key stakeholders on the nature and definition of the problem.
Nature of the solution and Stake holders	A relatively limited number of potential solutions.	A significant number of potential solutions with disagreement between stakeholders as to the preferred solution.
Relationship to environment	Environment within which the project takes place is understood and relatively stable.	Environment is dynamic; and programme objectives need to be managed in the context of the changing environment within which the organization operates.
Resources	Resources to deliver the project can be reasonably estimated in advance.	Resources are constrained and limited; there is competition for resources between projects.

Software Vs other types of project

- İnvisibility- Software can't be rep-resented with geometric models ,
- Complexity- The proposed model is based on the widely known and accepted
- Confirmity- The controlling document for a software
- Flexibility- project management performance

Invisibility:

- When a physical object such as a bridge or road is being constructed the progress being made can actually be seen. With Software, progress is not immediately visible.
- One way of perceiving software project management is as the process of making visible that which is invisible.

Complexity Per dollar, pound or euro spent, software products contain more complexity than other engineered artefacts.

Conformity

- The 'traditional' engineer is usually working with physical systems and physical materials like cement and steel.
- These physical systems can have some complexity, but are governed by physical laws that are consistent.
- Software developers have to conform to the requirements of human clients. It is not just that individual can be inconsistent.

Flexibility

- The ease with which software can be changed is usually seen as one of its strengths.
- However, this means that where the software system interfaces with a physical or organizational system, it is expected that, where necessary, the software will change to accommodate the other components rather than vice versa.
- This means the software systems are likely to be subject to a high degree of change.

Activities covered by project management

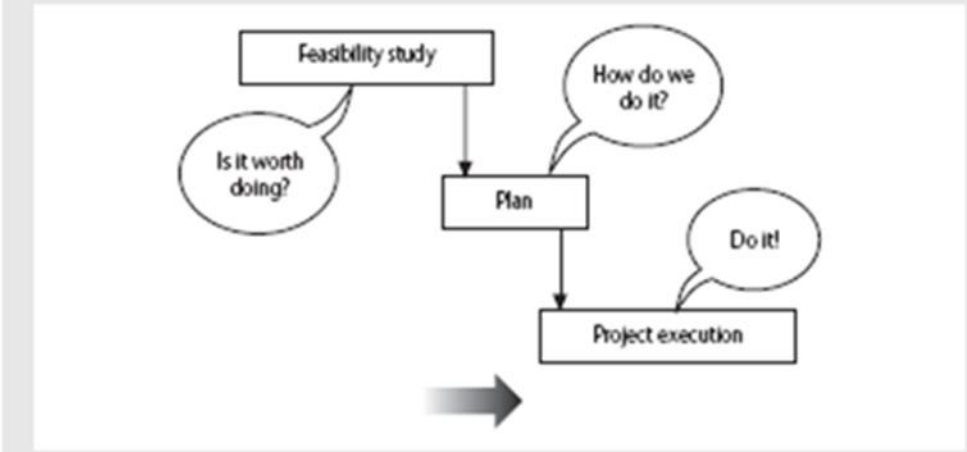


Figure 1.2 The feasibility study/plan/execution cycle

Feasibility Study

- Whether a prospective project can be started?
- Gather the information about the requirements of the proposed system.
- Identify the probable development and operational costs of the system
- Estimate the benefits of the new system
- Evaluate with a strategic plan with the proper identification of development tasks prioritized.

Planning

- Formulate an outline plan for the whole project
- Detailed plan for the initial stage of the project
- Develop detailed planning for the rest of the phases as and when they arise.

Project execution

- Projects can be executed in the same order of the project life cycle.

