ACTIVITIES & METHODOLOGIES

Activities of Project Management

Project management plan begins with a set of activities that are involved in the development process.

- Overview of the project
- Project deliverables
- Managerial processes
- Technical processes
- Work packages
- Schedule of the project
- Budget estimation

Characteristics of Project

Some of the characteristics of project include:

- Planning of process is required;
- Clear objectives have to be specified;
- Project must have a predetermined time span;
- Involves different phases of work;
- Resources used on the project are constrained.;
- Non-routine tasks are involved.

Activities Covered by SPM

A software project is considered as a software application with specific elements associated with each type of project. The lists of activities involved in software project management are:

- Feasibility Study;
- Planning Phase;
- Project Execution.

Feasibility Study

A valid business case implies a prospective project. The necessary information required for the proposed application is gathered. Initial requirement stage is quite complex

and difficult. The client is aware of the problems but not sure of how to achieve the solution. Estimation becomes an important factor in the development of the product. Developmental and operational costs have to be estimated along with the benefits of the system. For a complex project, the feasibility study can have sub phases and strategic planning becomes essential in prioritizing the range of potential software developments. Group of projects are
termed as a planned programme of development.

Feasibility studies aim to objectively and rationally uncover the strengths and weaknesses of the existing business or proposed venture, opportunities and threats as presented by the environment, the resources required to carry through, and ultimately the prospects for success. In its simplest term, the two criteria to judge feasibility are cost required and value to be attained. As such, a well-designed feasibility study should provide a historical background of the business or project, description of the product or service, accounting statements, details of the operations and management, marketing research and policies, financial data, legal requirements and tax obligations. Generally, feasibility studies precede technical development and project implementation.

Technology and System Feasibility

The assessment is based on an outline design of system requirements in terms of Input, Processes, Output, Fields, Programs, and Procedures. This can be quantified in terms of volumes of data, trends, frequency of updating, etc. in order to estimate whether the new system will perform adequately or not. Technological feasibility is carried out to determine whether the company has the capability, in terms of software, hardware, personnel and expertise, to handle the completion of the project when writing a feasibility report, the following should be taken to consideration:

- A brief description of the business
- The part of the business being examined
- The human and economic factor
- The possible solutions to the problems

At this level, the concern is whether the proposal is both technically and legally feasible.

Economic Feasibility

Economic analysis is the most frequently used method for evaluating the effectiveness of a new system. More commonly known as cost/benefit analysis, the procedure is to

determine the benefits and savings that are expected from a can did ate system and compare them with costs. If benefits out weigh costs, then the decision is made to design and implement the system. An entrepreneur must accurately weigh the cost versus benefits before taking an action.

Cost-based study: It is important to identify cost and benefit factors, which can be categorized as follows: Development costs and Operating costs. This is an analysis of the costs to be incurred in the system and the benefits derivable out of the system.

Time-based study: This is an analysis of the time required to achieve a return on investments. The future value of a project is also a factor.

Legal Feasibility

Legal feasibility determines whether the proposed system conflicts with legal requirements, e.g. a data processing system must comply with the local Data Protection Acts.

Operational Feasibility

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Operational feasibility is a measure of how well a proposed system solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development.

Schedule Feasibility

A project will fail if it takes too long to be completed before it is useful. Typically this means estimating how long the system will take to develop, and if it can be completed in a given time period using some methods like payback period. Schedule feasibility is a measure of how reasonable the project timetable is.

Planning Phase

The planning phase comes into existence only if the proposed project is a prospective one. This is found only by the outcome of the feasibility study phase. In case of complex project, a detailed plan is not needed during the initial stage of planning phase. Instead, anoutlineplanisformulatedforthewholeprojectexceptforthefirstphase, which has a detailed one. As the project steps into different phases, a detailed plan for each stage can be developed as they are approached this will provide a clear idea about what should be done at every stages of the development.

The Project Planning Phase is the second phase in the *project life cycle*. It involves creating of a set of plans to help guide your team through the execution and closure phases of the project. The plans created during this phase will help you to manage time, cost, quality,

change, risk and issues. They will also help you manage staff and external suppliers, to ensure that you deliver the project on time and within budget.

In the Planning Phase, the team defines the solution in detail what to build, how to build it, who will build it, and when it will be built. During this phase the team works through the design process to create the solution architecture and design, writes the functional specification, and prepares work plans, cost estimates, and schedules for the various
deliverables.

The Planning Phase culminates in the Project Plans Approved Milestone, indicating that the project team, customer, and key project stakeholders agree on the details of the plans. Plans prepared by team members for areas such as communications, test, and security, are rolled up into a master plan that the program manager coordinates. The team's goal during this phase is to document the solution to a degree that the team can produce and deploy the solution in a timely and cost-effective manner. These documents are considered living documents, meaning they will be updated continuously throughout the Planning Phase.
Diligent work in the Planning Phase, which often involves several iterations of plans and schedules, should mitigate risks and increase chances for success. The team continues to identify all risks throughout the phase, and it addresses new risks as they emerge.

Project Execution

There are two phases of project execution namely design and implementation. The boundary between these two phases must be clearly understandable. Design is about thinking and decision making about the form of the products which has to be created. Implementation lays down the activities that have to be carried out to create these products. Planning and design phase are difficult to separate at the most detailed level because planning decisions are influenced by design decisions. For example, if a software product development has five components then it must have five sets of activities defined for each component.

Project execution is the process from after the contract is signed to the point where the technology is ready for operational use. New and modified products must be ready from a technological and operational point of view before installation and operational use. This is achieved by carrying out the project planning process followed by the project execution process. A successful project execution process will make a new or modified product ready from a technological and operational point of view.

The project planning process will identify technical gaps related to the product itself, environment, standards, governing documents, verification, handling and documentation. The

technology qualification program (TQP) is a project plan that describes activities and decision gates for a specific product required to close these gaps.

The project planning process may also identify gaps related to vendor's organization. These gaps must be corrected prior to project execution and is not a part of the TQP. A preliminary TQP will be worked out by the vendor as a part of their tender. The TQP will be finalized in cooperation with the operator prior to contract award. There will be no need for the TQP when a product can be delivered off the shelf in accordance with operator's technical requirements.

The TQP describes required activities related to 'development and qualification testing (QT) in the above figure. Technology readiness is achieved when the TQP activities are executed and accepted.

The manufacturing and factory acceptance testing (FAT) is controlled by the quality plan. The operational preparations are controlled by the operational manager. Operational readiness is achieved when the manufacturing and operational preparations are finalized and accepted.

Vendors have quality assurance (QA) systems to provide quality in all steps of their services. These QA systems shall be used to establish the TQP and quality plans during the project planning process. Operators have requirements and recommended practices that shall be used during the operational preparation process. Still there is need for a practical summary of the entire project execution process as it will be for new technology. Such summary is wanted by completion-and drilling engineers responsible for the project planning process and will be used to control the content of the TQP and quality plan worked out by the vendors.

This need has resulted in the development of a guideline describing the entire project execution process. The guideline is fit ted to operator needs and has thus emphasis on qualification activities. The guideline is made for well technology, but the main principles can be used for most technology elements.

