



SOFTWARE PROJECT MANAGEMENT

CSE4016

PRIYANKA SINGH

Course Objectives

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Reflect on how management the principles will improve software projects.
- Demonstrate various software design techniques in software.
- Gauge the applicability of process models for a software development project.

UNIT 1- INTRODUCTION SOFTWARE PROJECT MANAGEMENT

Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

Text Books

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Text book of production management, Shridhara Bhat.K, 1st Edition, Himalaya Publishing House, 2012.
3. Industrial Engineering and Management, Khanna.O.P, 2nd Edition, Dhanpat Rai Publications, 2013.
4. Entrepreneurial Development, Jayshree Suresh, 5th Edition, Margham Publications, 2010.

Reference Books

1. Entrepreneurship, Robert D. Hisrich, 6th Edition, Tata McGraw Hill Publications.,2014.
2. Software Product Management and Pricing: Key Success Factors for Software Organization, Hans-Bernd Kittlaus, Peter N. Clough, 2011, Springer Science &Business Media.

Software

- **Software** is more than just a program code.
- A program is an executable code, which serves some computational purpose.
- Software is considered to be collection of executable programming code, associated libraries and documentations.
- Software, when made for a specific requirement is called **software product**.



Engineering on the other hand, is all about developing products, using well-defined, scientific principles and methods.

- **Software engineering**- Software engineering is an engineering branch associated with development of software product using well-defined scientific principles, methods and procedures.
- **Definition (IEEE)**- Software engineering is the establishment and use of sound engineering principles in order to obtain economically software that is reliable and work efficiently on real machines.
- The outcome of software engineering is an **efficient** and **reliable** software product.
- Software project management has wider scope than software engineering process.

Characteristics of good software

A software product can be judged by **what it offers and how well it can be used**. This software must satisfy on the following grounds:

- **Operational**
- **Transitional**
- **Maintenance**
- **Operational**- This tells us **how well software works in operations**. It can be measured on:
 - Budget
 - Usability
 - Efficiency
 - Correctness
 - Functionality
 - Dependability
 - Security
 - Safety

- **Transitional**- This aspect is important when the software is moved from one platform to another:
 - Portability
 - Interoperability
 - Reusability
 - Adaptability
- **Maintenance**- This aspect briefs about how well a software has the capabilities to maintain itself in the ever-changing environment:
 - Modularity
 - Maintainability
 - Flexibility
 - Scalability

- A **Software Project** is the complete procedure of software development from requirement gathering to testing and maintenance, carried out according to the execution methodologies, in a specified period of time to achieve intended software product.
- The job pattern of an IT company engaged in software development can be seen split in two parts:
 - **Software Creation**
 - **Software Project Management**

Software project management

- What is **Project Management**?

Ans: The methods and regulation used to define goals, plan and monitor tasks and resources, identify and resolve issues, and control costs and budgets for a specific project is known as **project management**.

- **Software project management** includes the tools, techniques, and knowledge essential to deal with the growth of software products.
- In Software Project Management, the end users and developers require to know the cost of the project, duration and length.
- It is a process of managing, allocating and timing resources to develop computer software that meets necessities.

It consists of eight tasks:

- Problem Identification
- Problem Definition
- Project Planning
- Project Organization
- Resource Allocation
- Project Scheduling
- Tracking, Reporting and Controlling
- Project Termination

Importance of software project management

All organizations, business and companies manage **project, people, costs and tasks on a daily basis**. This can prove to be a complicated task.

Having a solution that helps to organize and manage these aspects proves invaluable to a company.

What is Project?

- A project is a sequence of **unique, complex, and connected activities** having one goal or purpose and that must be completed by a specific time, within budget, and according to specification.
- A project is **well-defined task**, which is a collection of several operations done in order to achieve a goal (for example, software development and delivery).

- A Project can be characterized as:
 - Every project may has a **unique** and **distinct goal**.
 - Project is **not routine activity** or day-to-day operations.
 - Project comes with a **start time and end time**.
 - Project ends when its goal is achieved hence it is a **temporary phase** in the lifetime of an organization.
 - Project needs **adequate resources** in terms of time, manpower, finance, material and knowledge-bank.

Sequence of Activities

- A project includes a number of activities that must be completed in some particular order, or sequence.
- An activity is a defined chunk of work.
- The chain of the activities is based on technical requirements, not on management concern. i.e.
 - What is needed as input in order to begin working on this activity?
 - What activities produce those as output?

- Unique Activities –

- The activities in a project must be **unique**.
- A project has **never happened before**, and it will never happen again under the same conditions.

- Complex Activities–

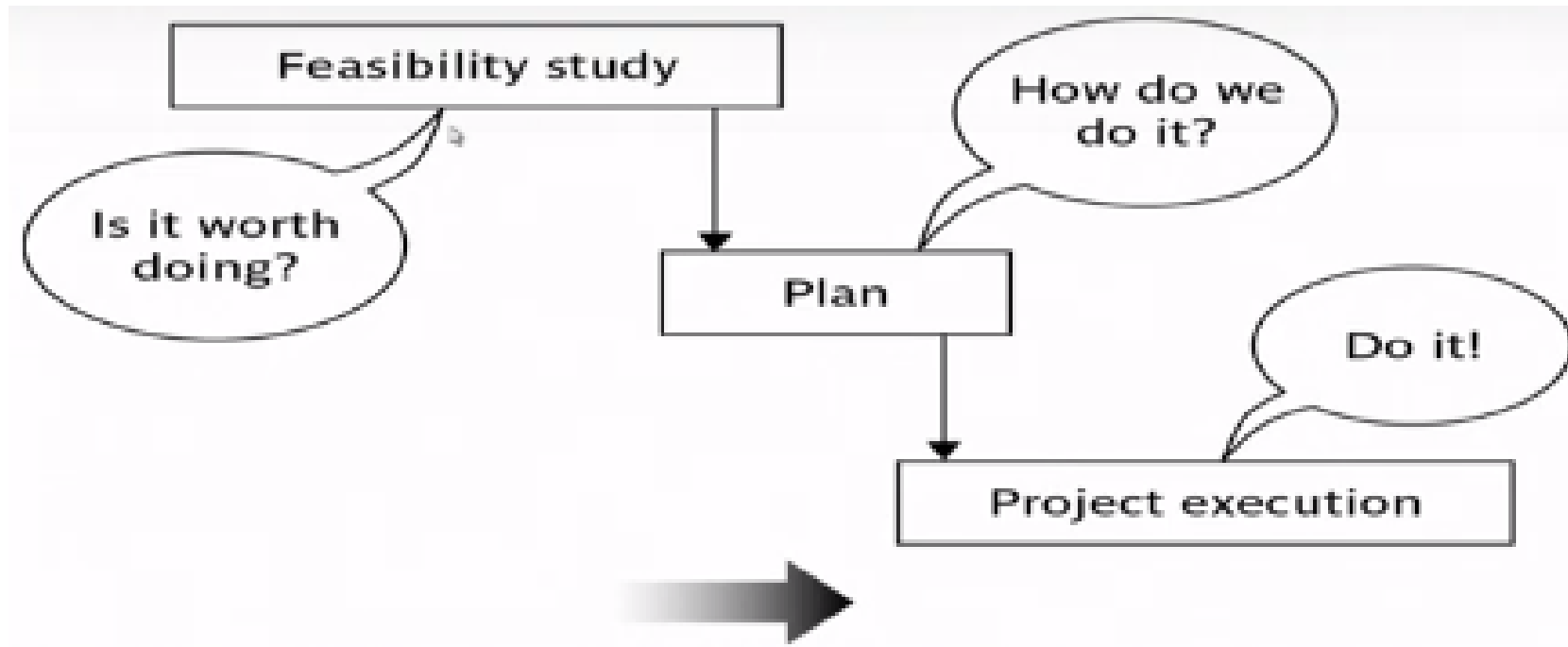
- The activities that make up the project are **not simple, repetitive acts**, such as mowing the lawn, painting the house, washing the car, or loading the delivery truck. They are complex.
- For example, designing an intuitive user interface to an application system is a complex activity.