The software development life-cycle (ISO 12207)

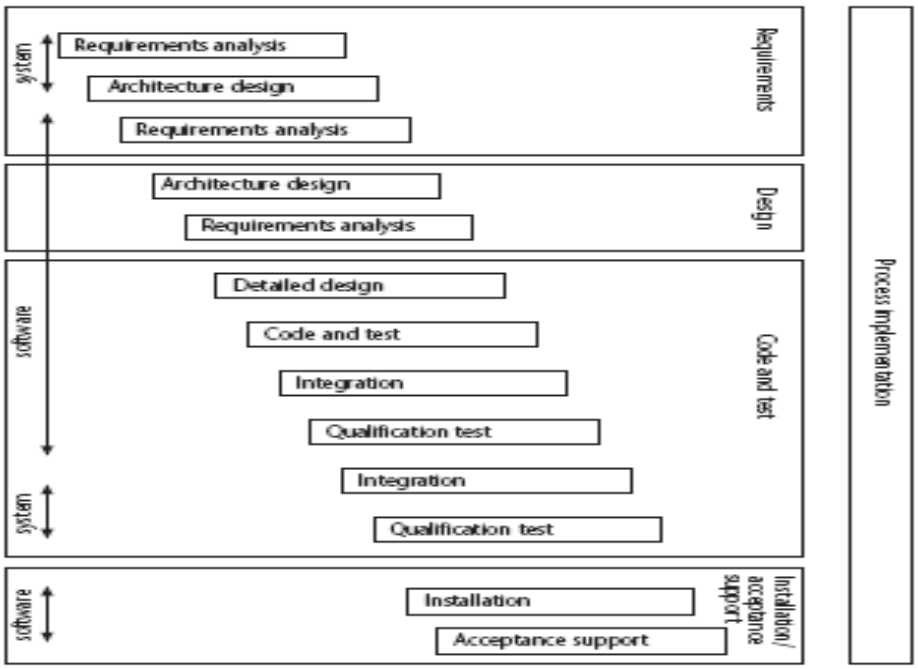


Figure 1.3 The ISO 12207 software development life cycle

- Requirement Analysis: Starts with requirements elicitation which investigates what the potential users and their managers and employers as features and qualities of the new system.
- Architecture Design: This maps the requirements to the components of the system that is to be built.
- Detailed Design: Each software component is made up of a number of software units that can be separately coded and tested. The detailed design of these units is carried out separately.
- Code and Test: This could refer to writing code for each software unit in a procedural language.
- Integration: Individual components are collected together and tested if they meet the overall requirements. Putting the components together
- Qualification Testing: System including software components has to be tested carefully to ensure that all the requirements have been fulfilled.
- Installation: It is the process of making the new system operational. It Includes setting up standing data, setting system parameters, installing on operational hardware platforms, user training etc
- Acceptance Support: Including maintenance and enhancement

Plan, Methods and Methodologies

- A **Plan** for an activity must be based on some idea of a method of work.
- A **method** relates to a type of activity .
- Plan takes that method and coverts it to real activities and identifying for each activity its start and end dates, who will carry it out, What tools and materials will be used.
- Groups of methods or techniques are often referred to as **methodologies**.

Software projects can be categorized into

Information systems vs Embedded systems

- In the information systems, the system interfaces with the organization
- In embedded systems, the system interfaces with the machine

Objective vs product driven

- A project might create a product as per the details specified by the client.

- The client has the responsibility for justifying the product.

Open Vs. closed systems

- **Open systems** are those that interact with the environment and are affected by outside changes.
- **Closed systems** is an isolated system that has no interaction with its external environment

Problems with software Projects

- Poor estimates and plan
- Lack of quality standards
- Lack of guidance about making organizational decision
- Lack of techniques to make progress visible
- Poor role definition – who does what?
- Incorrect success criteria

Objectives

- The project details should be clearly defined that are accepted by all the employees of an organization.
- The project authority must be identified where there is more than one group.
- This authority is held by a project steering committee that has the overall responsibility for setting, monitoring and modifying the objectives.
- Could be one person - or a group
  - Project Board
  - Project Management Board
  - Steering committee

Objectives should be **SMART**
S – specific, that is, concrete and well-defined
M –measurable, that is, satisfaction of the objective can be objectively judged
A – achievable, that is, it is within the power of the individual or group concerned to meet the target
R – relevant, the objective must relevant to the true purpose of the project
T – time constrained: there is defined point in time by which the objective should be achieved

