A Course Material on

Software Project Management

By

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QUALITY CERTIFICATE

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being prepared by me and it meets the knowledge requirement of the university curriculum.

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SEAL

TABLE OF CONTENTS			
S.NO	**DATE**	**TOPIC**	**PAGE NO**
UNIT-I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT			
1		Project Definition	4
2		Contract Management	7
3		Activities Covered By Software Project Management	8
4		Overview Of Project Planning	10
5		Stepwise Project Planning	12
UNIT-II PROJECT EVALUATION			
6		Strategic Assessment	21
7		Technical Assessment	22
8		Cost Benefit Analysis	27
9		Cash Flow Forecasting	29
10		Cost Benefit Evaluation Techniques	29
11		Risk Evaluation	32
UNIT-III ACTIVITYPLANNING			
12		Objectives	39
13		Project Schedule	39
14		Sequencing and Scheduling Activities	39
15		Network Planning Models	40
16		Forward Pass	44
17		Backward Pass	46
18		Activity Float	47
19		Shortening Project Duration	47
20		Activity on Arrow Networks	55
21		Risk Management	58
22		Nature Of Risk	59
23		Types Of Risk	59
24		Managing Risk	65
25		Hazard Identification	66
26		Hazard Analysis	67
27		Risk Planning And Control	68
UNIT-IV MONITORINGANDCONTROL			
28		Creating Framework	70
29		Collecting The Data	71
30		Visualizing Progress	73
31		Cost Monitoring	74
32		Earned Value	75
33		Prioritizing Monitoring	80
34		Getting Project Back To Target	80
35		Change Control	81
36		Managing Contracts	83
37		Types Of Contract	83

IT2403 SOFTWAREPROJECTMANAGEMENT 300 3

UNITI INTRODUCTIONTOSOFTWAREPROJECTMANAGEMENT 9

ProjectDefinition–ContractManagement–ActivitiesCoveredBySoftwareProjectManagement–OverviewofProjectPlanning–StepwiseProjectPlanning.

UNITII PROJECT EVALUATION 9

StrategicAssessment–TechnicalAssessment–CostBenefitAnalysis–CashFlow Forecasting–CostBenefitEvaluationTechniques–RiskEvaluation.

UNITIII ACTIVITYPLANNING 9

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network PlanningModels–ForwardPass–BackwardPass–Activity Float–ShorteningProject Duration–ActivityonArrow Networks–RiskManagement–NatureOfRisk–TypesOf Risk–ManagingRisk– HazardIdentification– HazardAnalysis–RiskPlanningAnd Control.

UNITIV MONITORINGANDCONTROL 9

CreatingFramework– Collecting TheData–VisualizingProgress –CostMonitoring–EarnedValue–PriortizingMonitoring–GettingProjectBackToTarget–Change Control–ManagingContracts– Introduction– TypesOfContract–StagesInContract Placement–Typical Terms OfAContract –Contract Management– Acceptance.

UNITV MANAGINGPEOPLEAND ORGANIZINGTEAMS 9

Introduction–UnderstandingBehavior–Organizational Behaviour:ABackground–SelectingTheRightPersonForTheJob–InstructionInTheBestMethods–Motivation –TheOldman–HackmanJobCharacteristicsModel–WorkingInGroups–Becoming ATeam–DecisionMaking–Leadership–OrganizationalStructures– Stress–Health AndSafety–CaseStudies.

TEXT TOTAL=45
BOOK:

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1. Ramesh, Gopalaswamy,"ManagingGlobal Projects", TataMcGrawHill,2001.
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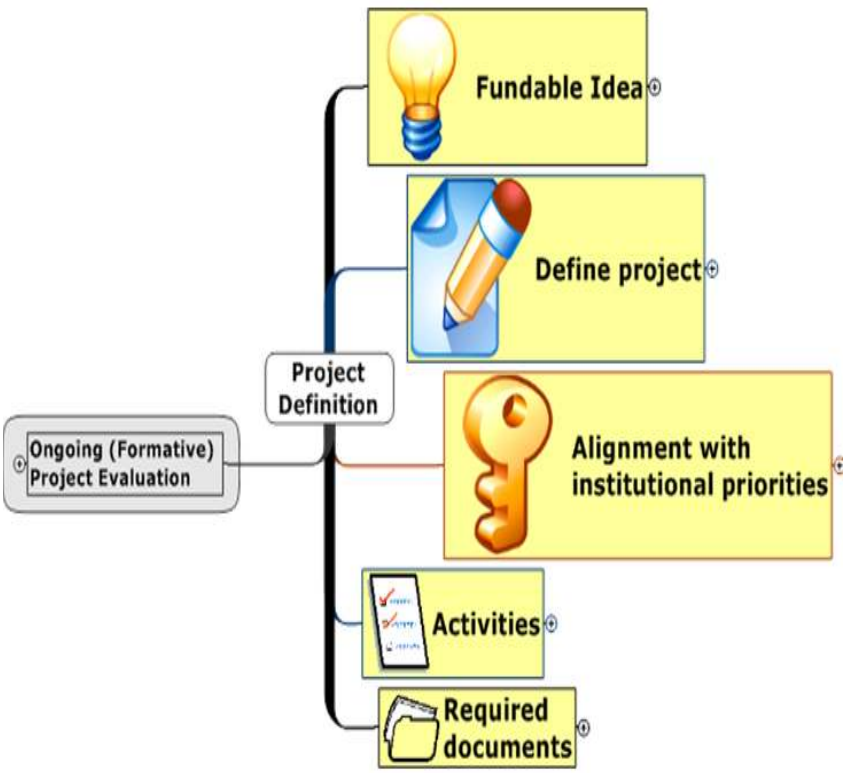
UNITI INTRODUCTIONTOSOFTWAREPROJECTMANAGEMENT

ProjectDefinition–ContractManagement–ActivitiesCoveredBySoftwareProject Management–OverviewOfProjectPlanning– StepwiseProjectPlanning.

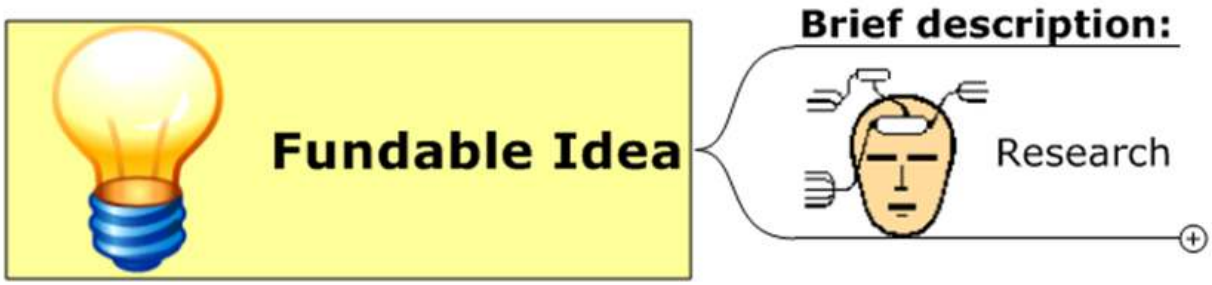
1.What is a Project?

The Triple Constraint of Projects

- On Time, Budget, Quality = Required Scope



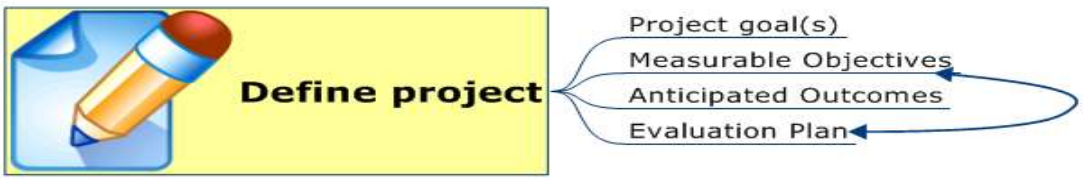
Fundable Idea



Research

- Potential Funding
- Best Practices
- Potential Partners

Define project



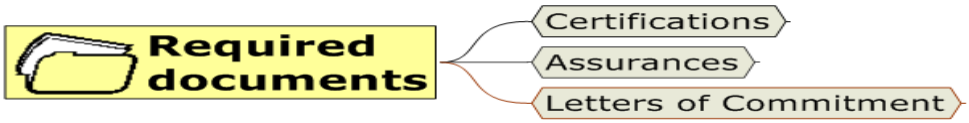
Alignment with institutional priorities

Activities

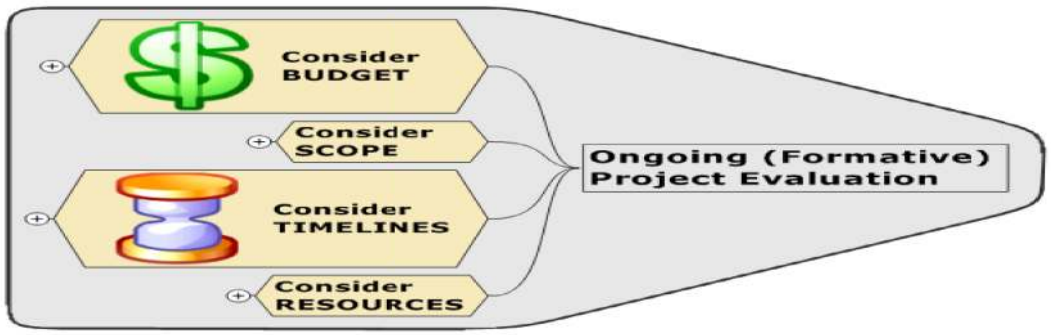
- In support of GOAL
- Realistic and Achievable Objectives
- Identify Resources Required
- Timeline for Implementation
- Criteria for success

- Evaluation Method/Instruments
- Budget Requirements

Required documents



Ongoing (Formative) Project Evaluation



Consider BUDGET

- Going over budget
  - Will result in...
- Having to get more money
- Having to reorganize budget
- Adjusting budget due to scope change
- Adjusting budget due to resources change

- Changing scope
- Increasing scope
- Decreasing scope
- Changing direction

- Extending deadlines
- Hurrying deadlines
- Changing deadlines for certain project components
- Adjusting schedule due to scope change
- Adjusting timelines due to resource change

Consider RESOURCES

- Losing resources
- Having to replace resources
- Running short on resources

Contract management includes negotiating the terms and conditions in contracts and ensuring compliance with the terms and conditions, as well as documenting and agreeing on any changes or amendments that may arise during its implementation or execution.

Common commercial contracts , , , and . Complex contracts are often necessary for construction projects, goods or services that are highly regulated, goods or services with detailed technical specifications, intellectual property (IP) agreements, and international trade.

A study has found that for "42% of enterprises...the top driver for improvements in the management of contracts is the pressure to better assess and mitigate risks" and additionally,"nearly 65% of enterprises report that contract lifecycle management (CLM) has improved exposure to financial and legal risk

A prerequisite requirement for the enforcement of a contract, amongst other things, is the condition that the parties to the contract accept the terms of the claimed contract. Historically, this was most commonly achieved through signature or performance, but in many jurisdictions - especially with the advance of electronic commerce - the forms of acceptance have expanded to include various forms of electronic signature.

2.1 CONTRACTS

Contracts can be of many types, e.g. sales contracts (including leases), agreements.

- A partnership agreement may be a contract which formally establishes the terms of a partnership such that they regard each other as 'partners' in a commercial arrangement. However, such expressions may also be merely Therefore, it might not be thecommon law arrangement of a partnership which by definition creates fiduciary duties and which also has 'joint and several' liabilities.

A Software project is concerned not only with the actual writing of software. In fact, where a software application is bought in 'Off-the-self', there might be no software writing as such. This is still fundamentally a software project because so many of the other elements associated with this type of project are present.