- Connected Activities-

- Connectedness implies that there is a **logical or technical relationship between pairs of activities**.
- There is an order to the sequence in which the activities that make up the project must be completed. They are considered connected because **the output from one activity is the input to another**.
- For example, we must design the computer program before we can program it.

Software Project Manager

- A software project manager is a person who undertakes the responsibility of executing the software project.
- Software project manager is thoroughly aware of all the phases of SDLC that the software would go through.
- Project manager may never directly involve in producing the end product but he controls and manages the activities involved in production.
- A project manager closely monitors the development process, prepares and executes various plans, arranges necessary and adequate resources, maintains communication among all team members in order to address issues of cost, budget, resources, time, quality and customer satisfaction.



Few responsibilities that a project manager shoulders -

- **Managing People**

- Act as project leader
- Communication with stakeholders
- Managing human resources
- Setting up reporting hierarchy etc.

- **Managing Project**

- Defining and setting up project scope
- Managing project management activities
- Monitoring progress and performance
- Risk analysis at every phase
- Take necessary step to avoid or come out of problems
- Act as project spokesperson

Activities by Software Project Management

- Software project management comprises of a number of activities, which contains **planning of project, deciding scope of software product, estimation of cost** in various terms, scheduling of tasks and events, and resource management.
- Project management activities may include:
 - Project Planning
 - Scope Management
 - Project Estimation

Project Planning

- Software project planning is task, which is performed before the production of software actually starts.
- It is there for the software production but involves no concrete activity that has any direction connection with software production; rather it is a set of multiple processes, which facilitates software production.

Scope Management

- It defines the scope of project; this includes all the activities, process need to be done in order to make a deliverable software product. Scope management is essential because it creates boundaries of the project by clearly defining what would be done in the project and what would not be done. This makes project to contain limited and quantifiable tasks, which can easily be documented and in turn avoids cost and time overrun.
- During Project Scope management, it is necessary to -
 - Define the scope
 - Decide its verification and control
 - Divide the project into various smaller parts for ease of management.
 - Verify the scope
 - Control the scope by incorporating changes to the scope

Project Estimation

- For an effective management accurate estimation of various measures is a must. With correct estimation managers can manage and control the project more efficiently and effectively.
- Project estimation may involve the following:
 - **Software size estimation-** Software size may be estimated either in terms of KLOC (Kilo Line of Code) or by calculating number of function points in the software. Lines of code depend upon coding practices and function points vary according to the user or software requirement. (The **function point is a "unit of measurement" to express the amount of business functionality** an information system (as a product) provides to a user.)
 - **Effort estimation-** The managers estimate efforts in terms of personnel requirement and man-hour required to produce the software. For effort estimation software size should be known. This can either be derived by managers' experience, organization's historical data or software size can be converted into efforts by using some standard formulae.

- **Time estimation-** Once size and efforts are estimated, the time required to produce the software can be estimated. Efforts required is segregated into sub categories as per the requirement specifications and interdependency of various components of software. Software tasks are divided into smaller tasks, activities or events by ***Work Breakthrough Structure (WBS)***. The sum of time required to complete all tasks in hours or days is the total time invested to complete the project.
- **Cost estimation-** This might be considered as the most difficult of all because it depends on more elements than any of the previous ones. For estimating project cost, it is required to consider -
 - Size of software
 - Software quality
 - Hardware
 - Additional software or tools, licenses etc.
 - Skilled personnel with task-specific skills
 - Travel involved
 - Communication
 - Training and support

Project managers vs Project leader

- Project managers are focused on **coordinating the project**. Project leaders, on the other hand, are **responsible for the overall success and vision for that project**. Their vision should guide the rest of the employees in what they should do and how they should do it.
- Project managers are responsible for the tactics that **create the end result—a successful project**. Their concern is ensuring that the team meets objectives on time and that the project stays on-budget. Project leaders focus on **managing the project while inspiring those who work around them to create their vision**.
- Project managers have an **outline for what they need to do**. Project managers **manage the budget, staffing and responsibilities of team members to ensure deadlines are met**. While project leaders also manage the team's effectiveness, their strategy is to **motivate and help generate new ideas to achieve goals**.

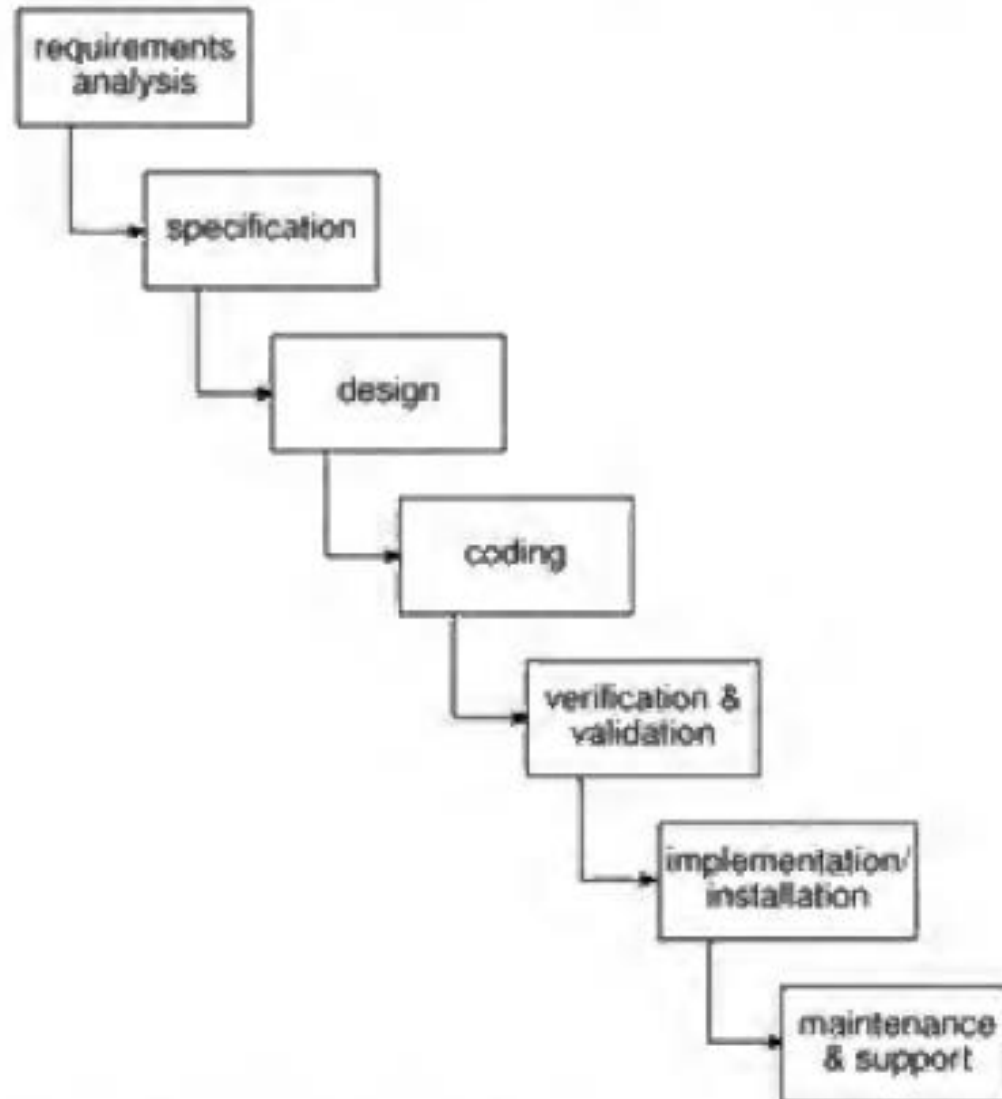
Activities covered by software project management

A software project is concerned not only with the actual writing of software. In fact, where a software application is bought in 'off-the-shelf' there might be no software writing as such.

- The feasibility study-This is an investigation to decide whether a prospective project is worth starting.