Goals/sub-objectives

These are steps along the way to achieving the objective. Informally, these can be defined by completing the sentence…
Objective X will be achieved
IF the following goals are all achieved
A……
B……
C…… etc

- Often a goal can be allocated to an individual.
- Individual may have the capability of achieving goal, but not the objective on their own e.g.
- Objective – user satisfaction with software product
- Analyst goal – accurate requirements
- Developer goal – software that is reliable

Measures of effectiveness

- How do we know that the goal or objective has been achieved?. By a practical test, that can be objectively assessed.
- Mean time between failures(mtbf)
- E.g. for user satisfaction with software product: Repeat business – they buy further products from us, Number of complaints – if low etc etc

Performance measures

- Measure the characteristics of a system that has been delivered.
- Unambiguous specification of the quality requirements of a proposed system is needed.

Predictive measures

- They indicate what the performance of the final system is likely to be.

Stakeholders

- Persons who have a stake / interest in the project.
- Stakeholders can be individuals working on a project, groups of people or organizations, or even segments of a population.
- A stakeholder may be actively involved in a project's work, affected by the project's outcome, or in a position to affect the project's success.
- Stakeholders can be an internal part of a project's organization, or external, such as customers, creditors, unions, or members of a community.

They could be:

Internal to the project team

- They are under the direct control of the project leader

External to the project team, but within the same organization

- The persons involved in providing assistance from other sources to carry out the system‟s testing and functionality.

External to both the project team and the organization

- Customers, investors who will benefit from the system or the sub-contractors who will carry out work for the project

The Business Case

- The business case should be established at the time of the project's feasibility study.
- The quantification of benefits will often require the formulation of a business model which explains how the new application can generate the claimed benefits.

Requirement specification

Functional requirements

- These define the total functionality of the system.
- SADT and information engineering are designed to provide functional requirements.

Quality requirements

- The attributes of the system which the user expects to be present in the system.
- Response time, the ease of using the system and its reliability

Resource requirements

- It deals with the identification of the cost which the organization is ready to spend for developing a project.