Usually,

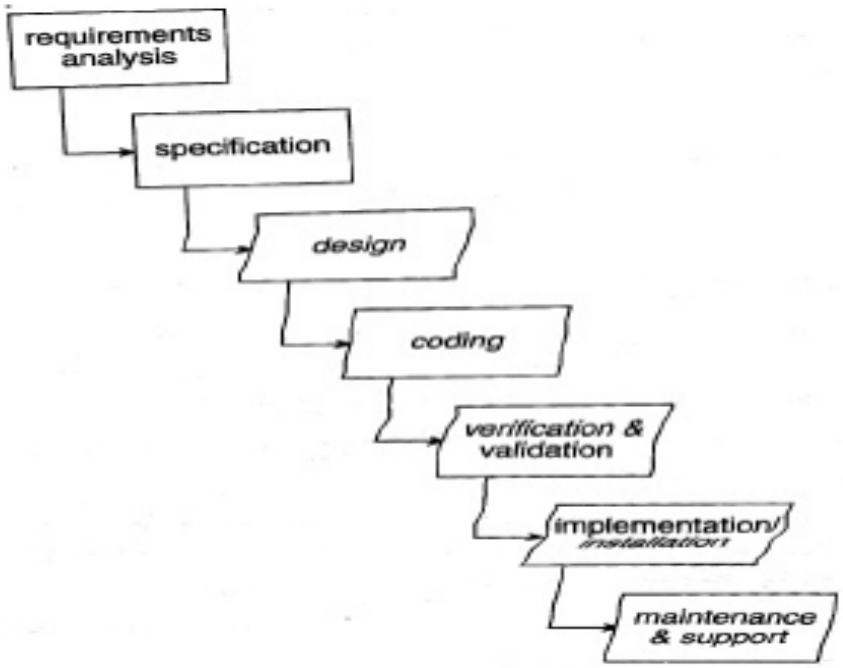
Let us understand what is the mean by 'Feasibility Study'?

- · To establish an outline of what users require
- · To ensure it is feasible to meet their needs · Entirely In part
  - · To record initial impressions of how to meet the requirements
  - · To give management a feel for costs and timescales of project
  - · To provide as much information as possible to project manager for · Estimating
  - · Purchasing and accommodation
  - · To help management decide whether to proceed with the project Planning
  - ·
  - · Continuous activity from initial concept through to system delivery.
- Plans must be regularly revised as new information becomes available
  - · Various different types of plan may be developed to support the main software project plan that is concerned with schedule and budget

3.1Project execution:

- The project can now be executed. Individual projects are likely to differ considerably but a classic project life cycle is shown in fig.Requirementsanalysis .

- This is finding out in detail what the users require of the system that the project is to implement.
- Some work along these lines will almost certainly have been carried out when the project was evaluated but now the original information obtained needs to be updated and supplemented.
- Several different approaches to the users' requirements may be explored.



For example, a small system that satisfies some, but not all, of the users' needs at a low price may be compared to a system with more functions but at a higher price. Specification Detailed documentation of what the proposed system is to do. Design A design that meets the specification has to be drawn
up. This design activity will be in two stages. One will be the external or user design. This lays down what the system is to look like to the users in terms of menus, screen and report layouts and so on. The next stage produces the physical design, which tackles the way in which the data and software procedures
are be structured internally.

3.2 Coding:
This might refer to writing code in a procedural language such as C or Ada, or might refer to the use of a high level application builder. Even where software is not being built from scratch, some modification to the base application might be required to meet the needs of the new application.

3.3 Verification and validation:
Whether software is developed specially for the current application or not, careful testing will be needed to check that the proposed system meets its requirements.

3.4 Implementation/installation:
Some system development practitioners refer to the whole of the project after design as

'implementation' (that is, the implementation of the design) while others insist that the term refers to the installation of the system after the software has been developed. In this case it encompasses such things as setting up data files and system parameters, writing user manuals and training users of the new system.

3.5 Maintenance and support:
Once the system has been implemented there will be a continuing need for the correction of anyerrors that may have crept into the system and for extensions and improvements to the system. Maintenance and support activities may be seen as a series of minor software projects. Inmany environments, most software development is in fact maintenance.

4. Stepwise: an overview of project planning

Planning is the most difficult process in project management This chapter describes a framework of basic steps in project planning. Many different techniques can be used but this chapter tells the overview of the steps and activities in each step of project planning

A major step in project planning is to plan in outline first and then in more detail.

4.1 StepwiseProjectPlanning

Step 0: Select project

Step 1: Identify project scope and objectives

Step 2: Identify project infrastructure

Step 3: Analyze project characteristics

Step 4: Identify project products and activities

Step 5: Estimate effort for each activity.

Step 6: Identify activity risks.

Step 7: Allocate resources

Step 8 Review / Publicize pl\an

Step 9 &10: Execute plan / lower level of planning

Each step of project planning has different activities to perform. Following the description of each step with its activities

4.1.1 Step 0: Select project

This is called step 0 because in a way of project planning, it is outside the main project planning process. Feasibility study suggests us that the project is worthwhile or not.

4.1.2 Step 1: Identify project scope and objectives

The activities in this step ensure that all parties to the project agree on the objectivesand are committed to the success of the project.

Step 1.1: Identify objectives and practical measures of the effectiveness in meeting those objectives

Step 1.2: Establish project authority

Step 1.3: Stakeholders analysis – Identify all stakeholders in the project and their interest.

Step 1.4: Modify objectives in the light of stakeholder analysis.

Step 1.5: Establish method of communication

4.1.3 Step 2: Identify project infrastructure

Projects are rarely carried out in a vacuum. There is usually some kind of infrastructure into which the project must fit. Where the project manager are new to the organization , they must find out the precise nature of this infrastructure.

Step 2.1: Identify relationship between the project and strategic planning

Step 2.2: Identify installation standards and procedures.

Step 2.3: Identify project team organization.

4.1.4 Step 3: Analyze project characteristics.

The general purpose of this part of planning operation is to ensure that the appropriate methods are used for the project.

Step 3.1: Distinguish the project as either objective- product driven

Step 3.2: Analyze other project characteristics (including quality –based ones)

Step 3.3: Identify high level project risks

Step 3.4: Take into account user requirement concerning implementation.

Step 3.5: Select development methodology and life cycle approach.

Step 3.6: Review overall resources estimates

4.1.5 Step 4: Identify project products and activities

The more detailed planning of the individual activities now takes place. The longer term planning is broad and in outline, while the more immediate tasks are planned in some detail.

Step 4.1: Identify and describes project products (ordeliverables)

Step 4.2: Document generic product flows

Step 4.3: Record product instance

Step 4.4: produce ideal activity network

Step 4.5: Modify the ideal to take into account need for stages and checkpoints.

4.1.6 Step 5: Estimate effort for each activity.

Step 5.1: Carry out bottom-up estimates

Step 5.2: Revise plan to create controllable activities.

4.1.7 Step 6: Identify activity risks.

Step 6.1: Identify and quantify activity based risks

Step 6.2: Plan risk reduction and contingency measures where appropriate

Step 6.3: Adjust overall plans and estimates to take account of the risks

4.1.8 Step 7: Allocate resources

Step 7.1: Identify and allocate resources

Step 7.2: Revise plans and estimates to take into account resource constraints

4.1.9Step 8: Review / Publicize plan

Step 8.1: Review quality aspects of the project plan.

Step 8.2: Document plans and obtain agreement.

4.1.10 Step 9 & 10: Execute plan / lower level of planning

Once the project is underway, plans will need to be drawn up in greater detail for each activity as it becomes due. Detailed and lower level of planning of the later stages will need to be delayed because more information will be available nearer the start of the stage.

Project planning is an iterative process. As the time approaches for the particular activities to be carried out they should be re-planned in more detail.

5. StepwiseProjectPlanning

- Step Wise project planning framework
- Preparation of a software project plan
- Planning and scheduling the activities in software project management
- Various approaches towards activity plan

- Various scheduling techniques such as sequencing and CPM

5.1 Aside – When to plan

- Planning is an on-going process of refinement
- Planning at different stages of the project has different emphases and purposes

5.2 Project Vs Activity

- A project is composed of a number of related activities
- A project may start when at least one of its activities is ready to start
- A project will be completed when all of its activities have been completed
- An activity must have a clear start and a clear stop
- An activity should have a duration that can be forecasted
- Some activities may require that other activities are completed before they can begin

5.3 Activity Planning

- A project plan is a schedule of activities indicating the start and stop for each activity
    - Also provide the project and resource schedules
- The start and stop of each activity should be visible and easy to measure
- Each activity should have some ‘deliverables’ for ease of monitoring
- During planning, managers consider:
    - Resource availability
    - Resource allocation
    - Staff responsibility
    - Project Monitoring
    - Cash flow forecasting
    - Re-planning of the project towards the pre-defined goal

5.4 Other Objectives of Activity Planning

- Feasibility assessment
- Resource allocation
- Detailed costing

- Motivation
- Co-ordination

5.5 Different Levels of Plans

- Project Schedule: a plan that shows
    - 1. the dates when each activity should start and stop
    - 2. when and how much of the resources will be required
- Activity Plan: a plan that describes
    - how each activity will be undertaken

5.6 Project Schedule in 4 Stages

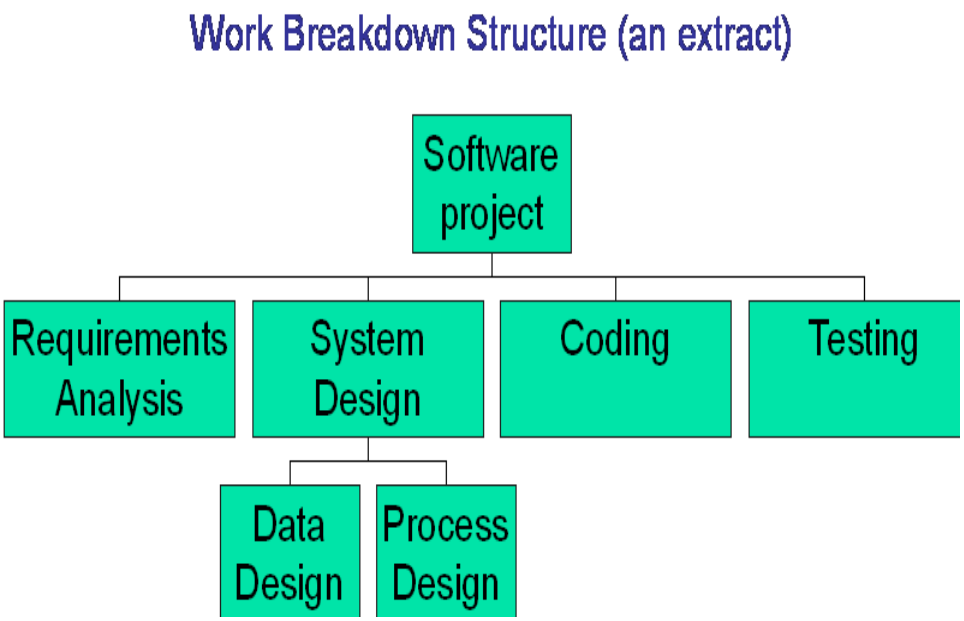
- Ideal Activity Plan
    - An activity plan without any constraints
- Risk consideration for each activity
- Resource consideration for whole project
- Schedule production and publication

Various Approaches towardsIdentifying Activity

- Activity-based approach
- Product-based approach
- Hybrid approach

5.7 Activity-based Approach

- Use *Work Breakdown Structure* (WBS) to generate a task list
- WBS involves
    - identifying the main tasks
    - break each main task down into subtasks
    - The subtasks can further be broken down into lower level tasks.