Plan, Methods & Methodologies

An **activity plan** is based on some method of work. To test software the following list is assumed.

- Requirement analysis for the software;
- Develop test cases for each requirement;
- Creating test scripts, expected results;
- Comparison of actual result with the expected result;
- Identifying the discrepancies.

A **method** denote s kind of activity.

A **plan** takes the method and converts it to activities. Ever activity identified must contain the start and end dates, the responsible person to carry out the activity, what tools and materials are used.

Complex procedures can be handled in sequence or in parallel manner. The output of first method will be the input of the second method, the second one's output might be the input of the third one and soon. Methods grouped together are termed as methodologies. For example, object oriented design is a methodology made up of several methods.

In strategic planning, resource allocation is a plan for using available resources, for example human resources, especially in the near term, to achieve goals for the future. It is the process of allocating resources among the various projects or business units. The plan has two parts: Firstly, there is the basic allocation decision and secondly there are contingency mechanisms. The basic allocation decision is the choice of which items to fund in the plan, and what level of funding it should receive, and which to leave unfunded: there sources are allocated to some items, not to others.

There are two contingency mechanisms. There is a priority ranking of items excluded from the plan, showing which items to fund if more resources should become available; and there is a priority ranking of some items included in the plan, showing which items should be sacrificed if total funding must be reduced.

Software Process/Phases of SPM

1. Project conception and initiation

An idea for a project will be carefully examined to determine whether or not it benefits the organization. During this phase, a decision making team will identify if the project can realistically be completed.

2. Project definition and planning

A project plan, project charter and/or project scope may be put in writing, outlining the work to be performed. During this phase, a team should prioritize the project, calculate a budget and schedule, and determine what resources are needed.

3. Project launch or execution

Resources' tasks are distributed and teams are informed of responsibilities. This is a good time to bring up import ant project related information.

4. Project performance and control

Project managers will compare project status and progress to the actual plan, as resources

perform the scheduled work. During this phase, project managers may need to adjust schedules or do what is necessary to keep the project on track.

5. Project close

After project tasks are completed and the client has approved the outcome, an evaluation is necessary to highlight project success and/or learn from project history. Projects and project management processes vary from industry to industry; however, these are more traditional elements of a project. The overarching goal is typically to offer a product, change a process or

to solve a problem in order to benefit the organization.

CATEGORIZATION OF SOFTWARE PROJECTS

The Categories are

- Compulsory versus voluntary users
- Information System versus Embedded Systems
- Outsources Projects
- Objective-driven development

Information system interfaces with the organization whereas an embedded system interfaces with a machine. Typical example for an information system can be inventory system maintained by an organization. An embedded system or an industrial system can be a process control system such as maintaining air conditioning equipment in a company.

Projects are also defined by producing a product or meeting the objectives. A project that produces the product must meet all kinds of client requirements. The produced product must be justified by the client. The project is also required to satisfy certainobjectives. The objectives can guide and motivate individual or groups to perform well in their assigned tasks.

In general, software projects have an objective-driven stage that recommends the new system to meet identified requirements and a project-driven stage to actually develop the product.

SETTING OBJECTIVES

To develop a successful project, the project manager and the team members must be aware of the factors that lead them to success. There must be well-defined objectives accepted by all the people involved in the development process. A project authority must be identified to have an overall authority over the project. This authority is governed by a project steering committee also called as a project management board. Day–to-day activities must be reported to the steering committee by the project manager at regular intervals. Any changes to the defined objectives can be done only by the steering committee.

An effective objective's scope for an individual must be within the individual'scontrol. Objectives can be broken down into goals or sub-objectives in order to achieve them. **SMART** technique is used for a well-defined objective.

- **S**pecific ; Concrete and well-defined; Up to the point.
- **M**easurable : measures of effectiveness.
- **A**chievable ; power within the individual or the group.
- **R**elevant : satisfy the purpose of the project.
- **T**ime-oriented : time limit for successful achievement of the project.

The objectives are met only when the system becomes operational. Performance measures deals the reliability of the operational system and predictive measures are done during the development of the project by measuring the effectiveness of the developing system.

MANAGEMENT PRINCIPLES

Division of Work - According to this principle the whole work is divided into small tasks. The specialization of the workforce according to the skills of a person , creating specific personal and professional development within the labor force and therefore increasing productivity; leads to specialization which increases the efficiency of labor.

- **Authority and Responsibility** - This is the issue of commands followed by responsibility for their consequences. Authority means the right of a superior to give enhance order to his subordinates; responsibility means obligation for performance.
- **Discipline** - It is obedience, proper conduct in relation to others, respect of authority, etc. It is essential for the smooth functioning of all organizations.
- **Unity of Command** - This principle states that each subordinate should receiveorders and be accountable to one and only one superior. If an employee receives orders from more than one superior, it is likely to create confusion and conflict.
- **Unity of Direction** - All related activities should be put under one group, there should be one plan of action for them, and they should be under the control of one manager.
- **Subordination of Individual Interest to Mutual Interest** - The management must put aside personal considerations and put company objectives firstly. Therefore the interests of goals of the organization must prevail over the personal interests of individuals.
- **Remuneration** - Workers must be paid sufficiently as this is a chief motivation of employees and therefore greatly influences productivity. The quantum and methodsof

remuneration payable should be fair, reasonable and rewarding of effort.

- **The Degree of Centralization** - The amount of power wielded with the central management depends on company size. Centralization implies the concentration of decision making authority at the top management.

- **Line of Authority/Scalar Chain** - This refers to the chain of superiors ranging from top management to the lowest rank. The principle suggests that there should be a clear line of authority from top to bottom linking all managers at all levels.

Order - Social order ensures the fluid operation of a company through authoritative procedure. Material order ensures safety and efficiency in the workplace. Ordershould be acceptable and under the rules of the company.

- **Equity** - Employees must be treated kindly, and justice must be enacted to ensure a just workplace. Managers should be fair and impartial when dealing with employees, giving equal attention towards all employees.

- **Stability of Tenure of Personnel** - Stability of tenure of personnel is a principle stating that in order for an organization to run smoothly, personnel (especially managerial personnel) must not frequently enter and exit the organization.

- **Initiative** - Using the initiative of employees can add strength and new ideas to an organization. Initiative on the part of employees is a source of strength for organization because it provides new and better ideas. Employees are likely to take greater interest in the functioning of the organization.

Esprit de Corps/Team Spirit - This refers to the need of managers to ensure and develop morale in the workplace; individually and communally. Team spirit helps develop an atmosphere of mutual trust and understanding. Team spirit helps to finish the task on time

MANAGEMENT CONTROL

The following are common types of management control.

- Structures. Organizational structures such as

  authority, roles, accountability, responsibility and separation of concerns.

- Objectives

- Performance Management.

- Task Assignment
- Setting Expectations
- Supervision.
- Measurements
- Monitoring

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Project Management is the discipline of defining and achieving targets while optimizing the use of resources(time, money, people, materials, energy, space, etc) over the course of a project(a set of activities of finite duration).

Why is project management important?