Management control

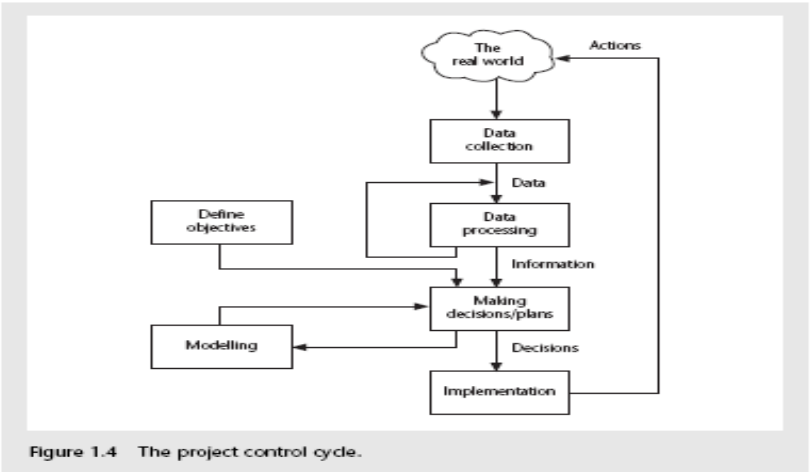


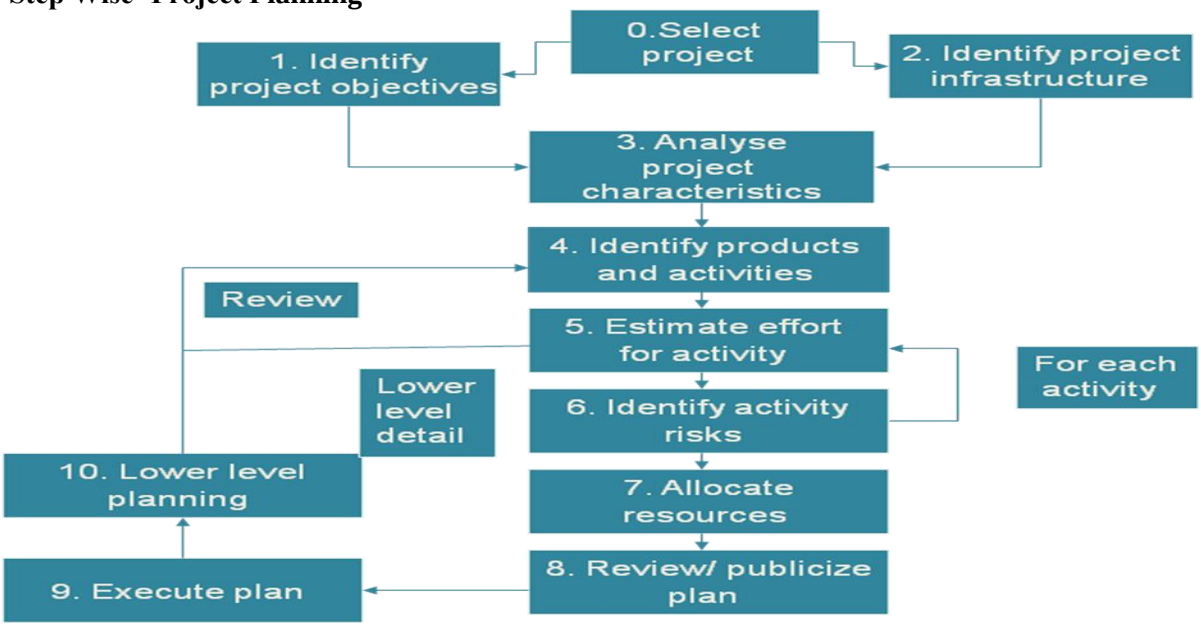
Figure 1.4 The project control cycle.

- It is a set of policies and procedures designed to keep operations going according to plan"
- The management has to know about all the activities of an organization.
- The local managers may have to collect required data.
- Data processing has to be done so that raw data is transformed into useful information.
- This helps in taking decisions / plans.
- The project manager has to find out the impact on staff while taking decisions.
- This results in modeling the consequences of a potential solution.
- The progress details are to be updated.

Information and control in organizations

- Hierarchical Information and control systems
- Larger projects are to have a hierarchical management structure.
- Management information flows up the organizational structure and control flows down
- Project team members will each have a group who allocates them work and to whom they report progress.
- The group leader will report to a manager at the next higher level
- There might be problems that cannot be resolved at a particular level.
- They will have to be reported to the next higher level of management.
- The information will have to be summarized to avoid overloaded information at the higher levels.
- Levels of decision making and information
- Each decision made in a project environment should be based on adequate information.
- Decisions are grouped at strategic, tactical and operational levels.
- Strategic decision making is about deciding objectives.
- Tactical decision making ensures that the objectives are fulfilled.
- The project leader will have to formulate a plan of action to meet those objectives
- The project leader monitors the progress to verify whether the objectives are likely to be met ad take necessary action.
- Operational decisions relate to day – to –day work implementing the project

'Step Wise' Project Planning



Stepwise covers only the planning stages of a project and not monitoring and control

Step 0

- It deals with making a decision as to whether a project is worth doing.

- If so, project evaluation must be done on an individual basis or as part of strategic planning.

Step 1 Identify project scope and objectives

1.1 Identify objectives and measures of effectiveness
- 'how do we know if we have succeeded?'

1.2 Establish a project authority
- a single person or group with unity of purpose
- to avoid being pulled in different directions

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

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?'
- including external authorities/providers
- might lead to making a communications plan

Step 2 Identify project infrastructure

2.1 Establish link between project and any strategic plan
- 'why did they want the project?'
- assign priorities to the projects to be carried out .
- Eg.Hardware and S/W standards
- These strategic decisions must be during strategic business plan

2.2 Identify installation standards and procedures
- 'what standards do we have to follow'
- Development procedures
- Document the products created at each stage
- Change control and configuration management standards
- Any changes to requirements are implemented in a safe and orderly way.
- Quality standards and procedures manual
- Quality checks that need to be done at each point of the project life cycle
- Measurement programme-certain statistics have to collected at various stages of a project.
- Project Manager should be aware of project planning and control stds

2.3. Identify project team organization
- 'where do I fit in?
- Business analyst and software developers are in different group

Step 3 Analysis of project characteristics

To ensure that appropriate methods are used for the project.