- Planning- If the feasibility study produces results that indicate that the prospective project appears viable, then planning of the project can take place. In fact, for a large project, we would not do all our detailed planning right at the beginning.
- Project execution- The project can now be executed, Individual projects are likely to differ considerably but a classic project life-cycle

Typical project life cycle



Some ways of categorizing software projects

Information systems versus embedded systems

A distinction may be made between information systems and embedded systems. Very crudely, the difference is that in the former case the system interfaces with the organization, whereas in the latter case the system interfaces with a machine!

A stock control system would be an information system that controls when the organization reorders stock.

An embedded, or process control, system might control the air conditioning equipment in a building.

Objectives versus products

- Projects may be distinguished by whether their aim is to produce a product or to meet certain objectives.
- A project might be to create a product, the details of which have been specified by the client. The client has the responsibility for justifying the product. On the other hand, the project might be required to meet certain objectives.
- There might be several ways of achieving these objectives in contrast to the constraints of the product-driven project.
- One example of this is where a new information system is implemented to improve some service to users inside or outside an organization. The subject of an agreement would be the level of service rather than the characteristics of a particular information system..

Problems with software projects

- poor estimates and plans;
- lack of quality standards and measure
- lack of guidance about making organizational decision
- lack of techniques to make progress visible
- poor role definition - who does what?
- incorrect success criteria,

Below is a [list of the problems identified](#) by a number of students on a degree course in Computing and Information Systems who had just completed a year's industrial placement:

- inadequate specification of work
- management ignorance of IT
- lack of knowledge of application area.
- lack of standards
- lack of up-to-date documentation
- preceding activities not completed on time - including late delivery of equipment
- lack of communication between users and technicians
- lack of communication leading to duplication of work
- lack of commitment - especially when a project is lied to one person who then moves
- narrow scope of technical expertise
- changing statutory requirements
- changing Malware environment
- deadline pressure
- lack of quality control
- remote management
- lack of training.

Purpose of project management and setting objectives

- The purpose of project management is to **foresee or predict as many dangers and problems as possible**; and to plan, organize and control activities so that the project is completed as successfully as possible in spite of all the risks.
- Project management can involve the following activities: **planning** - deciding what is to be done; **organizing** - making arrangements; **staffing** - selecting the right people for the job; **directing** - giving instructions; monitoring - checking on progress; controlling - **taking** action to remedy hold ups; **innovation** - coming up with new solutions; **representing** - liaising with users.

Setting Objectives

- Effective objectives in project management are specific.
- A specific objective increases the chances of leading to a specific outcome.
- Therefore objectives **shouldn't be vague**, such as "to improve customer relations," because they are not measurable.
- Objectives should show **how successful a project has been**, for example "to reduce customer complaints by 50%" would be a good objective.
- The measure can be, in some cases, a simple yes or no answer, for example, "did we reduce the number of customer complaints by 50%?"

Objectives can often be set under three headings:

1. Performance and Quality

The end result of a project must fit the purpose for which it was intended.

2. Budget

The project must be completed without exceeding the authorized expenditure

3. Time to Completion

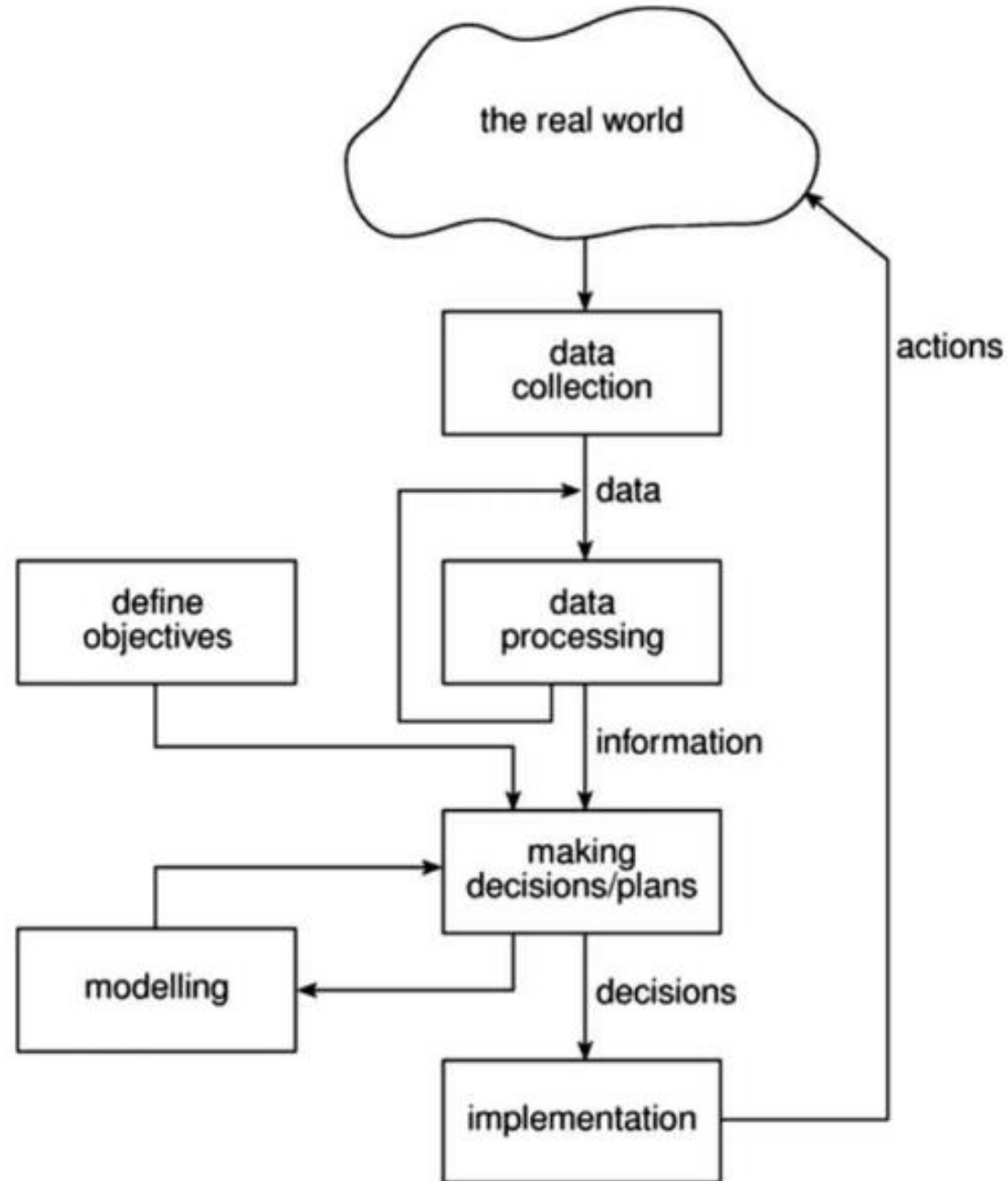
Actual progress has to match or beat planned progress. All significant stages of the project must take place no later than their specified dates, to result in total completion on or before the planned finish date.

Management control

The project control cycle-

- **Control** is a function of management which helps to check errors in order to take corrective actions.
- This is done to minimize deviation from standards and ensure that the stated goals of the organization are achieved in a desired manner.
- According to modern concepts, control is a foreseeing action; earlier concepts of control were only used when errors were detected.
- Control in management includes setting standards, measuring actual performance and taking corrective action and decision making.

Project control cycle



Principles of Project Management

- The primary challenge of project management is to achieve all of the project goals and objectives while honoring the pre-defined constraints.
- The primary constraints are scope, time, quality, and budget. The secondary—and more ambitious—challenge is to optimize the allocation of necessary inputs and integrate them to meet pre-defined objectives.
- For a successful project, the following project management principles are necessary assets when charting a path to completion.
 - Project structure
 - Definition phase
 - Clear goals
 - Transparency about project status
 - Risk recognition
 - Managing project disturbances
 - [Responsibility of the project manager](#)
 - Project success

Project Structure-

- Project Goal - An answer to the question “What has to be done” is usually a good starting point when setting a project goal.
- Project Timeline and Order- A flowchart is a powerful tool to visualize the starting point, the endpoint, and the order of work packages in a single chart.
- Project Milestones- Milestones define certain phases of your project and the corresponding costs and results. Milestones represent decisive steps during the project. They are set after a certain number of work packages that belong together. This series of work packages leads to the achievement of a sub-goal.