- Large amounts of money are spent on ICT (*Information and communications technology)*
- e.g. UK government in 2003-4 spent £2.3 billions on contracts for ICT and only £1.4billionson road building
- Project often fail–Standish Group claim only a third of ICT projects are successful. 82% were late and 43%exceeded their budget.
- Poor project management a major factor in these failures
- 1billion=100crore

Software Development Life Cycle:

The software development life-cycle is a methodology that also forms the framework for planning and controlling the creation, testing, and delivery of an information system.

The software development life-cycle concept acts as the foundation for multiple different development and delivery methodologies, such as the Hardware development life-cycle and Software development life-cycle. While Hardware development life-cycles deal specifically with hardware and Software development life-cycles deal specifically with software, a Systems development life-cycle differs from each in that it can deal with any combination of hardware and software, as a system can be composed of hardware only, software only, or a combination of both.

Four Project Dimensions

- People
- Process
- Product
- Technology

The5VariablesofProjectControl

1. Time - amount of time required to complete the project.

2. Cost-calculated from the time variable

3. Quality-The amount of time put into individual tasks determines the overall quality of the project.

4. Scope-Requirements specified for the end result.

5. Risk –Potential points of failure.

IMPORTANCE OF SOFTWARE PROJECT MANAGEMENT

Software is said to be an intangible product. Software development is a kind of all new stream in world business and there's very little experience in building software products. Most software products are tailor made to fit client's requirements. The most important is that the underlying technology changes and advances so frequently and rapidly that experience of one product may not be applied to the other one. All such business and environmental constraints bring risk in software development hence it is essential to manages of softtware projects efficiently.

Trade– off triangle:

The triangle illustrates the relationship between three primary forces in a project. Time is the available time to deliver the project, cost represents the amount of money or resources available and quality represents the fit-to-purpose that the project must achieve to be a success.

The normal situation is that one of these factors is fixed and the other two will vary in inverse proportion to each other. For example time is often fixed and the quality of the end product will depend on the cost or resources available. Similarly if you are working to a fixed level of quality then the cost of the project will largely be dependent upon the time available

(if you have longer you can do it with fewer people).

Project definition:

What is a project?

Some dictionary definitions:

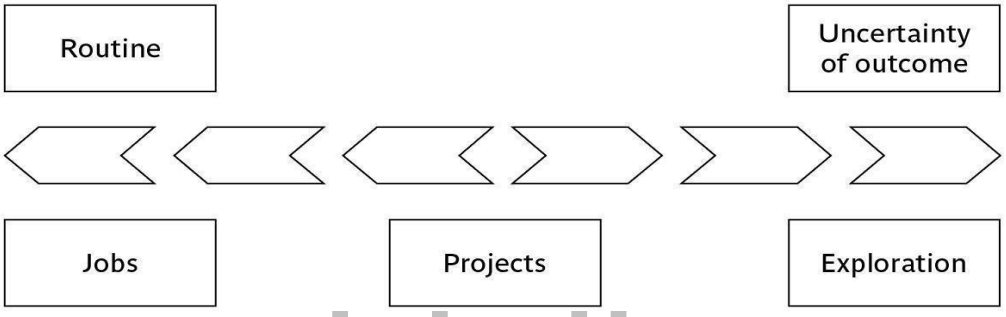
"A specific plan or design" "A planned undertaking"

"A large undertaking e.g. a public works scheme"

Longmans dictionary

Key points above are planning and size of task

Jobs versus projects



'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!

- Jobs-Very Little Uncertainty
- Task is well defined and there is little uncertainty.
- Software Process Management vs Software Project Management

Projects

- Projects seem to come somewhere between these two extremes. There are usually **well**-defined hoped-for outcomes but there are risks and uncertainties about achieving those outcomes.
- Asoftwareprojectcanbedefinedasaplannedactivitythatdescribeshowwearegoingto carryout a task before we start.
- Itisaplannedactivityaboutdevelopingasoftwarebeforeuactuallydesignandimplementit.

Examples of Software Projects:

Putting a robot vehicle on Mars to search for signs of life.

- Relative novelty of the project
- International nature of the project

- Successful achievement of the project from engineering point of view is the safe landing of the robot, not the discovery of signs of life.

Characteristics of projects

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

- Non-routine
- Planned
- Aiming at a specific target
- Carried out for a customer
- Carried out by a temporary workgroup
- Involving several specialism
- Made up of several different phases
- Constrained by time and resources
- Large and/or complex

Are *software* projects really different from other projects? Not really…but

- Invisibility

–Bridge construction

- Complexity
- Conformity(Cement &steel physical law vs conform to human mind)
- Flexibility(Easy to change is strength)

Make software more problematic to build than other engineered arte facts.

PROJECT PORTFOLIO MANAGEMENT

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.

Objectives of Project Portfolio Management

When it comes to the objectives, the following factors need to be outlined.

 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

Project portfolio management ensures that projects have a set of objectives, which when followed brings about the expected results. Furthermore, PPM can be used to bring out changes to the organization which will create a flexible structure within the organization in terms of project execution. In this manner, the change will not be a threat for the organization.

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.

 Management's perspectives with regards to project portfolio management is seen as an 'initiative towards higher return'. Therefore, this will not be considered to be a detrimental factor to work.

 Identification of dependencies is easier to identify. This will eliminate some inefficiency from occurring.

 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 responsibilities of IT is focused on part of the business rather than scattering across several.

The mix of both IT and business projects are seen as contributors to achieving the organizational objectives.

Project Portfolio Management Tools

There are many tools that can be used for project portfolio management. Following are the essential features of those tools:

- A systematic method of evaluation of projects.
- Resources need to be planned.
- Costs and the benefits need to be kept on track.
- Undertaking cost benefit analysis.
- Progress reports from time to time.
- Access to information as and when its required.
- Communication mechanism, which will take through the information necessary.

Techniques Used to Measure PPM

There are various techniques, which are used to measure or support PPM process from time to time. However, there are three types of techniques, which are widely used:

- Heuristic model.
- Scoring technique.
- Visual or Mapping techniques.

The use of such techniques should be done in consideration of the project and organizational objectives, resource skills and the infrastructure for project management.

Why Project Managers to Focus on PPM?

PPM is crucial for a project to be successful as well as to identify any back lags if it were to occur. Project Managers often face a difficult situation arising from lack of planning and sometimes this may lead to a project withdrawal.

It's the primary responsibility of project managers to ensure that there are enough available resources for the projects that an organization undertakes. Proper resources will ensure that the project is completed within the set timeline and delivered without a compromise on quality.

Project managers also may wish to work on projects, which are given its utmost priority and value to an organization. This will enable project managers to deliver and receive support for quality projects that they have undertaken. PPM ensures that these objectives of the project management will be met.

The Five Question Model

The five question model of project portfolio management illustrates that the project manager is required to answer five essential questions before the inception as well as during the project execution

Same as with financial portfolio management, the project portfolio management also has its own set of objectives. These objectives are designed to bring about expected results through coherent team players.