3.1 Distinguish the project as either objective or product-based.
- objective driven will give you more freedom but often there is a specified product you have to build to form a solution

3.2 Analyse other project characteristics (including quality based ones)
- what is different about this project?
- Eg.Information system or Embedded System or safety critical system

3.3Identify high level project risks
- 'what could go wrong?'
- 'what can we do to stop it?'
- Risk can be attributed to the operational or development environments

3.4Take into account user requirements concerning implementation
- some organizations (such as government) might require use of the waterfall method

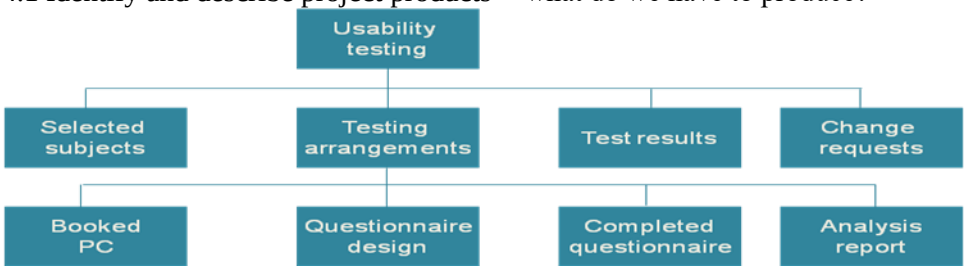
3.5Select general life cycle approach
- waterfall? Increments? Prototypes?

3.6 Review overall resource estimates
- After Risk is identified and project approach is identified ,re-estimate the effort and other resources to implement the project.

- Eg. Function point Estimate
- 'does all this increase the cost?'

Step 4 Identify project products and activities

4.1 Identify and describe project products - 'what do we have to produce?'



Products

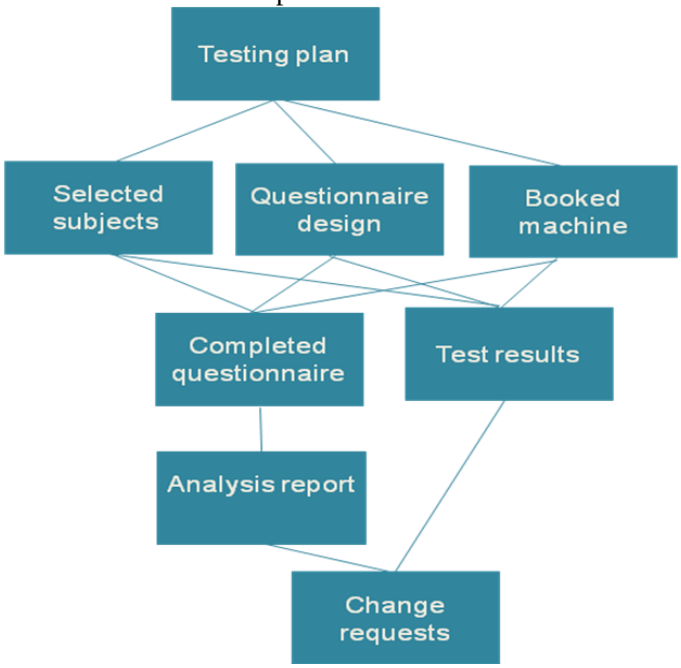
- The result of an activity
- Could be (among other things)
  - physical thing ('installed pc'),
  - a document ('logical data structure')
  - a person ('trained user')
  - a new version of an old product ('updated software')
- The following are NOT normally products:
  - activities (e.g. 'training')
  - events (e.g. 'interviews completed')
  - resources and actors (e.g. 'software developer') - may be exceptions to this
- Products CAN BE deliverable or intermediate

Product description (PD)

- Product identity
- Description - what is it?
- Derivation - what is it based on?
- Composition - what does it contain?
- Format
- Relevant standards
- Quality criteria