- **Definition Phase** - The definition phase is where many projects go wrong. This can happen when no clear definition, or when the definition is muddled due to the involvement of too many stakeholders.
- **Clear Goals** - The project manager is responsible for the achievement of all project goals. These goals should always be defined using the SMART paradigm (specific, measurable, ambitious, realistic, time-bound).
- **Transparency About the Project Status-** Your flowcharts, structure plan, and milestone plan are useful tools to help you stay on track. As a project manager, you should be able to present a brief report about the status of the project to your principal or stakeholders at each stage of the project. At such meetings, you should be able to give overviews about the costs, the timeline, and the achieved milestones.

- **Risk Recognition-** It's the duty of the project manager to evaluate risks regularly. You should come into every project with the knowledge that all projects come with a variety of risks. The sooner you identify these risks, the sooner you can address negative developments.
- **Managing Project Disturbances-** It's not very likely that you have enough personal capacity to identify every single risk that may occur. Instead, work to identify the big risks and develop specific strategies to avoid them. Even if you're no visionary, you should rely on your skill set, knowledge, and instincts in order to react quickly and productively when something goes wrong.

- **Responsibility of the Project Manager**

The Project Manager is responsible for communication, including status reporting, risk management, and escalation of issues that cannot be resolved in the team—and generally ensuring the project is delivered within budget, on schedule, and within scope.

- **Project Success**

Project success is a multi-dimensional construct that can mean different things to different people. It is best expressed at the beginning of a project in terms of key and measurable criteria upon which the relative success or failure of the project may be judged.

- For example, some generally used success criteria include:
 - Meeting key project objectives such as the business objectives of the sponsoring organization, owner or user.
 - Eliciting satisfaction with the project management process, i.e., the deliverable is complete, up to standard, is on time and within budget.
 - Reflecting general acceptance and satisfaction with the project's deliverable on the part of the project's customer and the majority of the project's community at some time in the future.

Project portfolio Management

- When there are many projects run by an organization, it is vital for the organization to manage their project portfolio.
- This helps the organization to categorize the projects and align the projects with their organizational goals.
- Project Portfolio Management (PPM) is a management process with the help of methods aimed at helping the organization to acquire information and sort out projects according to a set of criteria.
- Project Portfolio Management is the centralized management of the processes, methods, and technologies used by project managers and project management offices to analyze and collectively manage current or proposed projects based on numerous key characteristics

Objectives of Project Portfolio Management

- The need to create a descriptive document, which contains vital information such as name of project, estimated timeframe, cost and business objectives.
- The project needs to be evaluated on a regular basis to ensure that the project is meeting its target and stays in its course.
- Selection of the team players, who will work towards achieving the project's objectives.

Benefits of Project Portfolio Management

The following benefits can be gained through efficient project portfolio management:

- Greater adaptability towards change.
- Constant review and close monitoring brings about a higher return.
- Identification of dependencies is easier to identify.
- Advantage over other competitors (competitive advantage).
- Helps to concentrate on the strategies, which will help to achieve the targets rather than focusing on the project itself.
- The mix of both IT and business projects are seen as contributors to achieving the organizational objectives.

The answers to these questions will determine the success of the implementation of the project.



Cost Benefit Analysis

Methodology

- Cost benefit analysis is a method that facilitates decision makers of companies or institutions to evaluate potential outcomes and choose technologies to achieve these outcomes.
- Cost-benefit analysis (CBA) provides a means for systematically comparing the value of outcomes with the value of resources achieving the outcomes required. It measures the economic efficiency of the proposed technology or project. When there are many options to consider during a decision-making task, it is useful to evaluate the options with a common metric.

- In situations in which large amounts of money are at stake, the presentation of a cost-benefit analysis is the preferred way to demonstrate the reasoning behind investments.
- For the application of CBA, inputs may be divided into parameter values and benefit and cost values. Parameters include the discount rate, the future rates of economic growth, the future rates of inflation and the estimations about the future rates of technological change.

Factors for a reliable Cost Benefit Analysis

- The CBA time period should match the system life cycle.
- The analysis has to include at least three alternative solutions that consider alternative ways of fulfilling the demanded project.
- In the end of the analysis the decision maker should do a sensitivity analysis for the costs and the benefits considered during the previous steps. Sensitivity analysis identifies those input parameters that have the greatest influence on the outcome, repeats the analysis with different input parameter values, and evaluates the results to determine which, if any, input parameters are sensitive. If a relatively small change in the value of an input parameter changes the alternative selected, then the analysis is considered to be sensitive to that parameter.

A CBA application includes the following stages:

- **General description of the project**
- **List of alternative scenarios**
- **Identify Benefits and Costs** (*lists the exact benefits and costs met in each of the alternative scenarios. **Cost** include- Activities and Resources, **Cost Categories**, Personnel Costs, Direct and Indirect Costs (Overhead), Depreciation, and Annual Costs. Benefits are the services, capabilities, and qualities of each alternative system)*)
- **Schedule Benefits and Costs** (identifies the value of each benefit and cost for each year through the life cycle of the decision beginning from Year 0, which is the start of the decision life)
- **Comparison of alternatives** (with tables and graphs to facilitate decision making.)
- **Sensitivity Analysis** (define how sensitive the results are to changes in the costs and benefits)

Most costs are relatively easy to identify and quantify in approximate monetary terms. It is helpful to categorize costs according to where they originate in the life of the project.

- ***Development costs*** - include the salaries and other employment costs of the staff involved in the development project and all associated costs.
- ***Setup costs*** - include the costs of putting the system into place. These consist mainly of the costs of any new hardware and ancillary equipment but will also include costs of file conversion, recruitment and staff training.
- ***Operational costs*** - consist of the costs of operating the system once it has been installed.

Benefits, on the other hand, are often quite difficult to quantify in monetary terms even once they have been identified. Benefits may be categorized as follows,

- ***Direct benefits*** - these accrue directly from the operation of the proposed system. These could, for example, include the reduction in salary bills through the introduction of a new, computerized system.
- ***Assessable indirect benefits*** - these are generally secondary benefits, such as increased accuracy through the introduction of a more user-friendly screen design where we might be able to estimate the reduction in errors, and hence costs, of the proposed system.
- ***Intangible benefits***: these are generally longer term or benefits that are considered very difficult to quantify. Enhanced job interest can lead to reduced staff turnover and, hence, lower recruitment costs.

Risk evaluation

Dealing with uncertainty:

- project A might appear to give a better return than B but could be riskier
- Could draw up draw a project risk matrix for each project to assess risks
- For riskier projects could use higher discount rates

Example of a project risk matrix

<i>Risk</i>	<i>Importance</i>	<i>Likelihood</i>
Software never completed or delivered	H	—
Project cancelled after design stage	H	—
Software delivered late	M	M
Development budget exceeded $\leq 20\%$	L	M
Development budget exceeded $> 20\%$	M	L
Maintenance costs higher than estimated	L	L
Response time targets not met	L	H

Risk evaluation

- A software risk can be of two types
 - (a) internal risks that are within the control of the project manager and
 - (2) external risks that are beyond the control of project manager.