Advantages

- More likely to obtain a task catalogue that is complete and is composed of non-overlapping tasks
- WBS represents a structure that can be refined as the project proceeds
- The structure already suggests the dependencies among the activities

Disadvantage

- Very likely to miss some activities if an unstructured activity list is used

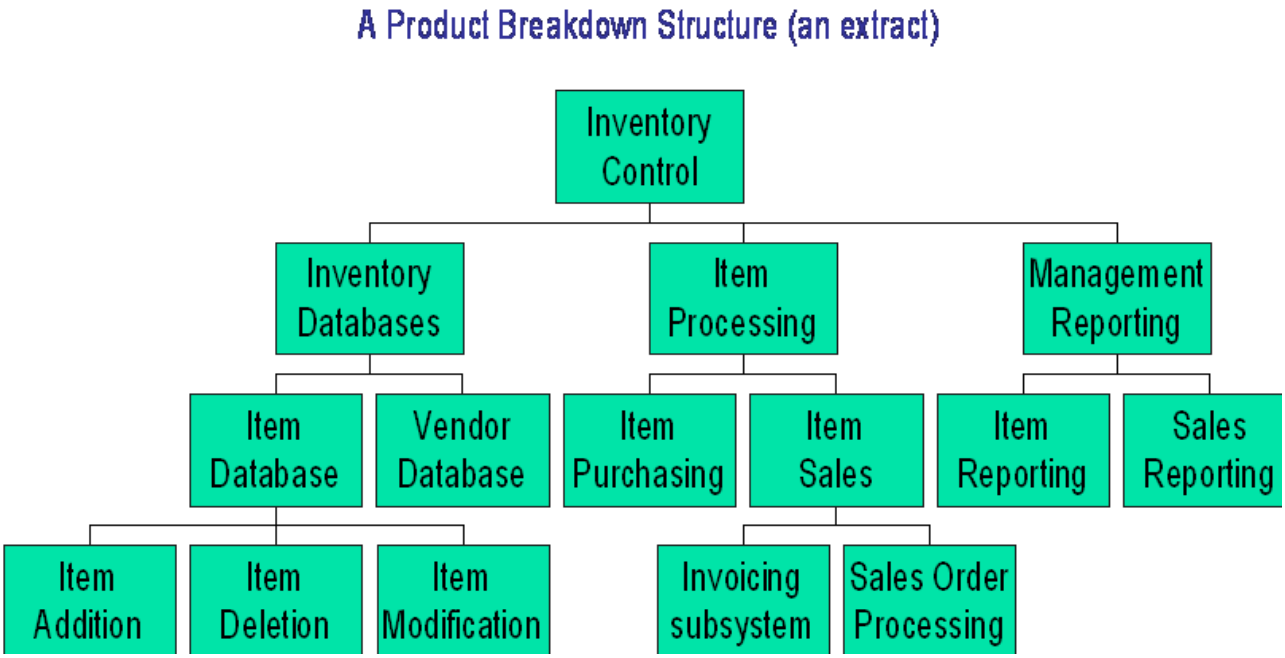
5.8 Product-based Approach

- Product Breakdown Structure (PBS)
  - To show how a system can be broken down into different products for development
- Product Flow Diagram (PFD)
  - To indicate, for each product, which products are required as 'inputs'

Advantages

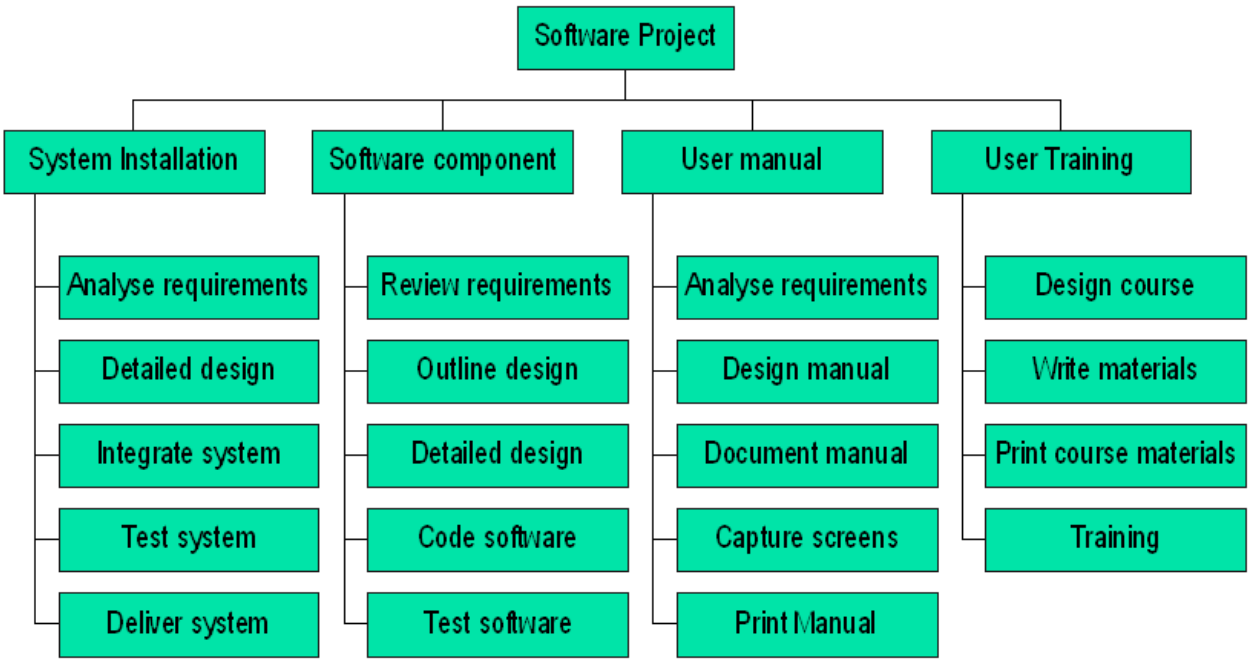
- Less likely to miss a product unexpectedly from a PBS

Product-based Approach – An example



5.9 Hybrid Approach

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



IBM in its MITP methodology suggests 5 levels

- Level 1: Project
- Level 2: Deliverables (software, manuals etc.)
- Level 3: Components
- Level 4: Work-packages
- Level 5: Tasks (individual responsibility)

Planning and Scheduling the Activities

- Once we have a project plan (or, project schedule), we need to schedule the activities in a project taking into account the resource constraints

Scheduling Techniques

- Simple sequencing
  - Suitable for small projects
- Critical Path Method (CPM)
  - Suitable for large software projects
  - The most commonly used "networking" technique

Simple sequencing

A simple sequencing of the tasks and the responsible personnel taken into account of the resources

- Easily presented in a simple bar chart

  see figure 6.6 in Hughes book

- Suitable for allocating individuals to particular tasks at an early stage

5.10Critical Path Method (CPM)

Primary objectives:

Planning the project so that it can be completed as quickly as possible

Identifying those activities where their delays is likely to affect the overall project completion date

- Developed by Du Pont Chemical Company and published in 1958
- Capture the activities and their inter-relationships using a graph
  - Lines are used to represent the activities

- Nodes are used to represent the startand stop of activities

- Adding time dimension
  - The forward pass

    Calculate the earliest start dates of the activities

    To calculate the project completion date
  - The backward pass

    Calculate the latest start dates for activities

    Identify the critical path from the graph

- Identifying critical path and critical event
  - Critical event:an event that has zero *slack*
  - Critical path: a path joining those critical events

Example to construct a CPM

Id.	Activity Name	Duration (weeks)	Precedents
A	Hardware selection	7	
B	Software design	4	
C	Hardware Installation	6	A
D	Coding	4	B
E	Data Preparation	5	B
F	User Documentation	9	
G	User Training	5	E,F
H	System Installation	3	C,D

Activity Float

Time allowed for an activity to delay

3 different types:

- Total float (without affecting the completion of the project)

= latest start date – earliest start date

- Free float (without affecting the next activity)

= earliest start date of *next* activity – latest end date of *previous* activity

- Interfering float (= total float - free float)

Significance of critical path

During planning stage

Shortening the critical path will reduce the overall project duration

During management stage

Pay more attention to those activities which fall in the critical path

UNITII PROJECT EVALUATION

StrategicAssessment–TechnicalAssessment–CostBenefitAnalysis–CashFlow Forecasting–CostBenefitEvaluationTechniques–RiskEvaluation.

6. Project Evaluation:

A high level assessment of the project

- to see whether it is worthwhile to proceed with the project
- to see whether the project will fit in the strategic planning of the whole organization

6.1 Project Evaluation

Why

- Want to decide whether a project can proceed before it is too late
- Want to decide which of the several alternative projects has a better success rate, a higher turnover, a higher ...

Is it desirable to carry out the development and operation of the software system

Who

- Senior management
- Project manager/coordinator
- Team leader

When

- Usually at the beginning of the project

  e.g. Step 0 of Step Wise Framework

What

- Strategic assessment
- Technical assessment
- Economic assessment

How

- Cost-benefit analysis
- Cash flow forecasting
- Cost-benefit evaluation techniques

- Risk analysis

7. Strategic Assessment

- Used to assess whether a project fits in the *long-term goal* of the organization
- Usually carried out by senior management
- Needs a strategic plan that clearly defines the objectives of the organization
- Evaluates individual projects against the strategic plan or the overall business objectives

Programme management

suitable for projects developed for use in the organization

Portfolio management

suitable for project developed for other companies by software houses

SA – Programme Management

Individual projects as components of a programme within the organization

Programme as "a group of projects that are managed in a coordinated way to gain benefits that would not be possible were the projects to be managed independently

7.1 SA – Programme Management Issues

- Objectives
  - How does the project contribute to the *long-term goal* of the organization?
  - Will the product increase the market share? By how much?
  - IS plan
  - Does the product fit into the overall IS plan?
  - How does the product relate to other existing systems?
  - Organization structure
  - How does the product affect the existing organizational structure? the existing workflow? the overall business model?
- MIS
  - What information does the product provide?
  - To whom is the information provided?

- How does the product relate to other existing MISs?

- Personnel
  - What are the staff implications?
  - What are the impacts on the overall policy on staff development?
- Image
  - How does the product affect the image of the organization?

7.2 SA – Portfolio Management

- suitable for product developed by a software company for an organization
- may need to assess the product for the client organization

  Programme management issues apply
- need to carry out strategic assessment for the providing software company
- *Long-term goal* of the software company
- The effects of the project on the portfolio of the company (synergies and conflicts)
- Any added-value to the overall portfolio of the company

8. Technical Assessment

- Functionality against hardware and software
- Thestrategic IS plan of the organization
- any constraints imposed by the IS plan

8.1 Economic Assessment

Why?

- Consider whether the project is the best among other options
- Prioritise the projects so that the resources can be allocated effectively if several projects are underway

How?

- Cost-benefit analysis
- Cash flow forecasting
- Various cost-benefit evaluation techniques

  NPV and IRR

8.2 EA – Cost-benefit Analysis

A standard way to assess the economic benefits

Two steps

Identify and estimate all the costs and benefits of carrying out the project

Express the costs and benefits in a common unit for easy comparison (e.g. $)

Costs

- Development costs
- Setup costs
- Operational costs

Benefits

- Direct benefits
- Assessable indirect benefits
- Intangible benefits

8.3 EA – Cash Flow Forecasting

What?

- Estimation of the cash flow over time

Why?

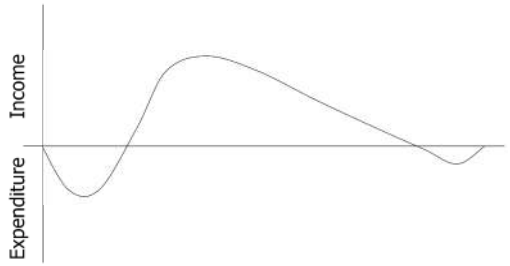
- An excess of estimated benefits over the estimated costs is not sufficient
- Need detailed estimation of benefits and costs versus time

What?

- Estimation of the cash flow over time

Why?