Create a PD for 'test data'

4.2 Document Generic product flows



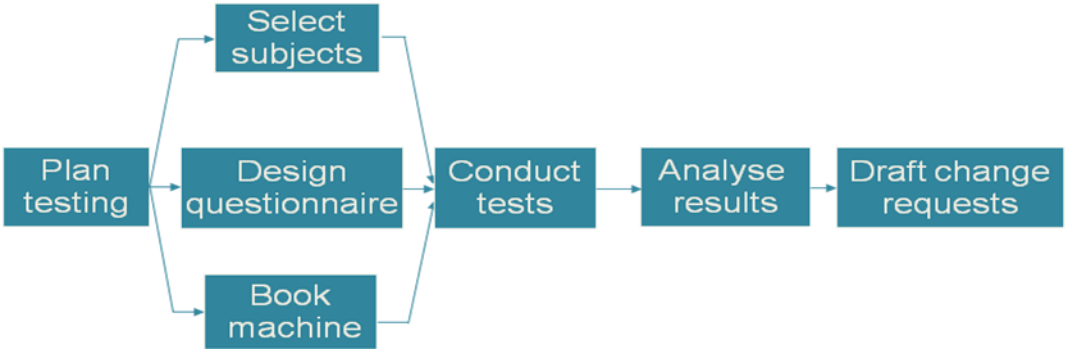
Step 4.3 Recognize product instances

- The PBS and PFD will probably have identified generic products e.g. ‘software modules’
- It might be possible to identify specific instances e.g. ‘module A’, ‘module B’ …
- But in many cases this will have to be left to later, more detailed, planning

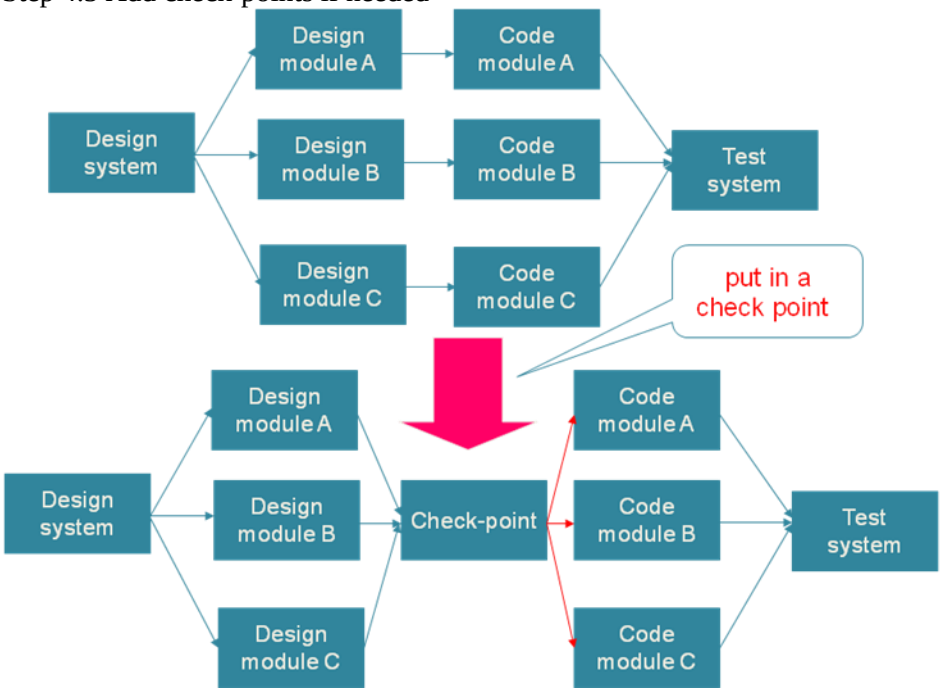
4.4. Produce ideal activity network

- Identify the activities needed to create each product in the PFD
- More than one activity might be needed to create a single product
- Hint: Identify activities by verb + noun but avoid ‘produce…’ (too vague)
- Draw up activity network