Project portfolio management provides an overview of all the projects that an organization isundertaking or is considering. The concerns of project portfolio management include:

- Identifying which project proposals are worth implementation
- Assessing the amount of risk of failure that a potential project has
- Deciding how to share limited resources, including staff time and finance, between projects

The three key aspects of project portfolio management are

- Portfolio Definition
- Portfolio Management
- Portfolio Optimization

COST BENEFIT EVALUATION TECHNOLOGY

The Cost Benefit Evaluation techniques are

- Net profit
- Payback period
- Return on Investment
- Net Present Value
- Internal Rate of Return

Net Profit

- The difference between the total costs and the total income over the life of the project iscalculated as net profit.
- Net profits do not involve the timing of the cash flows. When there are many projects, the net profit of preferable projects is done on selection criteria.
- Some projects incomes are returned only towards the end of the project. This is a majordisadvantage which means that the investment must be funded for longer time.
- Estimates in distant future are less reliable than the short-term estimates which are morepreferable.

Payback Period

- The time taken to break even or pay back the initial investment is the payback period. The project with the shortest payback period will be taken based on organizations that wish to minimize the time limit.
- The payback period is simple to calculate but sensitive to forecasting errors.
- The limitation of the payback period is that it ignores the overall profitability of theproject.

Return on Investment

- The accounting rate of return or the return on investment compares the net profitability to the investment required.
- Return on Investment (ROI) is calculated using the given formulae;

$$ROI = \frac{\textbf{average annual profit}}{total\ investment}\ ROI = \frac{\textbf{average annual profit}}{total\ investment}\ \text{X } 100$$

- The ROI provides simple, easy to calculate the measure of return on capital.

Eg: The net profit of a project id Rs.30,000 and the total investment if Rs.100,000.

Calculate the ROI if the total period is taken as 3 years.

$$ROI = \frac{\textbf{average annual profit}}{total\ investment}\ ROI = \frac{\textbf{average annual profit}}{total\ investment}\ \text{X } 100$$

= 30,000 x 1 /3X 100 = 100,000

= 10%

- The limitations of ROI is that it takes no account of the timing of the cash flows and does not bother about the compound interest.

Net Present Value

- Net present value is a project evaluation technique that is determined by theprofitability of the project and the timing of the cash flows produced.
- The annual rate of return with respect to discounted future earnings is termed as the discount rate.
- The net present value of any future cash flow is calculated by the formulae:Present value = value in year t / $(1+r)^t$

Where 'r' denotes the discount rate expressed as a decimal value,'t' represents the number of years of future cash flows.

- Net present value can also be calculated by multiplying the cash flow by the appropriate discount factor.
- NPV for a project is obtained by summing the discounted values and discounting each cash flows.
- The discount rates must be standard and it should reflect the interest rates as nominal with similar projects which is uncertain with NPV method.
- Using NPV, the measure of profitability of comparable projects is not directly concerned with earnings from other investments which are quoted as a percentage interest rate.

Internal Rate of Return

- The limitation of NPV is overcome by the internal rate of return method. This method provides a profitability measure as a percentage return that is directly compared with interest rates.
- The percentage discount rate which produces an NPV of zero is calculated by IRR.
- A spreadsheet or a small computer program can be used to calculate the IRR is a convenient and useful measure of value of a project.
- A project with an IR greater than the current interest rates provides better return ratethan lending from a bank.
- The limitation of IRR is that it does not indicate the absolute size of the return value.
- A total evaluation takes into account the problems of cash flow funding where as a project's IRR indicates that the profitable project future earnings are less reliable than investing with a bank.

Risk Evaluation

- Risk is associated with almost every project. Risk can become an important factor when the project is not able to meet its objectives.
- Every possible risk must be identified, analyzed and minimized during the development of the software system.

Risk Identification

- Every project evaluation involves risk handling issues.
- All possible risks are identified and must be quantified with their potential measures of evaluation.
- A project risk matrix can be implemented in creating a checklist of all possible risks and classify them based on their relative importance.
- The risk matrix contains values of high, medium and low based on their likelihood.
- Some factors classified in the risk project matrix contains, delivery of software, development budget exceeded limit, estimation of maintenance costs, response time targets and so on.

Risk Ranking

- Based on the risk identified, ranking can be established for projects.
- Evaluating projects based on the risk project matrix gives a clear picture of how to rank the different risks that occurs in projects.
- Risk ranking involves giving scores to projects based on priorities defined for each risk in the project.

NPV and Risk

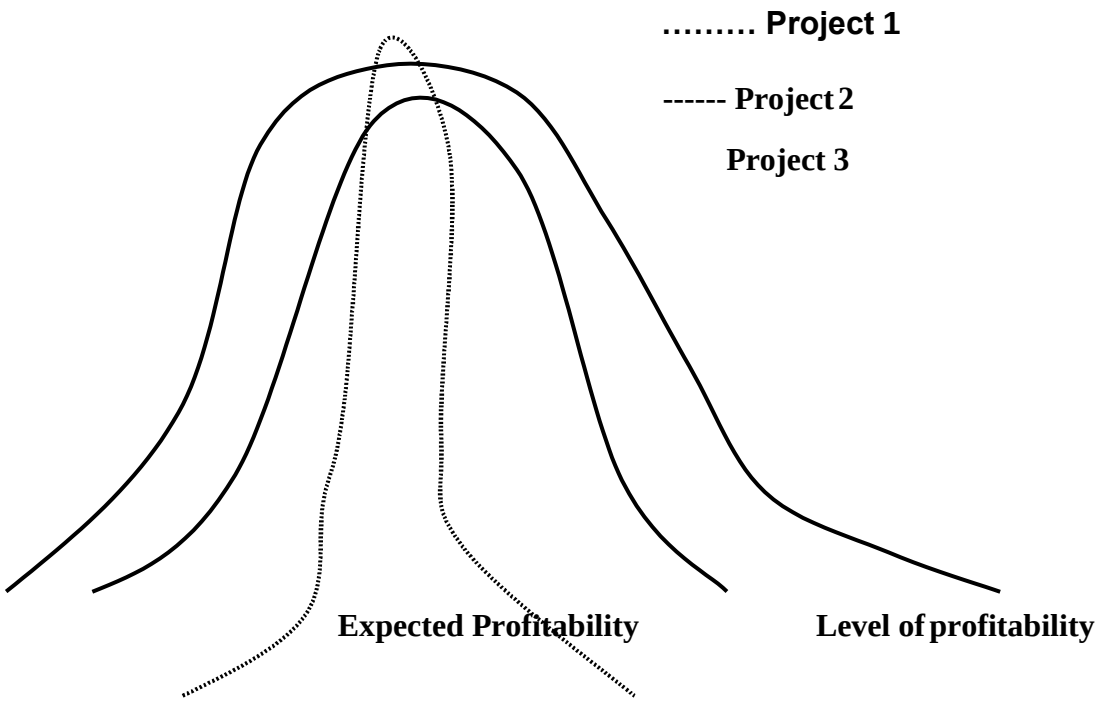
- Risky projects always have a higher discount rate for the net present value calculation.
- The risk level may be very high for a specific project due to rise in NPV value. So based on risk scores, projects are classified as high, medium and low level.
- It is better to have an additional risk premium factor to have an consistent method in developing the project.
- Discounted cash flow techniques can be used to evaluate the net present value of future cash flow taken into account the interest rates and uncertainty.