- An excess of estimated benefits over the estimated costs is not sufficient
- Need detailed estimation of benefits and costs versus time



Need to forecast the expenditure and the income

Accurate forecast is not easy

Need to revise the forecast from time to time

8.4 Cost-benefit Evaluation Techniques

- **Net profit**

$$= \text{Total income} - \text{Total costs}$$

- **Payback period**

$$= \text{Time taken to break even}$$

- **Return on Investment (ROI)**

$$= \frac{\text{average annual profit}}{\text{total investment}} \times 100\%$$

8.5 Cost-benefit Evaluation Techniques – NPV

Net present value (NPV)

- It is the sum of the present values of all future amounts.
- *Present value* is the value which a future amount is worth at present
- It takes into account the profitability of a project and the timing of the cash flows

Let n be the number of year and r be the discount rate, the present value (PV) is given by

$$\text{PV} = \frac{\text{value in year } n}{(1+r)^n}$$

- **Issues in NPV**
  - Choosingan appropriate discount rate is difficult

  - Ensuring that the rankings of projects are not sensitive to small changes in discount rate

- **Guidelines:**
  - Use the standard rate prescribed by the organization
  - Use interest rate + premium rate
  - Use a target rate of return
  - Rank the projects using various discount rates
- **Disadvantage**
  - May not be directly comparable with earnings from other investments or the costs of borrowing capital
- **Internal Rate of Return (IRR)**
  - The percentage discount rate that would produce a NPV of zero
  - A relative measure
- **Advantages**
  - Convenient
    - Directly comparable with rate of return on other projects and with interest rates
  - Useful
    - Dismiss a project due to its small IRR value
    - Indicate further precise evaluation of a project
  - Supported by MS Excel and Lotus 1-2-3

Estimation

- Why? – to define the project budget and to 'refine' the product to realize the budget
- Who? – the manager
- What? – size and cost
- When? – always
- How? – techniques and models

Issues related to Estimation

- Difficult to make accurate estimation
- Better to have previous data and analyze the actual values against their estimates so that you know how accurate you are
- Even better to have previous data of the whole organization so that you know how accurate the estimation method, if any, used within the organization

Positive Attitude Towards Estimation

- Use your estimation as a guide to manage your project
- From time to time, you need to revise your estimation based on the current status of the project

Estimation Approaches

- Expert judgement
  - Ask the knowledgeable experts
- Estimation by analogy
  - Use the data of a similar and completed project
- Pricing to win
  - Use the price that is low enough to win the contract
- Top-down
  - An overall estimate is determined and then broken down into each component task
- Bottom-up
  - The estimates of each component task are aggregated to form the overall estimate
- Algorithmic model

Estimation is based on the characteristics of the product and the development environment

Size Estimation

- Problems related to size estimation
- Size Estimation Model

Function Point Analysis (FPA)

Problems related to size estimation

- Nature of software
- Novel application of software
- Fast changing technology
- Lack of homogeneity of project experience
- Subjective nature of estimation
- Political implications within the organization

Cost-Benefit Analysis

Cost/benefit analysis, comparing

– Expected costs

– Expected benefits

Issues

– Estimating costs

– Estimating benefits

Use of financial models to evaluate

8.6 Cost-Benefit Analysis-Two Steps

Identifying and estimating all of the costs and benefits of carrying out the project and operating the delivered application

Expressing the costs and benefits in common units

8.7 Cost-Benefit Analysis-Cost Estimation

Estimate costs to compare with benefits/other investment options

Overall estimation based on

– Estimation of required activities (structure)

– Estimation for each activity

– Estimation of installation/setup cost

– Estimation of operational cost

Difficult, as a lot of these are‘estimates’;

estimation errors cascade

Cost-Benefit Analysis-Cost Category

Development costs

Setup costs

Operational costs

Cost-Benefit Analysis-Development Costs

- Salaries (base, incentives, and bonuses)
- Equipment for development
  - Hardware
  - Software

Cost-Benefit Analysis-Setup Cost

- Hardware and software infrastructure
- Recruitment/staff training
- Installation and conversion costs

Cost-Benefit Analysis-Operational Costs

Costs of operating the system once it has been installed

- Support costs
- Hosting costs
- Licensing costs
- Maintenance costs
- Backup costs

Cost-Benefit Analysis-Benefit Estimation

Estimate benefits of new system based on– Estimation of cost savings and money generation when deployed– Value of information obtained for objective driven project

- Value of intangibles

Cost Benefits Analysis-Benefits Types

- Direct benefits
- Indirect benefits
- Intangible benefits

Cost Benefits Analysis-Direct Benefits

Directly accountable to new system

– Cost savings (e.g., less staff, less paper, quicker turnaround)

– Money generation (e.g., new revenue stream, new markets)

Measurable after system is operational

Have to be estimated for cost/benefit analysis

Cost Benefits Analysis -Intangible Benefits

Positive side effects of new system

External system (e.g., increase branding, entry to new markets)

Internal system (increased interest in job for users, enabler for other systems)

Often very specific to a project; not measurable even after a system is operational

Part of strategic decision rather than cost/benefit analysis

9. Cash Flow Forecasting

Indicates when expenditure and income will take place

9.1Cash Flow Analysis

Typically there are outgoing payments initially and then incoming payments

There might be additional costs at the end of the project life

Cash flow considerations

– Is initial funding for the project available?

– Is timing of incoming/outgoing cash flow in line with financial plans?

– If cash flow is critical, forecasting should be done quarterly or monthly

Risky/expensive projects might be funded using venture capital

10. Cost-Benefit Evaluation-Techniques

Costs and benefits have to be expressed using the same scale to be comparable

Usually expressed in payments at certain times (cash flow table)

Payments at different points in time are not comparable based only on the amount

Time of payment should be considered

Techniques

– Net profit

– Payback period

– Return on investment

– Net present value

– Internal rate of return

10.1 Cost-Benefit Evaluation Techniques -Net Profit

Difference between total cost and total income

Pros: Easy to calculate

Cons

– Does not show profit relative to size investment (e.g., consider Project 2)

– Does not consider timing of payments (e.g., compare Projects 1 and 3)

Not very useful other than for "back of envelope" evaluations

10.2 Cost-Benefit Evaluation Techniques -Payback Period

Time taken to break even

Pros

– Easy to calculate

– Gives some idea of cash flow impact

Cons: Ignores overall profitability

Not very useful by itself, but a good measure for cash flow impact

10.3 Costs-Benefit Evaluation Techniques-Return On Investment

Also known as the accounting rate of return (ARR)

Provides a way of comparing the net profitability to the investment required

The common formula– ROI = (average annual profit/total investment) X 100

10.4 Cost-Benefit Evaluation Techniques -Return On Investment

Pros: Easy to calculate

Cons

– Does not consider the timing of payments

– Misleading: does not consider bank interest rates

Not very useful other than for "back of envelope" evaluations

10.5 Cost-Benefit Evaluation Techniques-Net Present Value

A project evaluation technique that takes into account the profitability of a project and the timing of the cash flows that are produced

Sum of all incoming and outgoing payments, discounted using an interest rate, to a fixed point in time (the present)

Cost-Benefit Evaluation Techniques-Net Present Value

Present value = (value in year t)/(1+r)^t

– r is the discount rate

– t is the number of years into the future that the cash flow occurs

– (1+r)^t is known as discount factor

In the case of 10% rate and one year

– Discount factor = 1/(1+0.10) = 0.9091

In the case of 10% rate and two years

– Discount factor = 1/(1.10 x 1.10) = 0.8294

Pros

– Takes into account profitability

– Considers timing of payments

– Considers economic situation through discount rate

Cons: Discount rate can be difficult to choose

Standard measure to compare different options

10.6 Cost-Benefit Evaluation Techniques -Internal Rate of Return

Internal rate of return (IRR) is the discount rate that would produce an NPV of 0 for the project

Can be used to compare different investment opportunities

There is a Microsoft Excel function to calculate IRR

Pros: Calculates figure which is easily comparable to interest rates

Cons: Difficult to calculate (iterative)

Standard way to compare projects

11. Definition of Risk

A risk is a potential problem – it might happen and it might not

Conceptual definition of risk

- Risk concerns future happenings
- Risk involves change in mind, opinion, actions, places, etc.
- Risk involves choice and the uncertainty that choice entails

Two characteristics of risk

- Uncertainty – the risk may or may not happen, that is, there are no 100% risks (those, instead, are called constraints)
- Loss – the risk becomes a reality and unwanted consequences or losses occur

11.1 Risk Categorization – Approach

Project risks

They threaten the project plan

If they become real, it is likely that the project schedule will slip and that costs will increase

Technical risks

They threaten the quality and timeliness of the software to be produced

If they become real, implementation may become difficult or impossible

Business risks

They threaten the viability of the software to be built

If they become real, they jeopardize the project or the product

Sub-categories of Business risks

Market risk – building an excellent product or system that no one really wants

Strategic risk – building a product that no longer fits into the overall business strategy for the company

Sales risk – building a product that the sales force doesn't understand how to sell

Management risk – losing the support of senior management due to a change in focus or a change in people

Budget risk – losing budgetary or personnel commitment

Known risks

Those risks that can be uncovered after careful evaluation of the project plan, the business and technical environment in which the project is being developed, and other reliable information sources (e.g., unrealistic delivery date)

Predictable risks

Those risks that are extrapolated from past project experience (e.g., past turnover)

Unpredictable risks

Those risks that can and do occur, but are extremely difficult to identify in advance

11.2Reactive vs. Proactive Risk Strategies

Reactive risk strategies

- "Don't worry, I'll think of something"
- The majority of software teams and managers rely on this approach
- Nothing is done about risks until something goes wrong
    - The team then flies into action in an attempt to correct the problem rapidly (fire fighting)
- Crisis management is the choice of management techniques

Proactive risk strategies

- Steps for risk management are followed (see next slide)
- Primary objective is to avoid risk and to have a contingency plan in place to handle unavoidable risks in a controlled and effective manner

11.3 Steps for Risk Management

1) Identify possible risks; recognize what can go wrong
2) Analyze each risk to estimate the probability that it will occur and the impact (i.e., damage) that it will do if it does occur
3) Rank the risks by probability and impact
   - Impact may be negligible, marginal, critical, and catastrophic

4) Develop a contingency plan to manage those risks having high probability and high impact

11.4 Risk Identification

- Risk identification is a systematic attempt to specify threats to the project plan
- By identifying known and predictable risks, the project manager takes a first step toward avoiding them when possible and controlling them when necessary
- Generic risks
  - Risks that are a potential threat to every software project
- Product-specific risks
  - Risks that can be identified only by those a with a clear understanding of the technology, the people, and the environment that is specific to the software that is to be built
  - This requires examination of the project plan and the statement of scope
  - "What special characteristics of this product may threaten our project plan?"

11.5 Risk Item Checklist

- Used as one way to identify risks
- Focuses on known and predictable risks in specific subcategories (see next slide)
- Can be organized in several ways
  - A list of characteristics relevant to each risk subcategory
  - Questionnaire that leads to an estimate on the impact of each risk
  - A list containing a set of risk component and drivers and their probability of occurrence

11.7 Known and Predictable Risk Categories

- Product size – risks associated with overall size of the software to be built
- Business impact – risks associated with constraints imposed by management or the marketplace
- Customer characteristics – risks associated with sophistication of the customer and the developer's ability to communicate with the customer in a timely manner
- Process definition – risks associated with the degree to which the software process has been defined and is followed

- Development environment – risks associated with availability and quality of the tools to be used to build the project
- Technology to be built – risks associated with complexity of the system to be built and the "newness" of the technology in the system
- Staff size and experience – risks associated with overall technical and project experience of the software engineers who will do the work

11.8 Questionnaire on Project Risk

1) Have top software and customer managers formally committed to support the project?
2) Are end-users enthusiastically committed to the project and the system/product to be built?
3) Are requirements fully understood by the software engineering team and its customers?
4) Have customers been involved fully in the definition of requirements?
5) Do end-users have realistic expectations?
6) Is the project scope stable?
7) Does the software engineering team have the right mix of skills?
8) Are project requirements stable?
9) Does the project team have experience with the technology to be implemented?
10) Is the number of people on the project team adequate to do the job?
11) Do all customer/user constituencies agree on the importance of the project and on the requirements for the system/product to be built?