An ‘ideal’ activity



Step 4.5 Add check-points if needed



Step 5: Estimate effort for each activity

5.1 Carry out bottom-up estimates

- distinguish carefully between effort and elapsed time

5.2. Revise plan to create controllable activities

- long activities (say 12 weeks) make a project difficult to control
- after 6 weeks are we 50% complete?
- can be hard to tell
- better to break down into smaller subtasks
- conversely, some very short, connected activities might be better bundled together, with a simple checklist
- roughly aim for activities to match the length of the reporting period
- if you have progress meetings every 2 weeks, try to identify activities which take two weeks

Step 6: Identify activity risks

6.1.Identify and quantify risks for activities

- look at the assumptions in the plan, such as:
- time required
- availability of staff/resources
- these generate uncertainty
- simple way to handle:
- create a most likely estimate for time/effort
- create a second estimate with a safety margin such that the target has a 95% chance of being met
- look at the damage that could be caused by a risk
- pick out the most important ones

6.2. Plan risk reduction and contingency measures

- risk reduction: activity to stop risk occurring
- contingency: action if risk does occur

6.3 Adjust overall plans and estimates to take account of risks

- e.g. add new activities which reduce risks associated with other activities e.g. training, pilot trials, information gathering

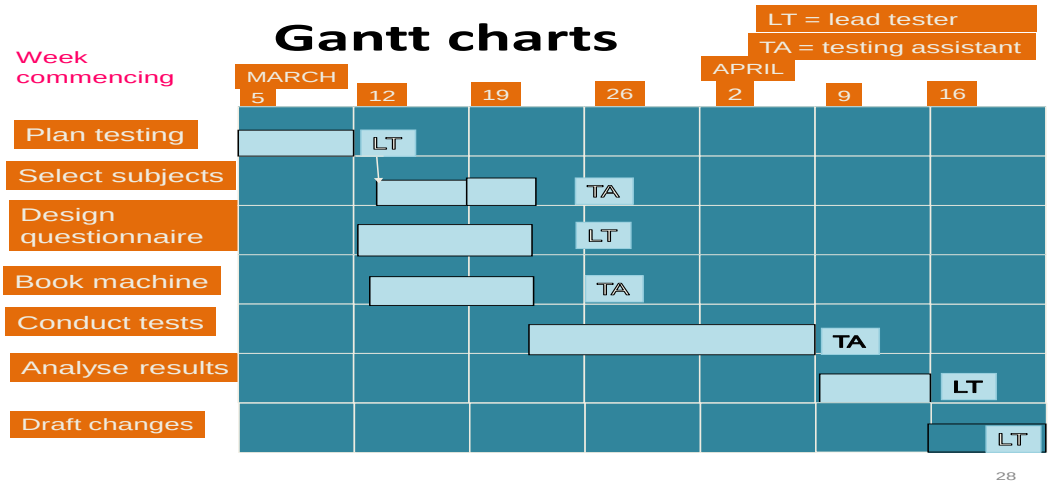
Step 7: Allocate resources

7.1 Identify and allocate resources to activities

- what type of staff is needed for activity?
- who is (provisionally) available when required?

7.2 Revise plans and estimates to take into account resource constraints

- where there is conflict establish an order of priority
- note effects upon project duration
- a GANNT chart can help resolve conflict and maximize productivity...



Step 8: Review/Publicise plan

8.1 Review quality aspects of the project plan

- Sometimes undertaking one activity can reveal that an earlier activity was not properly completed:
- will have to be reworked
- will require effort and resources
- can lead to loss of control of project
- need to be sure that a completed task is truly completed
- need quality criteria for each task
- tick off when complete
- the list from step 1.1 will help form these

8.2 Document plans and obtain agreement

- make sure everyone understands and agrees
- specify this task in a communications plan if need be (as mentioned in step 1.5)

Steps 9 and 10: Execute Plan / Lower Levels of Planning

- During the project draw up plans for activities in greater detail as they become due
- Detail has to wait as more information becomes available
- Especially if you are using an iterative development approach
- It maintain provisional plans for more important later tasks
- Its planning in great detail too soon could be a waste of time