Risk in Cost benefit analysis

- Cost-benefit analysis focuses on the estimated cost defined for the project compared with the actual costs incurred in the development process.
- Evaluation of risk involves the possible outcomes of the project by estimating the probability of occurring.
- A group of cash flow forecasts associated with each probability of occurring can be defined and the value summarizes the cost or benefit of each possible outcome weighted with its relative probability.
- Basically, cost-benefit analysis is done for evaluation of larger projects which are subject to uncertainty.
- It is most appropriate to evaluate a portfolio of projects to determine the overall profitability.

Risk Profile Analysis

- Risk profiles are constructed using sensitivity analysis which involves the sensitivity factors that affect the project costs or benefits.
- For example, the original estimate of a project was calculated with plus or minus 5% of risk, then calculating the expected costs and benefits for each of the estimating factor results in evaluating the sensitivity of the project.
- Sensitivity analysis identifies the factors that yields a success to the project and decide about whether to carry on with the project or lay off.
- The sensitivity analysis takes into account every risk factor, and evaluates on the possible chances of a particular outcome of the project.
- Monte Carlo simulation tool is used to find out the number of possible chances of specific project.
- A sample risk analysis profile is depicted in the figure below:
- Consider three projects 1, 2 and 3, the figure describes that project 1 is very far from the expected value compared to project 2. Project 2 exhibits a larger variance where as project 3 represent a skewed distribution. Project 3 can attain the profitability than expected but it can go worse too.



A Risk Profile Analysis

Risk handling using Decision trees

- It is better to reject projects than working with risky ones.
- Decision trees is a tool which provides evaluation of project's expected outcomes and choosing between the alternative strategies.

Any decision that is made will have a greater impact on the future profitability of the project.

- The analysis of a decision tree consists of evaluating the expected benefit of takingeach path from a decision point.
- The expected value of each path is determined by the sum of the value of eachpossible outcome multiplied by its probability of occurrence.
- The figure illustrates the use of decision tree of when to extend the project or replacethe existing system based on the NPV values defined.
- Decision tress are more advantageous because it will give a precise idea of modelingand analyzing the problems in the project.

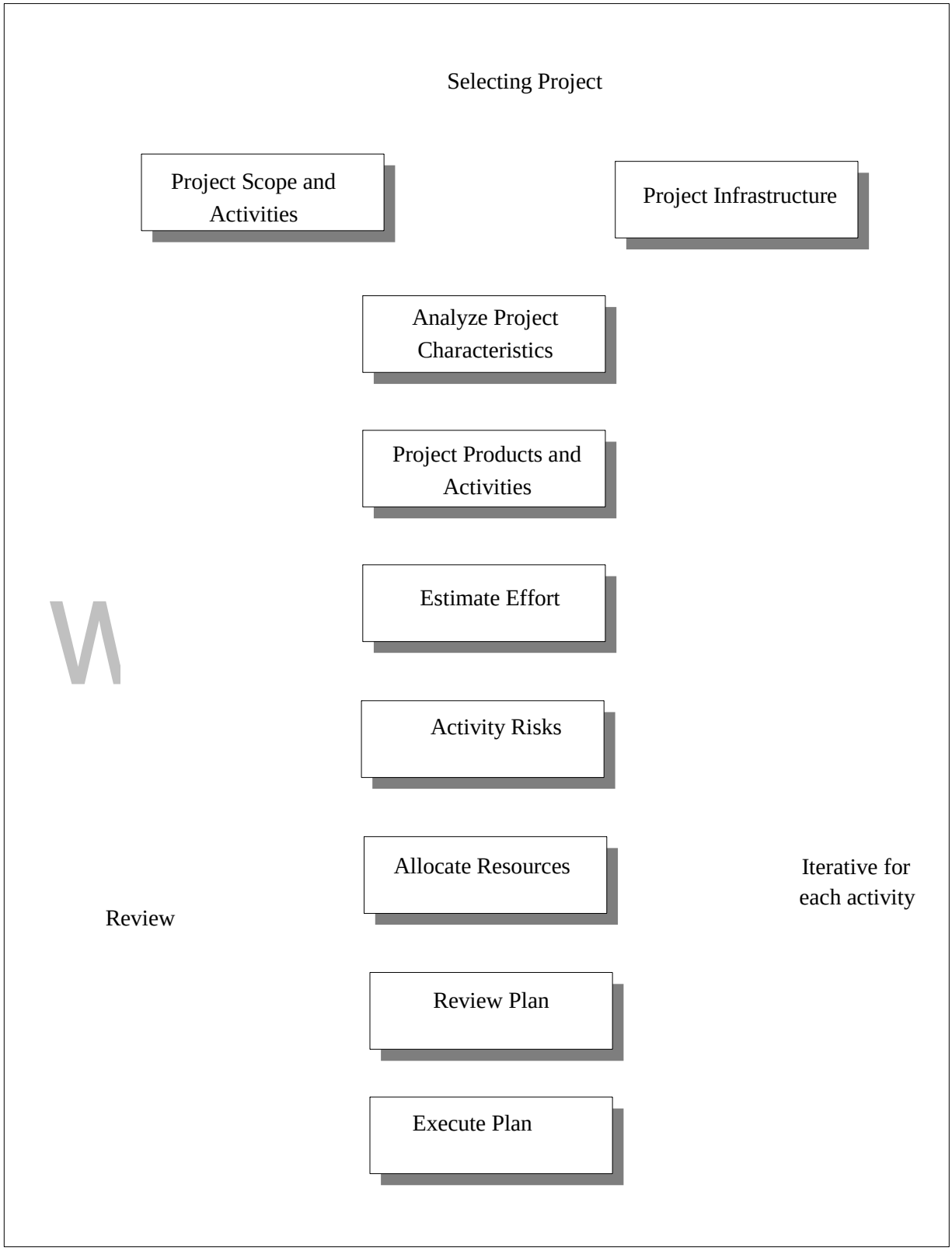
STEPWISE PROJECT PLANNING

Outline of Step Wise Project Planning

The framework of basic steps in project planning illustrates the various activities involved in the development process.

An outline of Step Wise planning is listed below:

- Selecting project
- Project scope & objectives
- Project infrastructure
- Analyze project characteristics
- Project products and activities
- Estimation effort
- Activity risks
- Allocate resources
- Review plan
- Execute plan


Selecting Project
Project Scope and Activities
Project Infrastructure
Analyze Project Characteristics
Project Products and Activities
Estimate Effort
Activity Risks
Allocate Resources
Review Plan
Execute Plan
Review
Iterative for each activity

Step 0: Selecting Project

- This is the initial step which starts well outside the project planning process.
- Feasibility study of the project helps in choosing the appropriate one.
- Strategic planning process helps in evaluating the metrics of selecting the project.
- Different methodologies are inevitable, stemming directly from the questions of what constitutes a methodology and what are a methodology's underlying principles.
- Projects differ according to size, composition, priorities, and criticality.
- The people on a project have different biases based on their experiences, principles, and fears.
- These issues combine so that, what is optimal differs across projects.
- Projects are undertaken to produce a product or a service for various reasons.
- This includes factors like market share, financial benefits, return on investment, customer retention and loyalty, and public perceptions.
- Organizations might receive several projects at a time. They have to select the best among the received projects request.
- They make decisions based on the best information they have about a particular project at a given point of time when selecting the project.