11.9 Risk Components and Drivers

- The project manager identifies the risk drivers that affect the following risk components
  - Performance risk - the degree of uncertainty that the product will meet its requirements and be fit for its intended use
  - Cost risk - the degree of uncertainty that the project budget will be maintained
  - Support risk - the degree of uncertainty that the resultant software will be easy to correct, adapt, and enhance
  - Schedule risk - the degree of uncertainty that the project schedule will be maintained and that the product will be delivered on time
- The impact of each risk driver on the risk component is divided into one of four impact levels

  - Negligible, marginal, critical, and catastrophic

- Risk drivers can be assessed as impossible, improbable, probable, and frequent

11.10 Risk Projection (Estimation)

- Risk projection (or estimation) attempts to rate each risk in two ways
  - The probability that the risk is real
  - The consequence of the problems associated with the risk, should it occur
- The project planner, managers, and technical staff perform four risk projection steps (see next slide)
- The intent of these steps is to consider risks in a manner that leads to prioritization
- Be prioritizing risks, the software team can allocate limited resources where they will have the most impact

11.10.1 Risk Projection/Estimation Steps

1) Establish a scale that reflects the perceived likelihood of a risk (e.g., 1-low, 10-high)
2) Delineate the consequences of the risk
3) Estimate the impact of the risk on the project and product
4) Note the overall accuracy of the risk projection so that there will be no misunderstandings

11.10.2 Contents of a Risk Table

- A risk table provides a project manager with a simple technique for risk projection
- It consists of five columns
  - Risk Summary – short description of the risk
  - Risk Category – one of seven risk categories (slide 12)
  - Probability – estimation of risk occurrence based on group input
  - Impact – (1) catastrophic (2) critical (3) marginal (4) negligible
  - RMMM – Pointer to a paragraph in the Risk Mitigation, Monitoring, and Management Plan

11.10.3 Developing a Risk Table

- List all risks in the first column (by way of the help of the risk item checklists)

- Mark the category of each risk
- Estimate the probability of each risk occurring
- Assess the impact of each risk based on an averaging of the four risk components to determine an overall impact value (See next slide)
- Sort the rows by probability and impact in descending order
- Draw a horizontal cutoff line in the table that indicates the risks that will be given further attention

11.10.4 Assessing Risk Impact

- Three factors affect the consequences that are likely if a risk does occur
  - Its nature – This indicates the problems that are likely if the risk occurs
  - Its scope – This combines the severity of the risk (how serious was it) with its overall distribution (how much was affected)
  - Its timing – This considers when and for how long the impact will be felt
- The overall risk exposure formula is RE = P x C
  - P = the probability of occurrence for a risk
  - C = the cost to the project should the risk actually occur
- Example
  - P = 80% probability that 18 of 60 software components will have to be developed
  - C = Total cost of developing 18 components is $25,000
  - RE = .80 x $25,000 = $20,000

11.10.5 Risk Mitigation, Monitoring, and Management

- An effective strategy for dealing with risk must consider <u>three</u> issues (Note: these are not mutually exclusive)
  - Risk mitigation (i.e., avoidance)
  - Risk monitoring
  - Risk management and contingency planning
- <u>Risk mitigation</u> (avoidance<u>)</u> is the primary strategy and is achieved through a plan

Example: Risk of high staff turnover

- Seven Principles of Risk ManagementMaintain a global perspective

  - View software risks within the context of a system and the business problem that is is intended to solve

- Take a forward-looking view
  - Think about risks that may arise in the future; establish contingency plans
- Encourage open communication
  - Encourage all stakeholders and users to point out risks at any time
- Integrate risk management
  - Integrate the consideration of risk into the software process
- Emphasize a continuous process of risk management
  - Modify identified risks as more becomes known and add new risks as better insight is achieved
- Develop a shared product vision
  - A shared vision by all stakeholders facilitates better risk identification and assessment
- Encourage teamwork when managing risk
  - Pool the skills and experience of all stakeholders when conducting risk management activities

UNITIII ACTIVITYPLANNING

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network PlanningModels–ForwardPass–BackwardPass–Activity Float–ShorteningProject Duration– ActivityonArrow Networks–RiskManagement–NatureOfRisk–TypesOf Risk–ManagingRisk– HazardIdentification– HazardAnalysis–RiskPlanningAnd Control.

12. Objectives of activity planning

- Feasibility assessment-Whether project can be finished within specified time scales
- Resource allocation
- Detailed costing-Cost?
- Motivation
- Co-ordination

13. Project schedules

- Steps
  - Ideal activity plan
  - Activity risk analysis
  - Resource allocation
  - Schedule production

13.1 Projects and activities

- Defining activities
- Identifying activities

Identifying activities

- The activity based approach
- The product based approach
- The hybrid approach

14. Sequencing and scheduling activities

- Project plan-bar chart
- SSADM

- Take into account availability of staff
- Way of allocation

15. Network-Planning Models

- A project is made up of a sequence of activities that form a network representing a project.
- The path taking longest time through this network of activities is called the "*critical path*."
- The critical path provides a wide range of scheduling information useful in managing a project.
- Critical Path Method (CPM) helps to identify the critical *path(s)* in the project networks.
- CPM with a Single Time Estimate
    - Used when activity times are known with certainty.
    - Used to determine timing estimates for the project, each activity in the project, and slack time for activities.
- CPM with Three Activity Time Estimates (a.k.a. PERT)
    - Used when activity times are uncertain.
    - Used to obtain the same information as the Single Time Estimate model *andprobability information*.
- Time-Cost Models
    - Used when trade-off information cost is a major consideration in planning.
    - Used to determine the least cost in reducing total project time.

Example:. CPM with Single Time Estimate

Consider the following consulting project

Activity	Designation	Immed. Pred.	Time (Weeks)
Assess customer's needs	A	None	2
Write and submit proposal	B	A	1
Obtain approval	C	B	1
Develop service vision and goals	D	C	2
Train employees	E	C	5
Quality improvement pilot groups	F	D, E	5
Write assessment report	G	F	1

Develop a critical path diagram (network) and determine the duration of the critical path and Slacktimes for all activities

1. Draw the network
2. Compute early starts and early finish times (forward pass)
3. Compute late starts and late finish times (backward pass)
4. Compute Slack (LS-ES) per activity and Critical Path(s)

Example2. CPM with Three Activity Time Estimates

Develop a critical path diagram (network) and determine the duration of the critical path and Slacktimes for all activities

1. Draw the network
2. Compute early starts and early finish times (forward pass)
3. Compute late starts and late finish times (backward pass)
4. Compute Slack (LS-ES) per activity and Critical Path(s)

What is the probability of finishing this project in less than 53 days?

What is the probability that the project duration will exceed 56 days?

15.1 Time-Cost Models

- Sometimes it is possible to "crash" (expedite) some activities thus reducing the overall completion time for the entire project.
- Crashing an activity implies spending additional funds (e.g., overtime costs, hiring more workers, and so on) to get the task done earlier.

- On many occasions reducing the project completion time that in turn reduces the fixed cost outlays can generate substantial savings.

1. Draw the CPM network, identify the CP
2. Identify the least cost activity(ies) on the critical path(s)
3. Shorten the project completion time (CP) at the least cost

Repeat until no more crashing is possible (or cost exceeds the benefits)

- Assume fixed costs = $1,000 day.
- Find the optimum time-cost schedule.

15.2 CPM Assumptions/Limitations

- Project activities can be identified as entities. (There is a clear beginning and ending point for each activity.)
- Project activity sequence relationships can be specified and networked.
- Project control should focus on the critical path.
- The activity times follow the beta distribution, with the variance of the project assumed to equal the sum of the variances along the critical path. Project control should focus on the critical path.

15.3 MS Project

- MS Project is very popular and inexpensive project management software.
- It is constantly improved (upgraded).
- Many independent software firms have developed "add-ons" to further improve or help users (managers) take full advantage of its capabilities.
- For example, probabilistic analysis (PERT approach) is not directly available in MS Project.
    - CAUTION: "PERT" in MS Project refers to the AON network representation, and simplistic project duration calculations done by using either optimistic or most likely or pessimistic time estimates for all activities.
- Risk+ developed by C/S Solutions "is a comprehensive risk analysis tool that integrates seamlessly with Microsoft® Project to quantify the cost and schedule uncertainty associated with your project plans."

15.4 Reliable Construction Company Project

- This is a mini case/group exercise.

- The Reliable Construction Company has just made the winning bid of $5.4 million to construct a new plant for a major manufacturer.
- The contract includes the following provisions:
  - A penalty of $300,000 if Reliable has not completed construction within 47 weeks.
  - A bonus of $150,000 if Reliable has completed the plant within 40 weeks.

Questions:

1. How can the project be displayed graphically to better visualize the activities?
2. What is the total time required to complete the project if no delays occur?
3. When do the individual activities need to start and finish?
4. What are the critical bottleneck activities?
5. For other activities, how much delay can be tolerated?
6. What is the probability the project can be completed in 47 weeks?
7. Is it worth to expedite the activities to finish the project in 40 weeks?
   - Assume activities with 7 or more weeks can be shortened by two weeks and the rest can be reduced by only one week.
   - For simplicity assume that cost per week to expedite any activity is $30,000.

Three Time Estimates for the Project

Activity	optimistic	Most likely	pessimistic
A	**1**	**2**	**3**
B	**2**	**3.5**	**8**
C	**6**	**9**	**18**
D	**4**	**5.5**	**10**
E	1	4.5	5

F	**4**	**4**	**10**
G	**5**	**6.5**	**11**
H	**5**	**8**	**17**
I	**3**	**7.5**	**9**
J	**3**	**9**	**9**
K	**4**	**4**	**4**
L	**1**	**5.5**	**7**
M	**1**	**2**	**3**
N	**5**	**5.5**	**9**

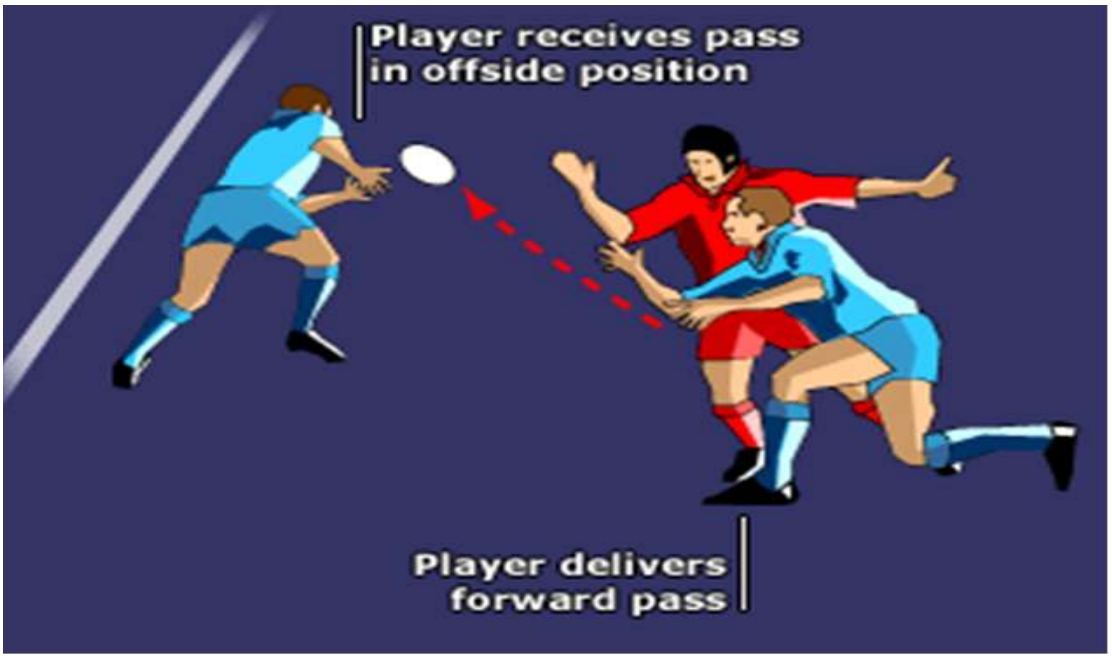
16. Forward and backward pass

16.1 Why Network Diagrams?

- Splits up the decision making process into
  - Method/logic - the order in which tasks have to be completed
  - Time – estimates for the time to completion can be added to each task
  - Resources – these can be added and then analysis carried out