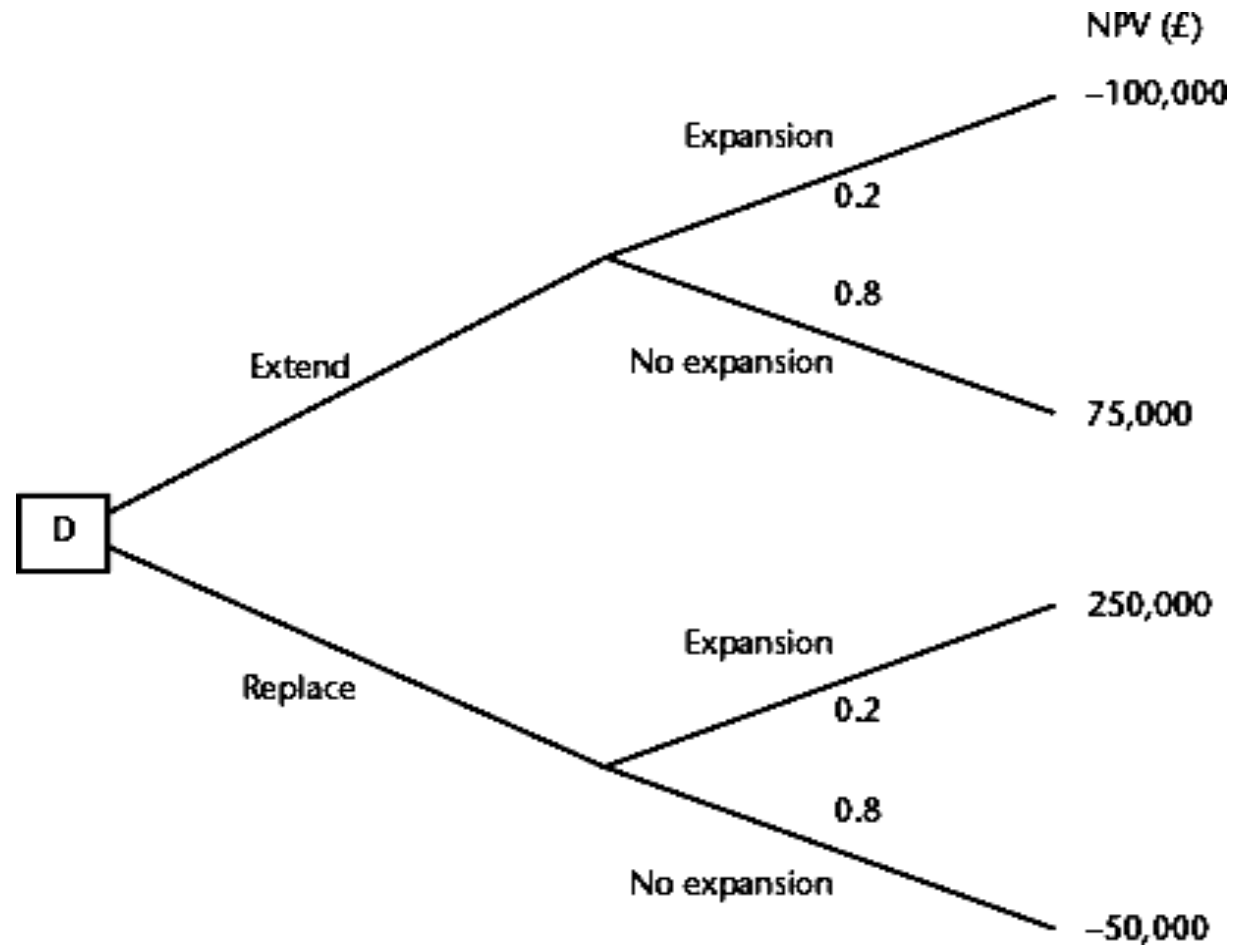
Risk management is carried out to:

- Identify the risk
- Reduce the impact of risk
- Reduce the probability or likelihood of risk
- Risk monitoring

- For risk evaluation:
 - Ranking the risks &
 - Determining the corresponding risk reduction strategies
- Because all risks are not equal in their impact to a project, you need to decide which ones to ignore and which ones to manage. You can prioritize risks by assigning **risk priority numbers (RPNs)** to them. There are three factors that contribute to the RPN:
 - The probability that the risk may occur
 - The severity of the effect the risk could have on the project
 - The ability to detect ahead of time when the risk happens

Risk evaluation

Decision trees



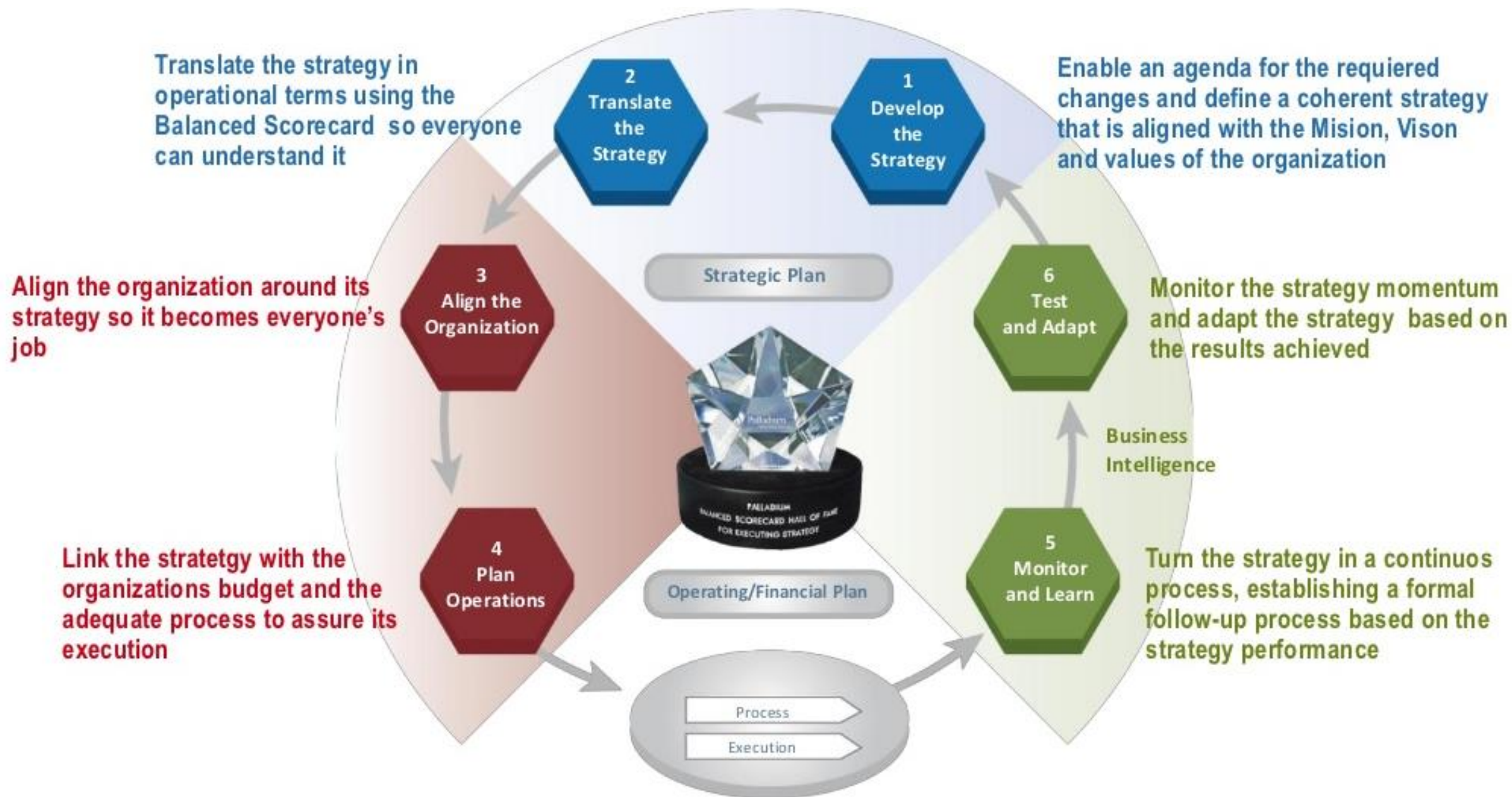
Strategic program Management

Program Management-

- A program consists of interconnected projects that serve some strategic goal.
- Let's take an example, an organization plans to develop software for accounting purpose and it wants to market it to the right target audience. In this case, there would be two different projects. One project will be for the development of the software and another project will be to market the software. Let's say, the strategic goal is to increase the customer base of the organization.
- A Program will comprise of these two projects with a goal to increase the customer base.