Step 1: Project Scope and Objectives

- Every stakeholder involved in the project must agree on the objectives defined in determining the success of the project.
- Scope statements may take many forms depending on the type of project being implemented and the nature of the organization.
- The scope statement details the project deliverables and describes the major objectives.
- The objectives should include measurable success criteria for the project.
- The Scope Statement should be written before the Statement of work and it should capture, in very broad terms, the product of the project, for example, *"developing a software based system to capture and track orders for software."*

- The Scope Statement should also include the list of users using the product, as well as the features in the resulting product.
- As a baseline scope statements should contain:
  - The project name
  - The project charter
  - The project owner, sponsors, and stakeholders
  - The problem statement
  - The project goals and objectives
  - The project requirements
  - The project deliverables
  - The project non-goals
  - Milestones
  - Cost estimates

- In more project oriented organizations the scope statement may also contain these and other sections:
  - Project Scope Management Plan
  - Approved change requests
  - Project assumptions and risks
  - Project acceptance criteria
- The project objectives are identified and practical measures are analyzed in achieving them
- A project authority must be identified to have an overall authority over theproject.
- Identify different stakeholders involved in the development of the project.
- Changes in the objectives must be in a controlled manner.
- Interaction and communication among all parties must be straight forward.

Step 2: Project Infrastructure

- Project Infrastructure refers to the organizational structure, processes, tools, techniques and training an organisation puts in place to make projects more successful.

- Organisational Structure – Organisational structure including such support mechanisms as project management office, project recruiting function, financial
- monitoring area etc. It also covers lines of communication and escalation.
- Processes – Typically methodologies, checklists and guidelines
- Tools – Software and templates
- Techniques – Repeatable processes such as kick off meetings, PIRs, analysis techniques, etc.
- Training – Formal and informal training and reference documentation
- Organization must give priorities for multiple projects to be carried out.
- Strategic decisions must be documented within the strategic plan in identifying the relationship between multiple projects.
- Change control must be implemented without affecting the original objectives.
- Configuration and procedural standards are defined for quality checks at regular intervals of the SDLC process and documented in separate manual.
- Measurement programme determines the control policy and monitors the progress of the project.
- Project manager must have an overall control of any project planning and control standards adopted.
- Project leader takes the responsibility of building the project team as an organized, well-built and effective one yielding excellent results.
- Team members must work together as a team and resolve conflicts.

Step 3: Analyze Project Characteristics

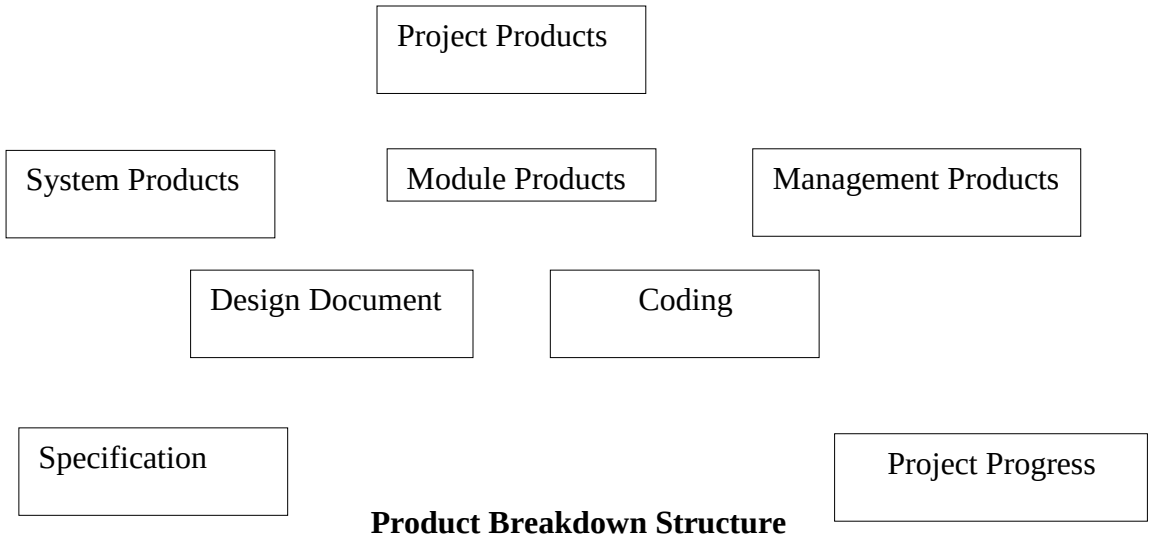
- The project is categorized as either product-driven or an objective-driven.
- A project has several characteristics:
  * Projects are unique.
  * Projects are temporary in nature and have a definite beginning and ending date.
  * Projects are completed when the project goals are achieved or it's determined the project is no longer viable.

* A successful project is one that meets or exceeds the expectations of your stakeholders.

- As the system is developed, the product is driven out of the defined objectives.
- The project must be analyzed based on its quality requirements.
- Projects are prone to higher risk which needs to be handled without affecting the product created.
- In implementing the product, user requirements are given due importance.
- Appropriate methodology and SDLC process must be chosen to suit the current product.
- Review the overall resource estimates.

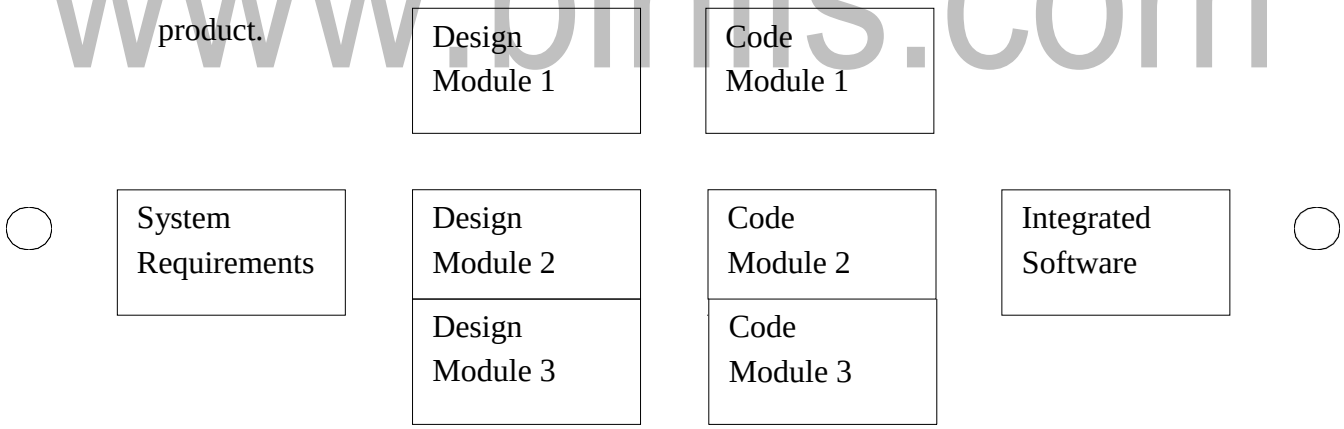
Step 4: Project Products and Activities

- Identify the project deliverables i.e. the end product that has to been given over to the client.
- Some products are identified as intermediate products during the creation of deliverables.
- Project products can be System products, module products or management products.
- Technical products include training materials and operating instructions in managing the quality of the project.
- Describe the project products into components and sub-components related to individual modules in each step.
- Every activity must be carried out for each stage of the development process.
- Management products include progress of the project that is developed.
- Product descriptions contain the identity, purpose, derivation, composition, form, relevant standard and the quality criteria that apply.
- Not all products are independent. Some products depend on other products for their creation.