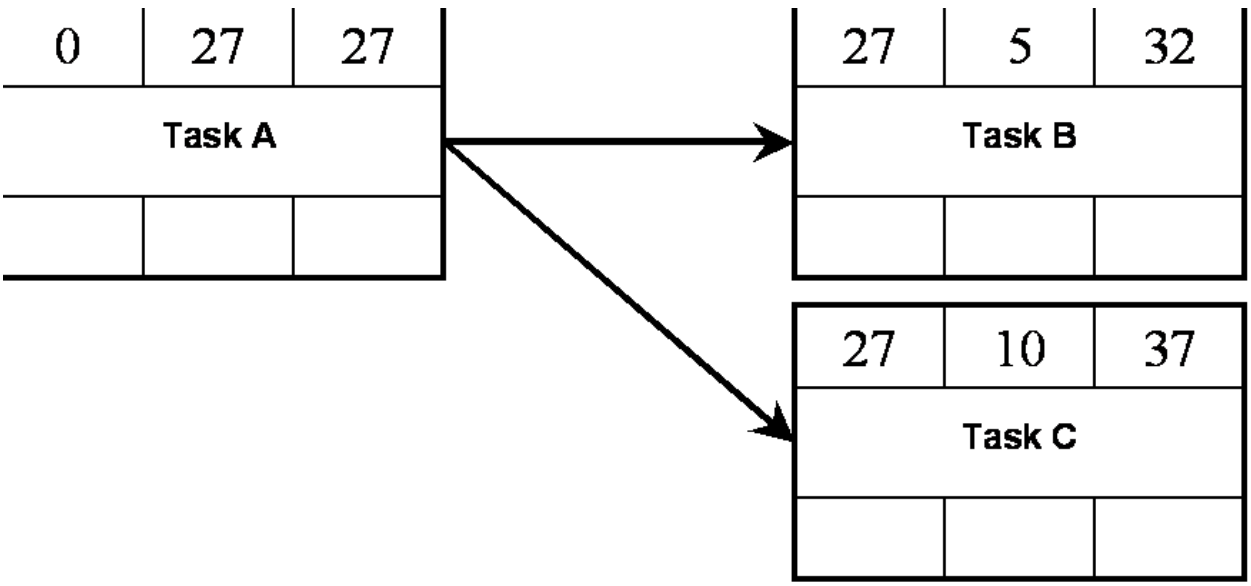
16.2 Two Parts to the Analysis

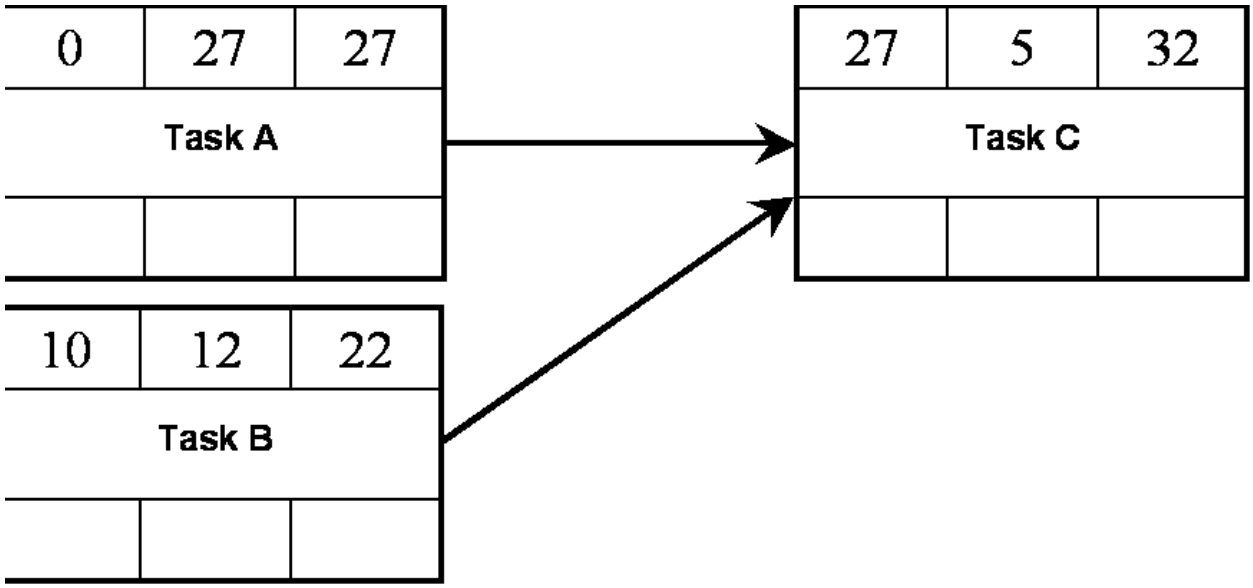
- Forward Pass
  - Calculates the Duration of the Project
- Backward Pass
  - Calculates the slack/float for each task and shows the critical path



- To calculate the total duration of the Project…
- For each task:
  - Take the earliest start time (EST)
  - Calculate the Earliest finish time (EFT):

EFT = EST+Duration

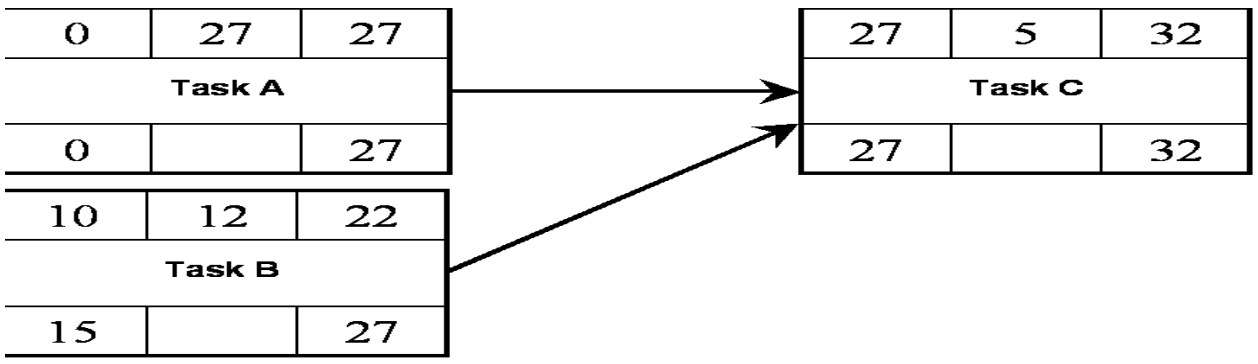


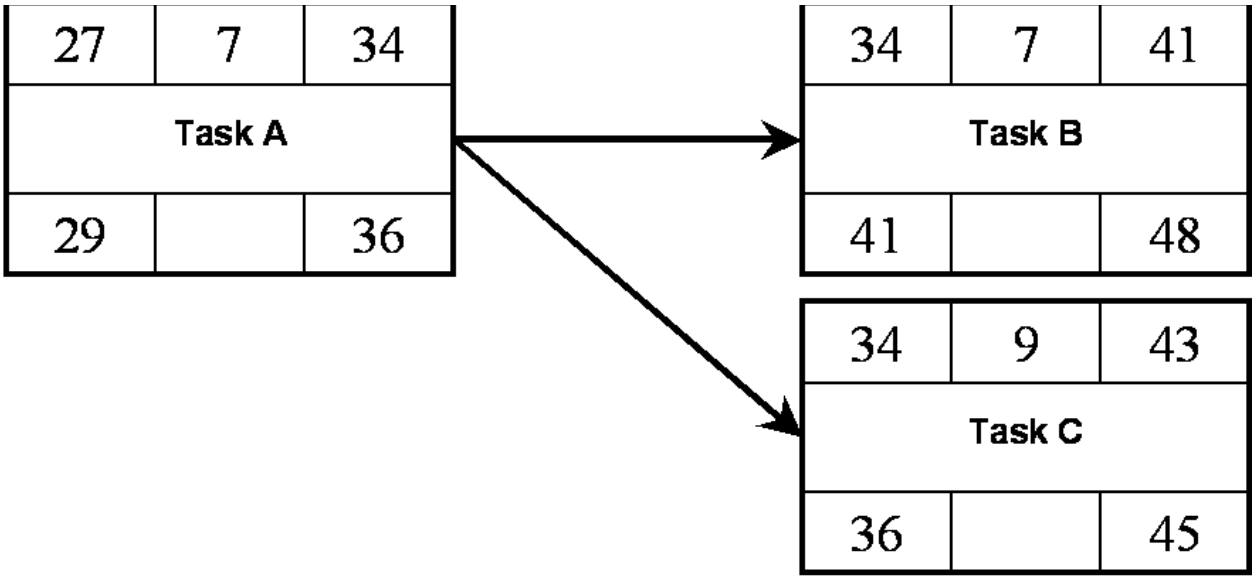


Backward Pass

- To calculate the float for each task?
- For each task:
  - Take the latest start time (LST)
  - Calculate the latest finish time (LFT):

LST = LFT-Duration





17. ACTIVITY FLOAT MEASURES

- Free float
  - The time by which an activity may be delayed without affecting any specific activity
- Interfering float
  - The diff between the total float and free float

18. Reducing Project Duration

- Time Is Money: Cost-Time Tradeoffs
  - Reducing the time of a critical activity usually incurs additional direct costs.
    - Cost-time solutions focus on reducing (crashing) activities on the critical path to shorten overall duration of the project.
  - Reasons for imposed project duration dates:
    - Time-to-market pressures
    - Unforeseen delays
    - Incentive contracts (bonuses for early completion)
    - Imposed deadlines and contract commitments
    - Overhead and public goodwill costs
    - Pressure to move resources to other projects

18.1 Options for Accelerating Project Completion

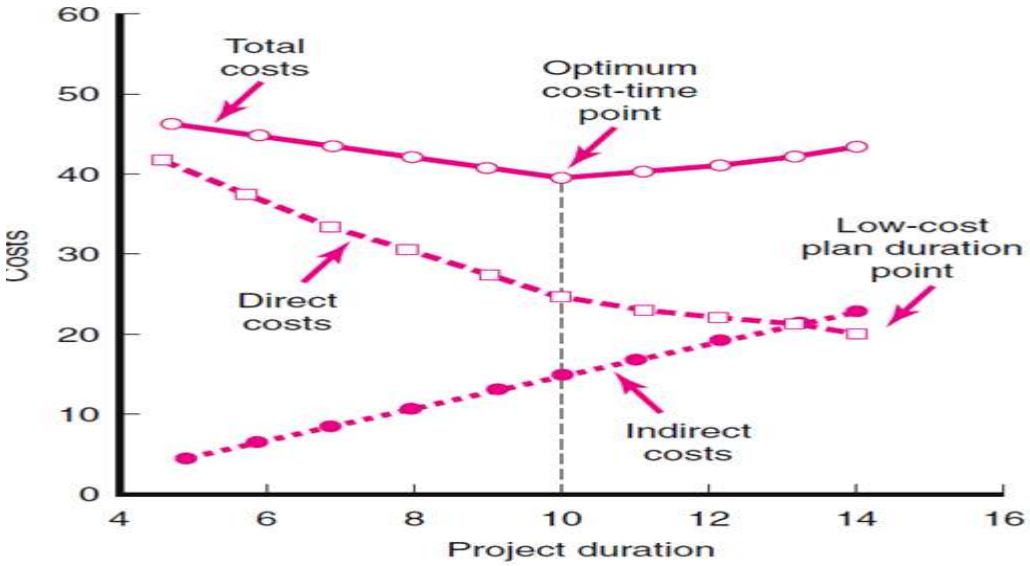
- Resources Not Constrained
  - Adding resources
  - Outsourcing project work
  - Scheduling overtime
  - Establishing a core project team
  - Do it twice—fast and then correctly
- Resources Constrained
  - Fast-tracking
  - Critical-chain
  - Reducing project scope
  - Compromise quality

18.2 Explanation of Project Costs

- Project Indirect Costs
  - Costs that cannot be associated with any particular work package or project activity.
    - Supervision, administration, consultants, and interest
  - Costs that vary (increase) with time.
    - Reducing project time directly reduces indirect costs.
- Project Direct Costs
  - Normal costs that can be assigned directly to a specific work package or project activity.
    - Labor, materials, equipment, and subcontractors
  - Crashing activities increases direct costs.