- Program Management thus refers to the specific techniques, knowledge, and skills to manage such a program.
- In real scenarios, a program could consist of a large number of projects and management of such a program would be highly complicated.
- The essential parts of program management would be to monitor and control the interdependencies among projects in the program
- Strategic Program Management will help you achieve strategic business outcomes and deliver the improved capital efficiency for mega-projects.

- Two thirds of all large engineering and construction projects are significantly under performing, exceeding budgets and schedules approved as part of final investment decisions by 20% or more.
- But, if you prepare your organization, plan your project right and ensure strong, continuous alignment around your strategic business objectives, it doesn't have to be so.
- The challenges of today's mega-projects are largely management and organizational.
- At Strategic Program Management you improve the performance of today's and tomorrow's mega-projects.



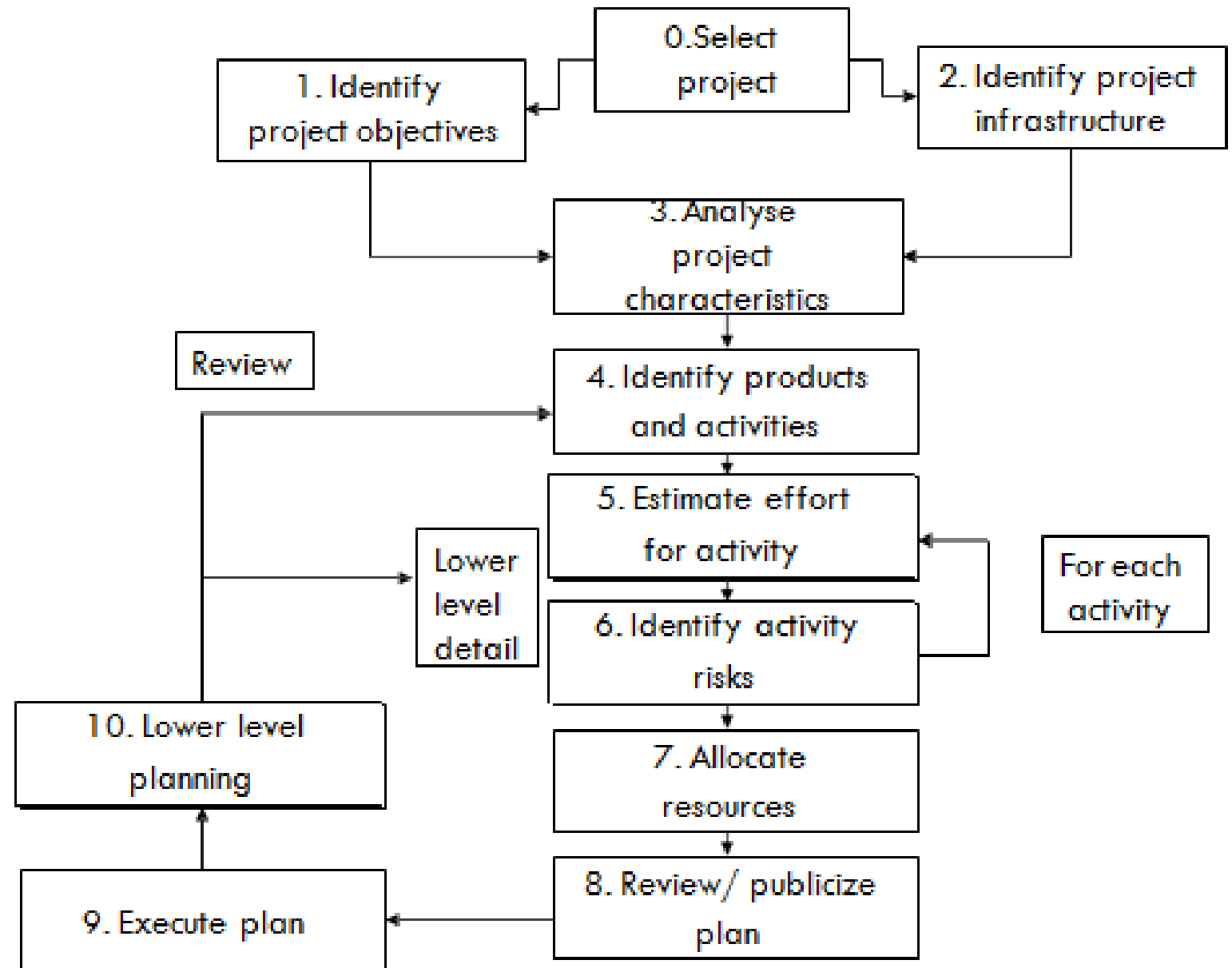
In summary-

- Most organizations have a strategy
- 90% of organizations fail to execute
- Strategy Execution can be a core competence
- Program Management plays a key role in effective Strategy Execution

Step Wise Project Planning

- Practicality
 - ▣ tries to answer the question ‘what do I do now?’
- Scalability
 - ▣ useful for small project as well as large
- Range of application
- Accepted techniques
 - ▣ e.g. borrowed from PRINCE etc

Step Wise' - an overview



A project scenario

- Hardware/software engineering company (C++ language of choice)
- teams are selected for individual projects - some friction has been found between team members
- HR manager suggests psychometric testing to select team
- Software package to be used to test staff
- Visual basic suggested as a vehicle for implementation
- usability is important - decision to carry out usability tests

Step 1 establish 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
 - ▣ ‘who is the boss?’
- 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?’

Back to the scenario

- Project authority
 - ▣ should be a project manager rather than HR manager?
- Stakeholders
 - ▣ project team members to complete on-line questionnaires: concern about results?
- Revision to objectives
 - ▣ provide feedback to team members on results

Step 2 Establish 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 organization
 - ▣ ‘where do I fit in?’

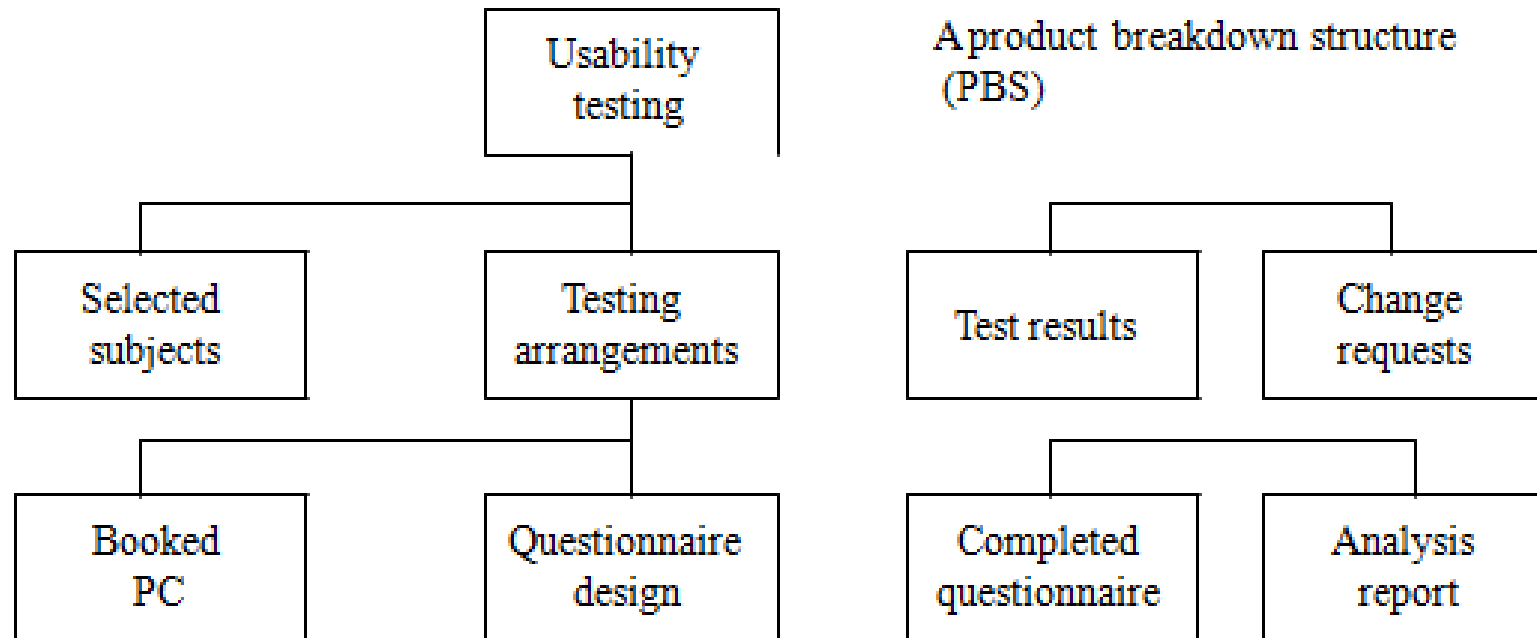
Step 3 Analysis of project characteristics