Product Breakdown Structure

- Product flow diagram represents the flow of the product being developed.
- Product instances must be recognized when a product is related to more than one product.



Sample Activity Network

- An activity network is created for generating the product that depends on another product describing every task associated with it.
- Sequencing of activities minimizes the overall duration for the project.
- For a complex project, the entire project can be divided into stages and checkpoints can be formulated at each specific stage for compatibility.
- Milestones represents the completion of important stages of the project.

Step 5: Estimating Effort

- The effort estimation for the staff required, the probable duration and the non-staff resources needed for every activity is determined.
- These estimates depend on the type of the activity.
- Effort is the amount of work that has to be done.
- Software development efforts estimation is the process of predicting the most realistic use of effort required to develop or maintain software based on incomplete, uncertain and/or noisy input.
- Effort estimates may be used as input to project plans, iteration plans, budgets, investment analyses, pricing processes and bidding rounds.
- Elapsed time is the time between the start and end of a task.
- With all the activities defined, the overall duration of the project can be calculated using the activity network.

- For longer activities it will be difficult to control the project over estimating factors.
- There are many ways of categorizing estimation approaches. The top level categories are the following:
  - Expert estimation: The quantification step, i.e., the step where the estimateis produced based on judgmental processes.
  - Formal estimation model: The quantification step is based on mechanicalprocesses, e.g., the use of a formula derived from historical data.
  - Combination-based estimation: The quantification step is based on a judgmental or mechanical combination of estimates from different sources.
- The uncertainty of an effort estimate can be described through a prediction interval (PI). An effort PI is based on a stated certainty level and contains a minimum and a maximum effort value.
- The most common measures of the average estimation accuracy is the MMRE (Mean Magnitude of Relative Error), where MRE is defined as:

MRE = |actual effort − estimated effort| / |actual effort|

- Psychological factors potentially explaining the strong tendency towards over-optimisticeffort estimates that need to be dealt with to increase accuracy of effort estimates.
- These factors are essential even when using formal estimation models, because much ofthe input to these models is judgment-based.
- Factors that have been demonstrated to be important are: Wishful thinking, anchoring,planning fallacy and cognitive dissonance.
- The psychological factors found in work by Jorgensen and Grimstad describes,
  - It's easy to estimate what you know.
  - It's hard to estimate what you know you don't know.
  - It's very hard to estimate things that you don't know you don't know.

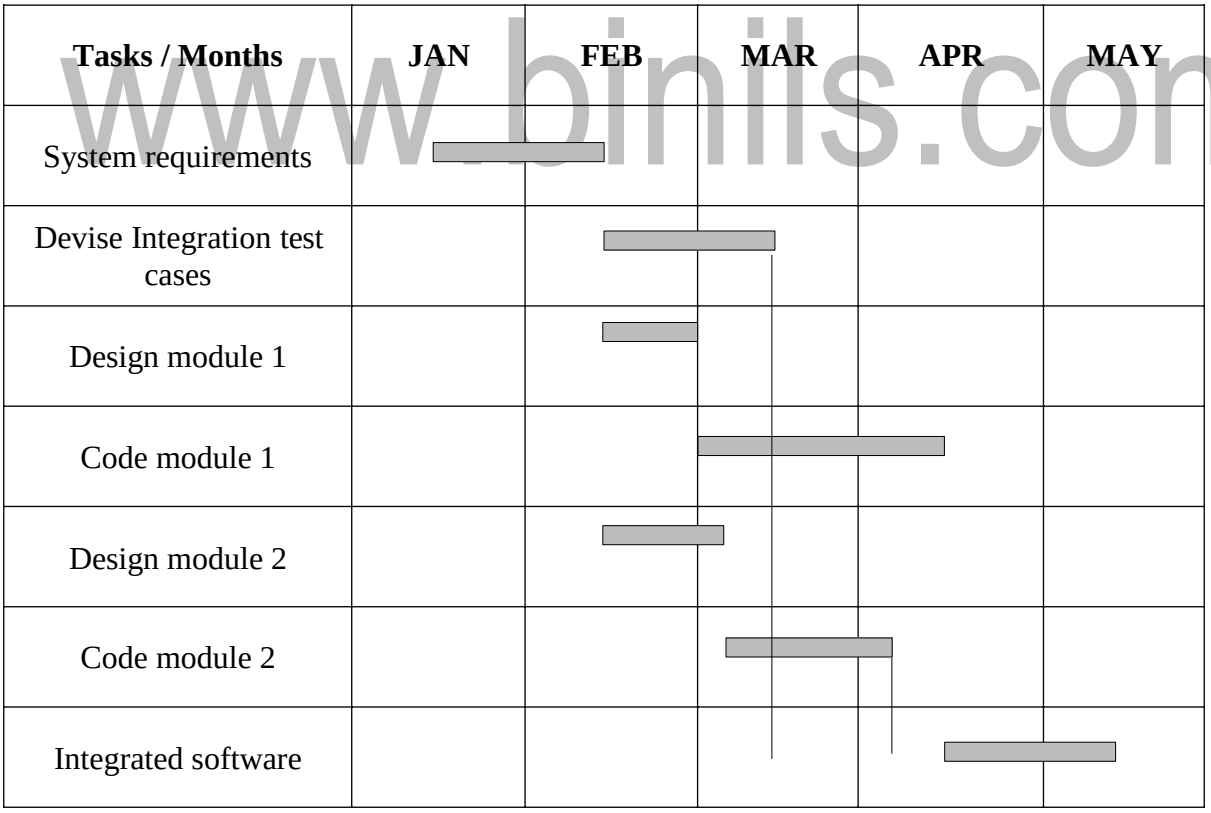
Step 6: Identify Activity Risks

- Activity based risks are identified for every activity based on number of assumptions.
- Risk planning reduces the impact of identified risks.
- To materialize the risk, contingency plans are specified.
- New activities can reduce risks to a certain extent when there is change in plans.
- Risks fall into three broad categories — controllable known, uncontrollable known and unknown.
- The former two, are those risks happen before they can determine how to manage them. This is done using root cause analysis.
- As the name implies its goal is to look for the root cause on the problem and solve it at that point.
- The four ways of handling risk are:
  - **Avoidance** - Take action to avoid the risk
  - **Mitigation** - Define actions to take when the risk occurs
  - **Transfer** - Have someone else handle the risk i.e. insurance
  - **Acceptance** - Identify the risk as acceptable and let it happen.