Reducing Project Duration

Project Cost–Duration Graph



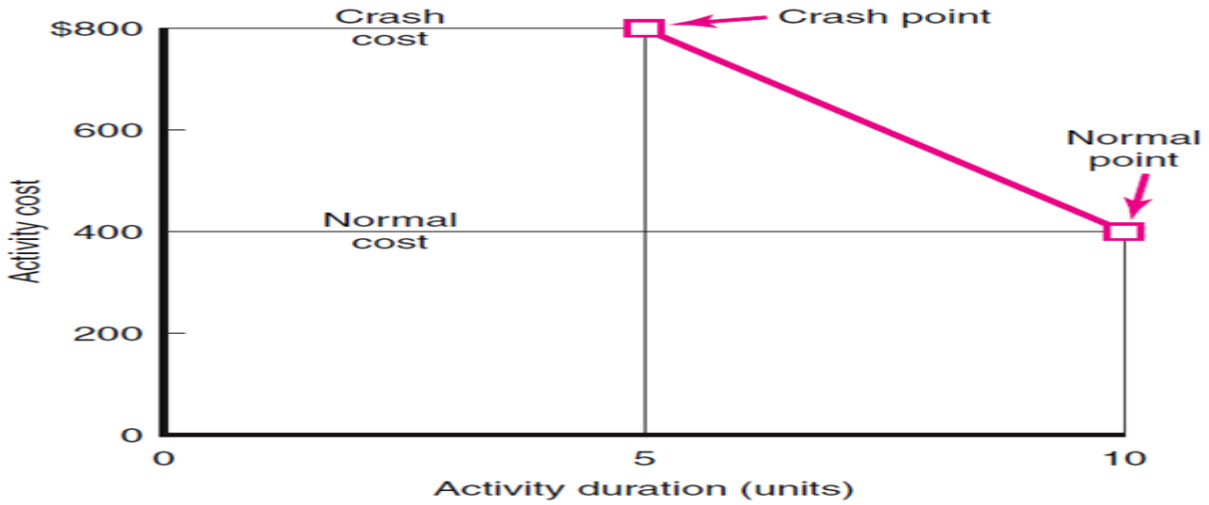
Constructing a Project Cost–Duration Graph

- Findtotal direct costs for selected project durations.
- Find total indirect costs for selected project durations.
- Sum direct and indirect costs for these selected project durations.
- Compare additional cost alternatives for benefits.

18.3 Constructing a Project Cost–Duration Graph

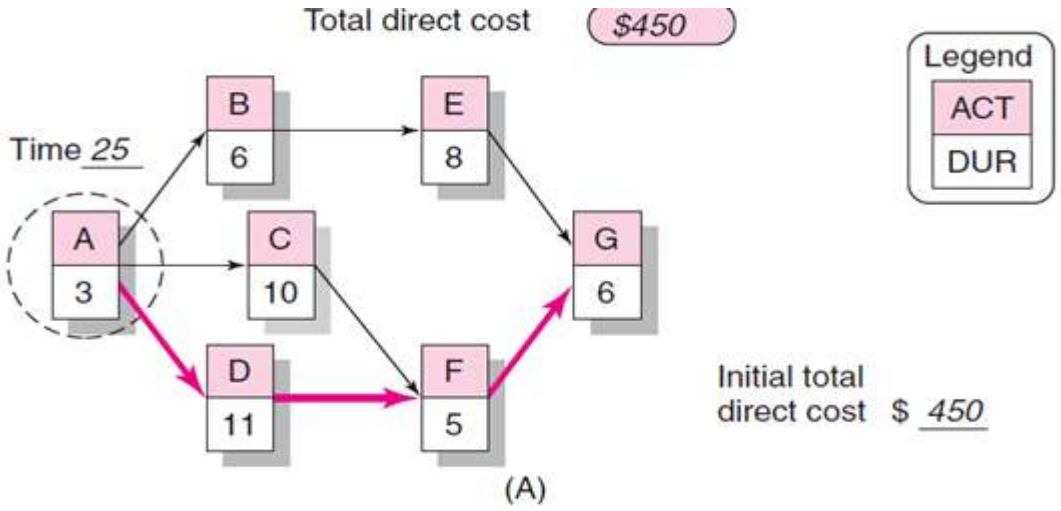
- **Determining Activities to Shorten**
  - Shorten the activities with the smallest increase in cost per unit of time.
  - Assumptions:
    - The cost relationship is linear.
    - Normal time assumes low-cost, efficient methods to complete the activity.
    - Crash time represents a limit—the greatest time reduction possible under realistic conditions.
    - Slope represents a constant cost per unit of time.
    - All accelerations must occur within the normal and crash times.

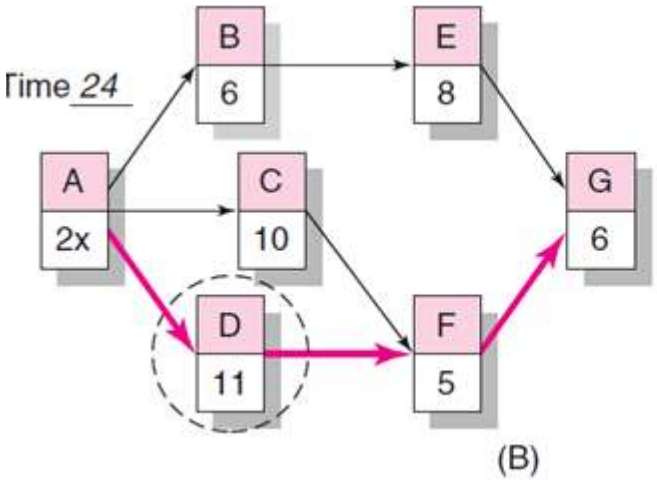
Activity Graph



Cost–Duration Trade-off Example

Activity ID	Slope	Maximum crash time	Direct costs			
			Normal		Crash	
			Time	Cost	Time	Cost
A	$20	1	3	$50	2	$70
B	40	2	6	80	4	160
C	30	1	10	60	9	90
D	25	4	11	50	7	150
E	30	2	8	100	6	160
F	30	1	5	40	4	70
G	0	0	6	70	6	70



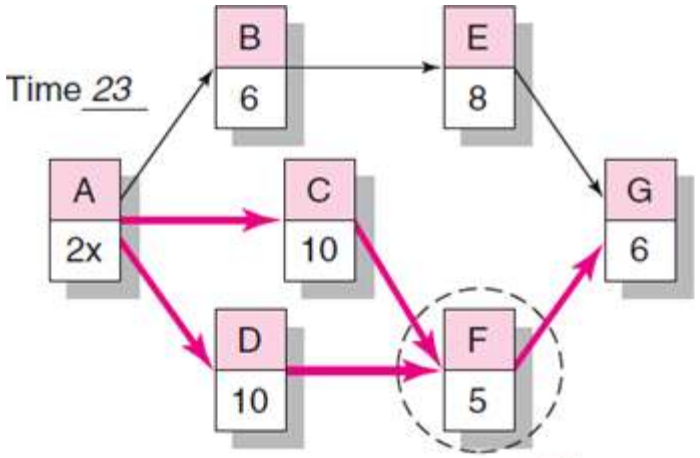


(B)

Total direct cost $ 470

Activities changed

A $20 ____ ____

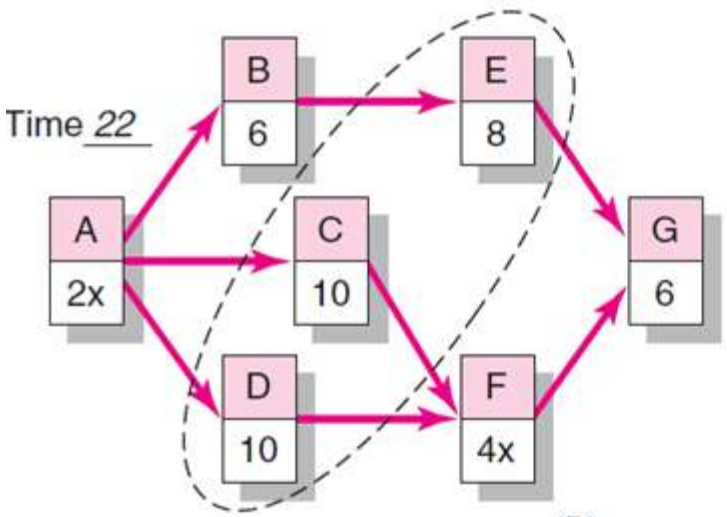


(A)

Total direct cost $ 495

Activities changed

D $25 ____ ____



(B)

Total direct cost $ 525

Activities changed

F $30 ____ ____

Practical Considerations

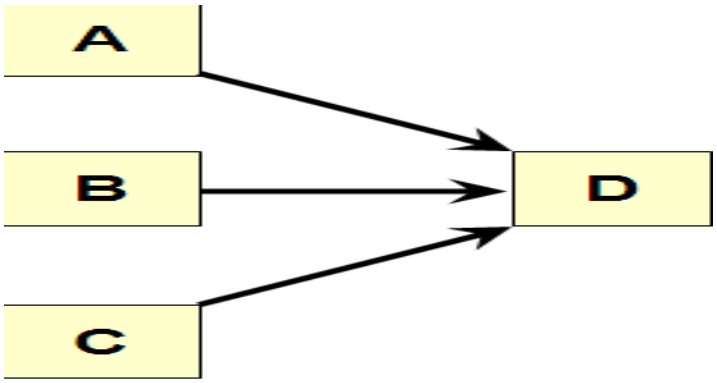
- Using the Project Cost–Duration Graph
- Crash Times
- Linearity Assumption
- Choice of Activities to Crash Revisited
- Time Reduction Decisions and Sensitivity

What if Cost, Not Time Is the Issue?

- Commonly Used Options for Cutting Costs
  - Reduce project scope
  - Have owner take on more responsibility
  - Outsourcing project activities or even the entire project
  - Brainstorming cost savings options

18.4 Constructing a Project Network

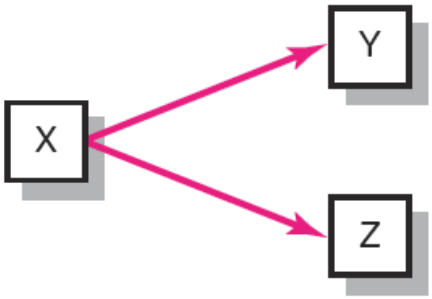
- Terminology
  - Activity: an element of theproject that requires time.
  - Merge activity: an activity that has two or more preceding activities on which it depends.
  - Parallel (concurrent) activities: Activities that can occur independently and, if desired, not at the same time.



Activity-on-Node Fundamentals

A is preceded by nothing
B is preceded by A
C is preceded by B

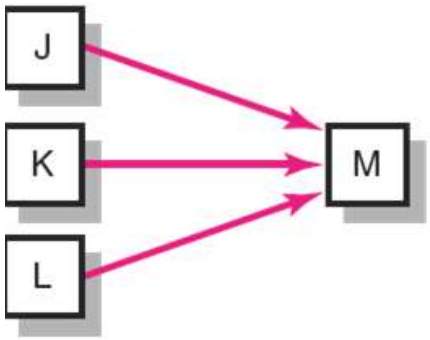
(A)



Y and Z are preceded by X

Y and Z can begin at the same time, if you wish

(B)

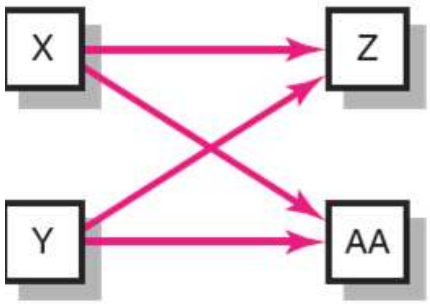


J, K, & L can all begin at the same time, if you wish (they need not occur simultaneously)

but

All (J, K, L) must be completed before M can begin

(C)



Z is preceded by X and Y

AA is preceded by X and Y

(D)

- Path: a sequence of connected, dependent activities.
- Critical path: the longest path through the activity network that allows for the completion of all project-related activities; the shortest expected time in which the

entire project can be completed. Delays on the critical path will delay completion of the entire project.

Forward Pass Computation

- Add activity times along each path in the network (ES + Duration = EF).
- Carry the early finish (EF) to the next activity where it becomes its early start (ES) unless…

The next succeeding activity is a merge activity, in which case the largest EF of all preceding activities is selected.

Backward Pass Computation

- Subtract activity times along each path in the network (LF - Duration = LS).
- Carry the late start (LS) to the next activity where it becomes its late finish (LF) unless...
- The next succeeding activity is a burst activity, in which case the smallest LF of all preceding activities is selected.

Determining Slack (or Float)

- Free Slack (or Float)
  - The amount of time an activity can be delayed without delaying connected successor activities
- Total Slack
  - The amount of time an activity can be delayed without delaying the entire project
- The critical path is the network path(s) that has (have) the least slack in common.