- 3.1 Distinguish the project as either objective or product-based.
 - ▣ Is there more than one way of achieving success?
- 3.2 Analyse other project characteristics (including quality based ones)
 - ▣ what is different about this project?
- Identify high level project risks
 - ▣ ‘what could go wrong?’
 - ▣ ‘what can we do to stop it?’
- Take into account user requirements concerning implementation
- Select general life cycle approach
 - ▣ waterfall? Increments? Prototypes?
- Review overall resource estimates
 - ▣ ‘does all this increase the cost?’

Back to the scenario

- Objectives vs. products
 - ▣ use paper questionnaire then input results of the analysis?
- Some risks
 - ▣ team members worried about implications and do not co-operate
 - ▣ project managers unwilling to try out application
 - ▣ Developer not familiar with features of VB
- Answer? - evolutionary prototype?

Step 4 Identify project 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')
- 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*

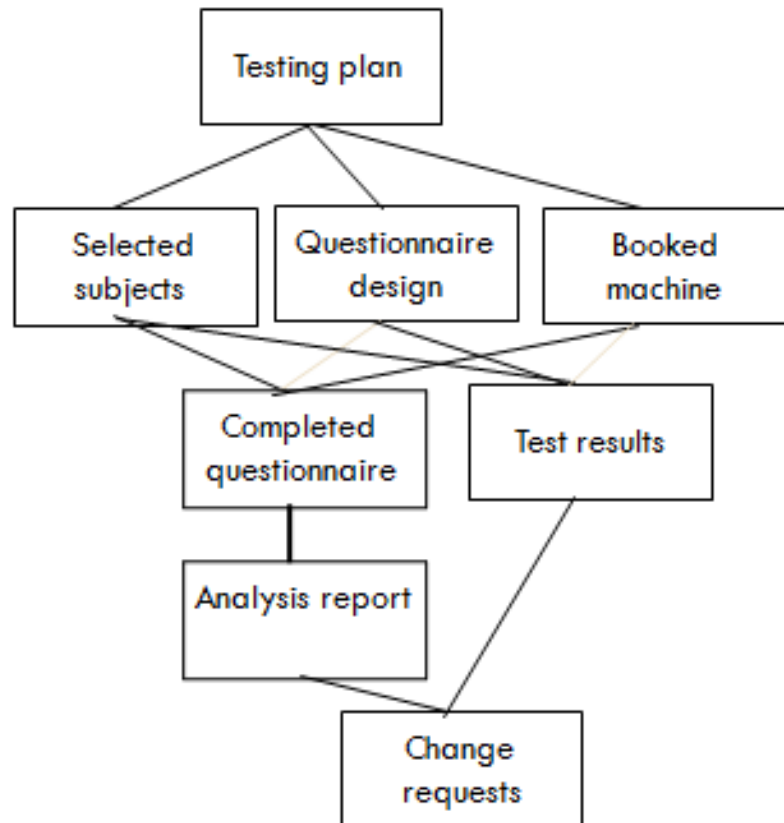
Product description (PD)

- 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'