- Determining which option to chose is primarily financial, but schedule and manpower may be involved.
- As a tool, a number of "checklist" opinions for looking at each of these options.
- Contingency planning is briefly discussed for scope, resource and schedule.

Step 7: Allocate Resources

- Resource allocation is used to assign the available resources in an economic way. It is part of resource management. In project management, resource allocation is the scheduling of activities and the resources required by those activities while taking into consideration both the resource availability and the project time.
- Staff needed and available are identified for each activity and allocated their respective tasks.



Gantt chart showing staff tasks

- Staff priority list is generated based on the task allotted to them because some staffs are used for more than one task.

- A Gantt chart pictorially represents when activities have to take place and which one has to be executed at the same time.
- The chart represents when staff will be carrying out the tasks in each month. It also shows staff involved in more than one task.
- When allocating resources the constraints associated is estimated and included in the overall cost.

Step 8: Review Plan

- When a task is completed it leads to the quality review. These quality checks have to be passed before the activity is completely signed-off.
- Every plan has to be documented and all stakeholders must have agreed to all constraints and understand the project.
- There are some steps involved in project plan review.

- **Define the problem:** This activity provides the background for decisions about the scope and focus of the Project Review. Here are some simple questions the Project Review Team can ask themselves before creating a plan for the project. Use our Planning Tool to capture the background on your project.
  - What, if any, review work has already been done?
  - What is the problem we are trying to solve?
  - What would success look like?
  - Scope the Project. How big was it? How long did it take? How many people were involved?
  - What is the investment the team would like to make?
- **Determine the focus**: The focus of the Project Review is the question that the team will ask themselves as they investigate the events that occurred during the project. This is the fundamental question that will guide the decisions that the team will make while planning the Project Review. It is always stated as aquestion. A commonly used question that project teams ask is:
  - What are the root causes of events that determined or impacted resources, schedule, or quality?

- **Select the appropriate tools**: Now that the scope, the goal and the problem are known, the data set needed for the project review are identified along with the various activities that will used.
- **Identify the participants**: The Project Review Leadership Team guides the Postmortem effort. As a group they determine the focus if the investigation, select the tools that will be used, review the output from each step, decide who should participate in each activity, and are responsible for reporting lessons learned and recommendations for action. The Project Review Team usually consists of the movers and shakers that drove the project or event. They work together to manage
- The Project Review process. The team should consist of folks most intimate with the project including any of the following representatives:
  - ❖ Project Managers
  - ❖ Product Managers
  - ❖ Development Leads
  - ❖ Quality Leads
  - ❖ Content Experts
  - ❖ Customer Support Leads
  - ❖ Management

- **Document the review plan**: The project review template can be used so that everyone responsible for implementation has a copy of the plan.

Step 9: Execute Plan

- ➢ Finally, the execution of the project is drawn with each specified activity as it is approached.
- ➢ Detailed planning of later stages is necessary because more information will be available than the start stage.
- ➢ Project planning and execution becomes an iterative process where as each activity which is to be carried out approaches, they should be reviewed in detail.

STRATEGIC PROGRAM MANAGEMENT

Programme Management Definition

- A classical definition of programme management by D.C.Ferns, "**a group of** projects thatare maintained in a coordinated way to gain benefits that would not be possible where the projects to be managed independently".

Different forms of Programme Management

There are various forms of programme management exists. They are

- Strategic programmes
- Business cycle programmes
- Infrastructure programmes
- Research and development programmes

Strategic Programmes

- Portfolio programme models define a strategic domain process within the organization.
- Group of projects can lead to single strategy.
- Organizations can be grouped together and every activity associated with each distinct project can be controlled and coordinated manner as a programme.

Business Cycle Programmes

- A project portfolio is a group of projects carried out under the sponsorship or management of an organization.
- Prioritizing projects must be based on decisions made by the project manager to handle them in different situations.
- If one project needs more resources than expected, expenses can be incorporated from other projects giving preference to the former one.
- Importance must be given to individual projects inside the portfolio.

Infrastructure Programmes

- Organizations differ in the way they exist. Some of them have distinctdepartments while others have integrated systems.
- Each department might be unique in handling different information having distinct databases defined.

- A uniform infrastructure will allow sharing of applications between various departments which would help in the development process.

Research and Development Programmes

- Innovative companies develop new products that are too risky. If the new product fails in the market, it will be difficult to handle the situation.
- On the other hand, the new product becomes success, then there will be huge reap in the business organization.

Certain development projects results in a good planned project. But projects that are toorisky if successful yields more benefit than the innovative ones.

- A risk involved fluctuates in a innovative project. Research projects leading to new discovery results in technological revolution that affect the market.
- For example, internet and world wide web has helped in adopting innovative and research development programmes.

Strategic Programme Management

- A programme manager must possess these qualities:
  - Managing simultaneous projects inside the portfolio
  - Resources must be well understood
  - Utilization of resources must be attained
  - Optimal usage of specialist staff for specific tasks
- When portfolios of projects contribute to a common objective, it leads to strategic management.
- To have consistent and uniformity of projects, a business objective is defined to coordinate the project at a different level.
- Large organizations typically have a large and complicated organizational structure. For example, government department like OGC (Office of Government Commerce) has defined effective guidelines for the strategic programme development.

Creating a Programme

- The various phases involved in creating a programme are defined as:
  - Creation of programme mandate
  - Programme brief

Vision statement Blueprint of programme

Programme portfolio

Creation of programme mandate

- A programme mandate contains a formal document containing:

New services the programme delivers

- Benefit of organization by new services
- Meeting the corporate goals and other initiatives

- A programme director is nominated within the organization to provide an initial leadership for the programme. The programme director must be from the sponsoring group which has already identified the need for the programme.

Programme brief

- A programme brief defines the feasibility study of the programme. It includes:
  - Preliminary vision statement highlighting the capacity of the organization.
  - Benefits generated from the programme
  - Risks and other issues involved
  - Estimated cost, effort and time limit for completion

Vision statement

- The vision statement describing the sponsoring group with a more detailed planning process.
- To govern the day to day responsibilities a programme manager is appointed from within the project management team for running the programme.
- Programme manager along with the project development team analyzes the vision statement and formulates a refined plan for implementing the process.

Blueprint of programme

- The description of the vision statement and the changes that have been made to the structure and the operations are represented in the blueprint.
- A blueprint must emphasize on:

- Requirement of business models for the new process Staff requirement by the organization
- Resources requirements

- Data and information requirements
- Cost, effort, performance and service level requirements

Programme portfolio

- Initially, a list of projects are created along with is objectives to create a programme portfolio.
- An outline schedule of the entire development process is presented by the sponsoring group with all estimation factors.
- Groups are identified with similar interest and drawn out as a stakeholder map.
- A communication strategy and plan shows the appropriate information flow between stakeholders.

The preliminary plan produces the project portfolio, estimation of costs, expectedbenefits, risks identified and the resources needed