Step 4 continued

4.2 document Generic Product flows

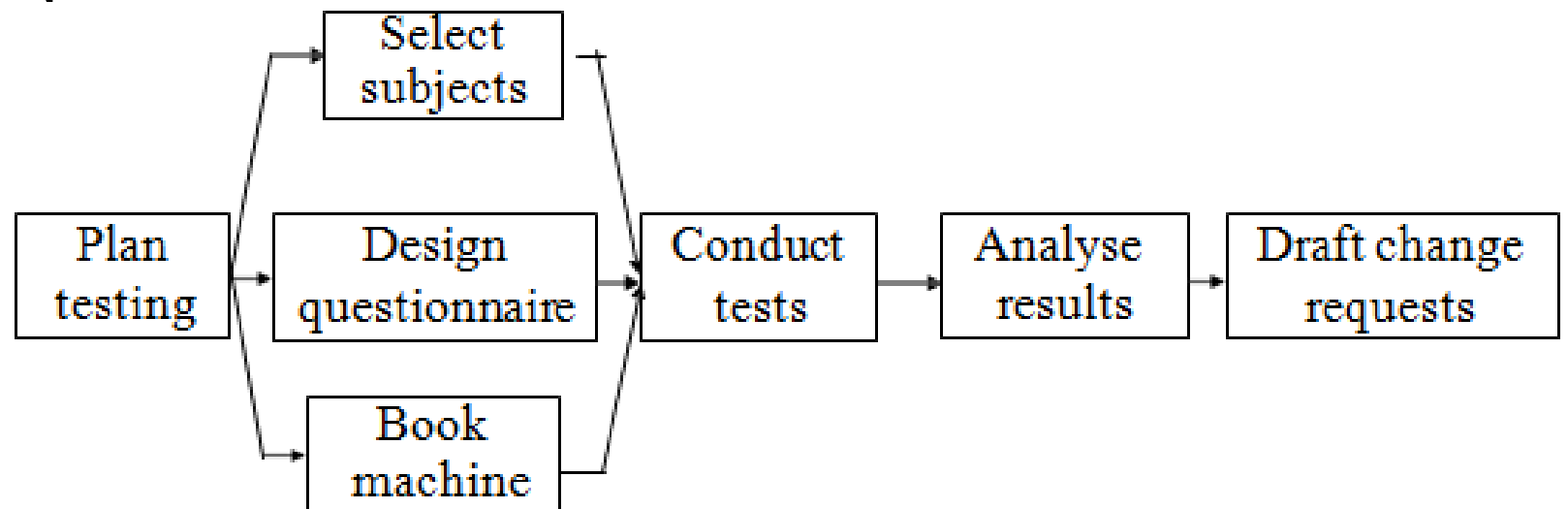


Step 4.3 Recognize product instances

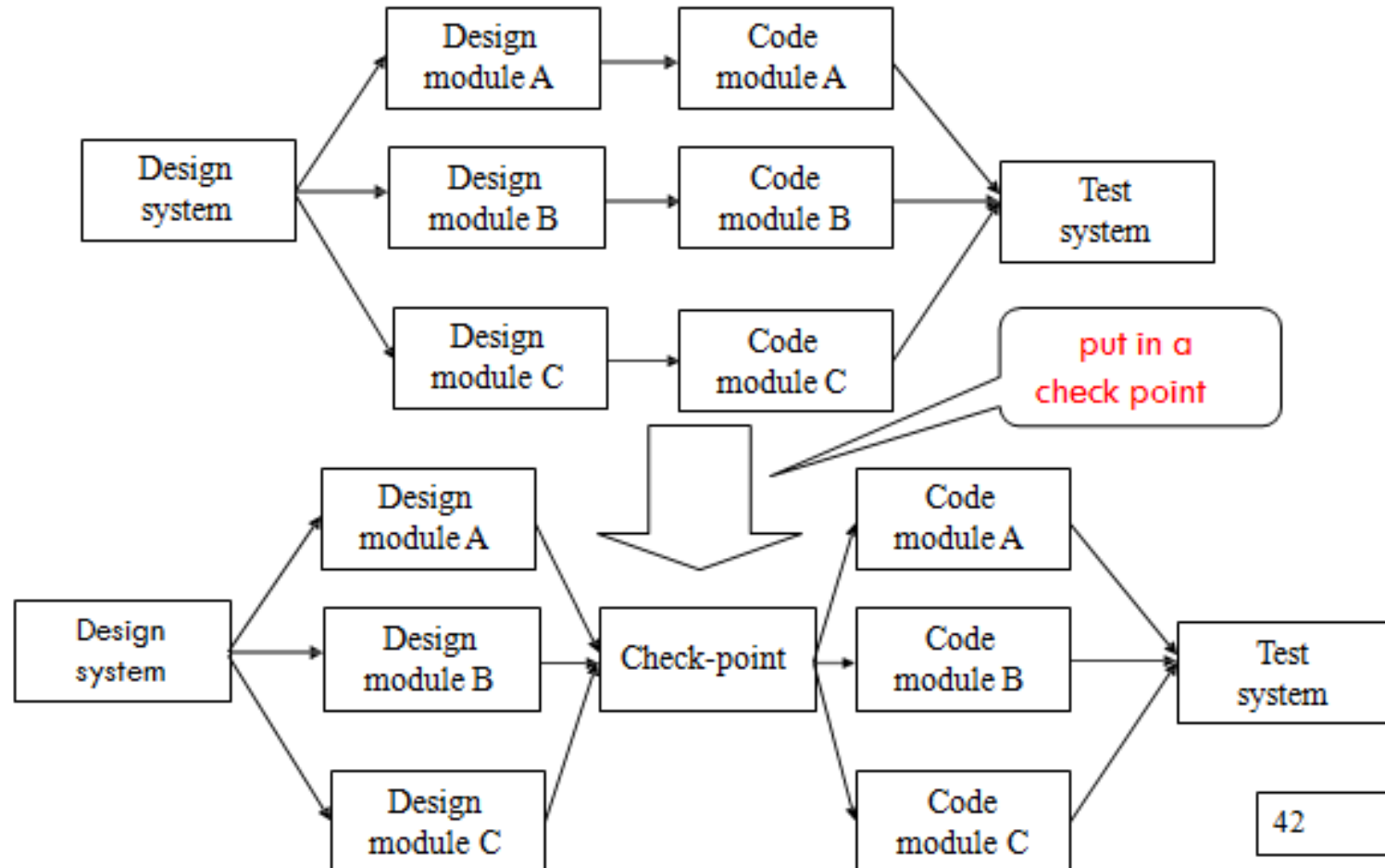
- The PBS and PFD will probably have identified generic products e.g. ‘software modules’
- It might be possible to identify specific instances e.g. ‘module A’, ‘module B’ ...
- But in many cases this will have to be left to later, more detailed, planning

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



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
 - ▣ break up very long activities into a series of smaller ones
 - ▣ bundle up very short activities (create check lists?)

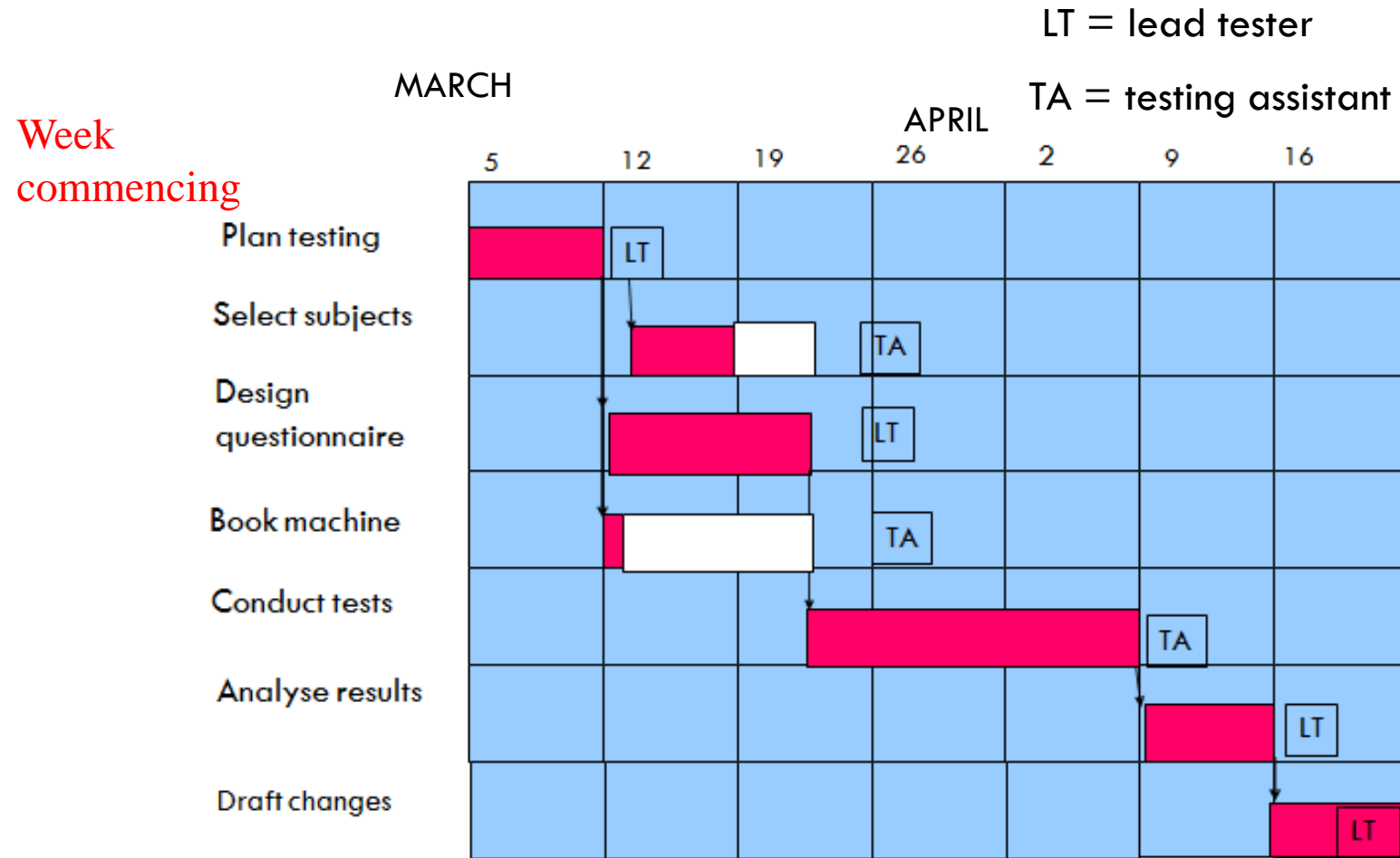
Step 6: Identify activity risks

- 6.1. Identify and quantify risks for activities
 - ▣ damage if risk occurs (measure in time lost or money)
 - ▣ likelihood if risk occurring
- 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

- 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

Gantt Chart



Step 8 : Review/ Publicize plans

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

Step 9 and 10 : Execute plan. Lower levels of planning

- Once the project is under way, plans will need to be drawn up in greater detail for each activity as it becomes due.
- Detailed planning of the later stages will have to be delayed because more information will be available nearer the start of the stage.
- Of course, it is necessary to make provisional plans for the more distant tasks because thinking about what has to be done can help unearth potential problems but sight should not be lost of the fact that these plans are provisional.

SUMMARY

- Any planning approach should have the following elements:
 - ✓ the establishment of project objectives;
 - ✓ the analysis of the characteristics of the project;
 - ✓ the establishment of an infrastructure consisting of an appropriate organization and set of standards, methods and tools;
 - ✓ the identification of the products of the project and the activities needed to generate those products;
 - ✓ the allocation of resources to activities;
 - ✓ the establishment of quality controls.
- Project management is an iterative process. As the time approaches for particular activities to be carried out they should be re-planned in more detail.