Sensitivity of a Network

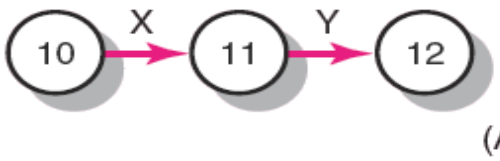
- The likelihood the original critical path(s) will change once the project is initiated.
  - Function of:

    The number of critical paths

    The amount of slack across near critical activities

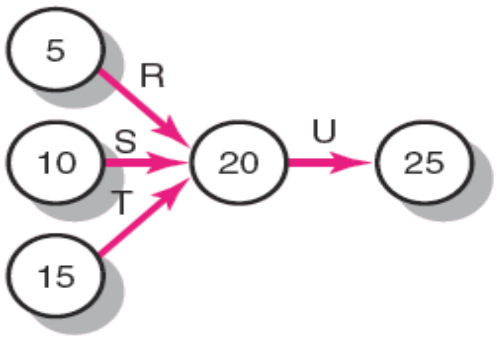
19. Activity-on-Arrow Network-Building Blocks

Activity-on-Arrow Network Fundamentals



Y is preceded by X

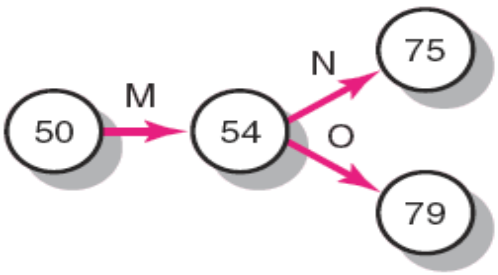
(A)



U is preceded by R, S, T

R, S, T can occur concurrently, if you wish

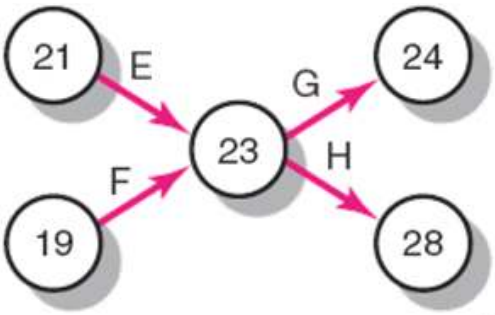
(B)



N and O are preceded by M

When M is complete, N and O can occur concurrently, if you wish

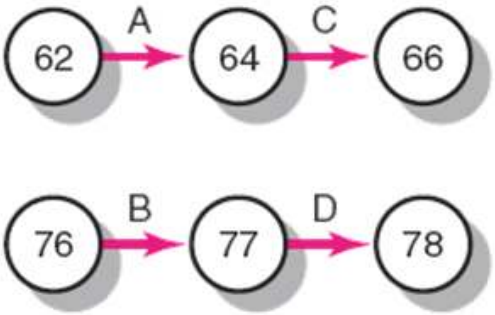
(C)



(D)

E and F must precede G and H

E and F can occur together, if you wish
G and H can occur together, if you wish

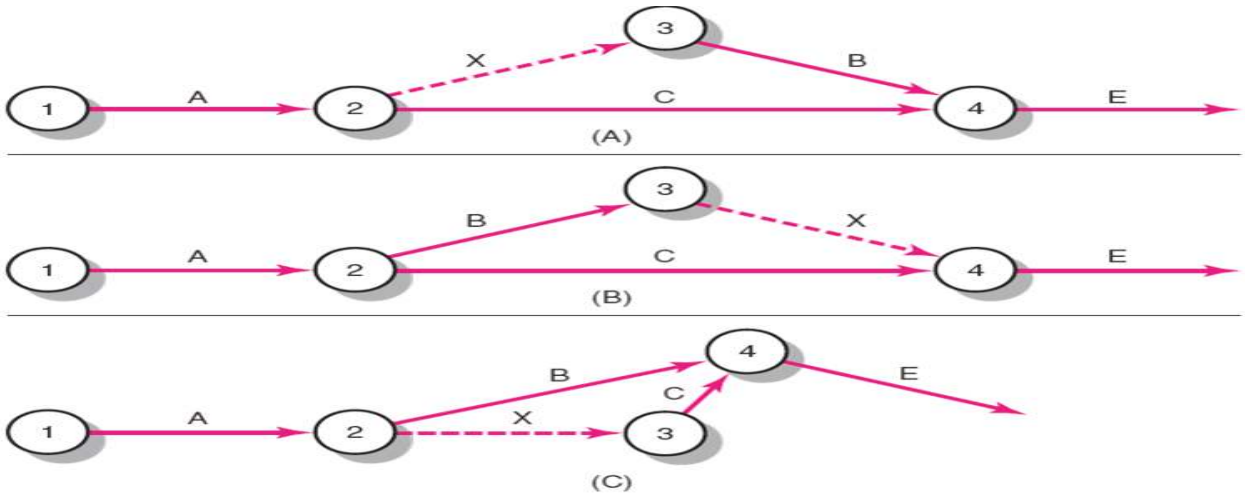


(E)

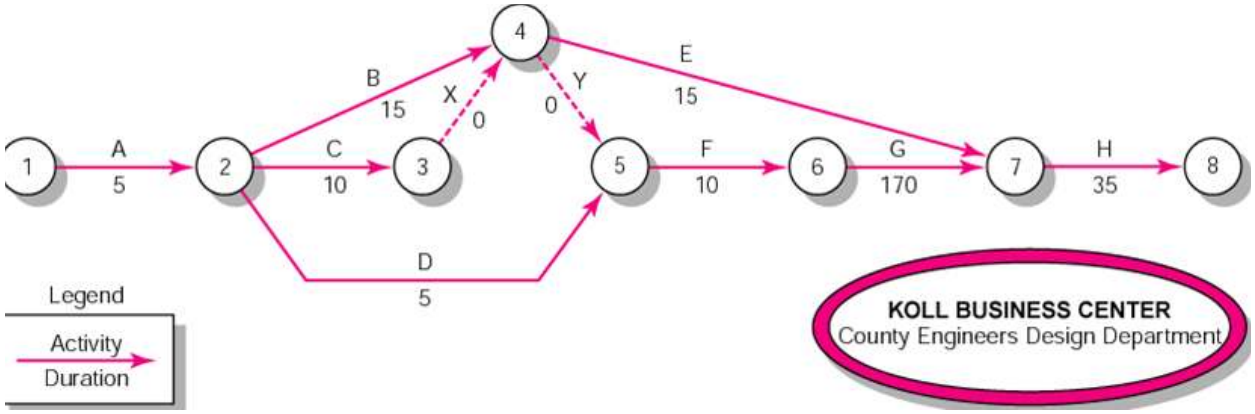
A must precede C
B must precede D

Path A–C is independent of path B–D

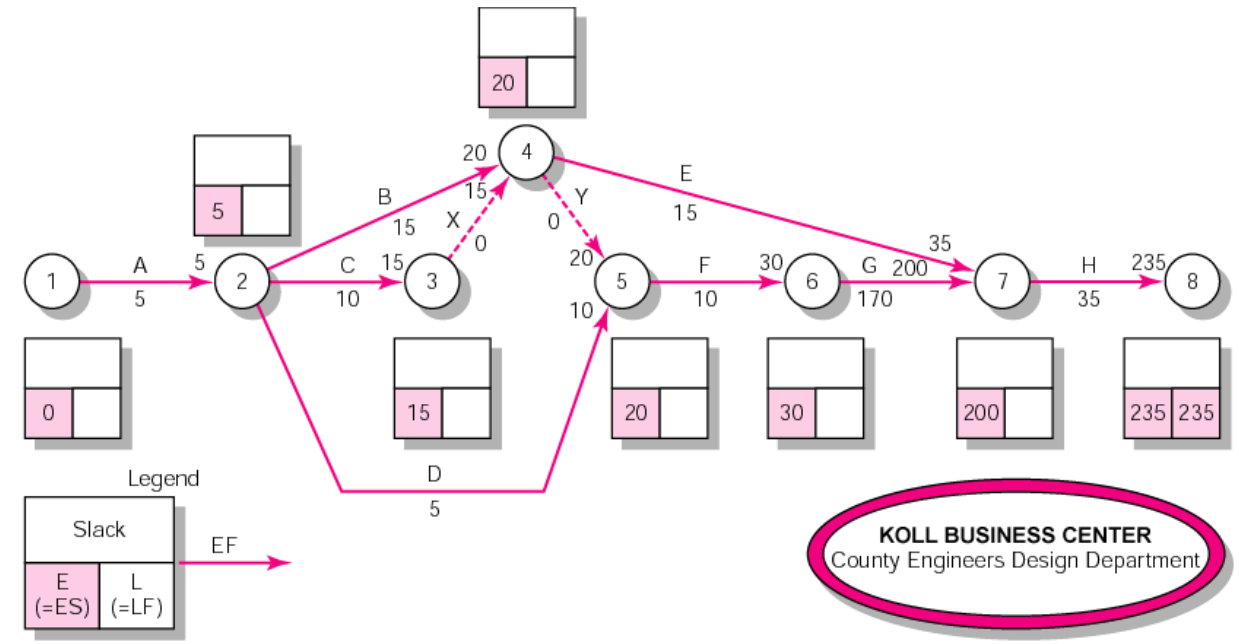
19.1 Partial AOA Koll Network



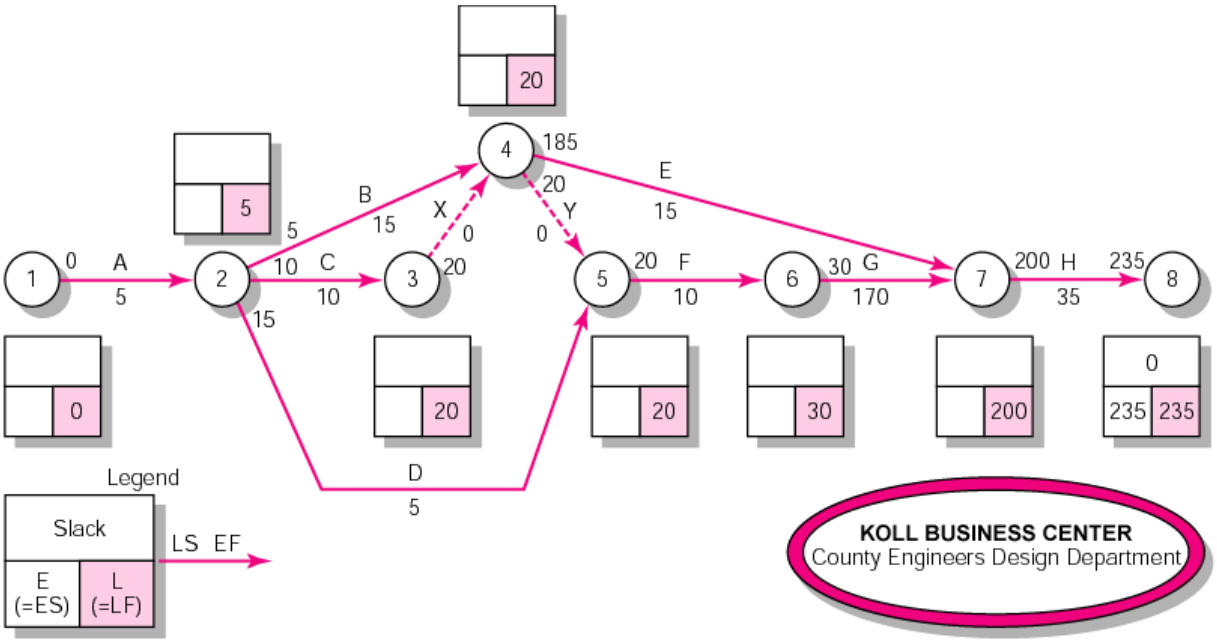
19.2 Activity – on-Arrow Network



19.3 Activity – on-Arrow Network Forward Pass



19.4 Activity-on-Arrow Network Backward Pass



20. RiskManagement

The proactive management of risks throughout the software development lifecycle is important for project success.

- The risk management practice, which involves risk identification, analysis, prioritization, planning, mitigation, monitoring, and communication
- software development risks that seem to reoccur in educational and industrial projects
- a risk-driven process for selecting a software development model

20.1Risk Identification

In the risk identification step, the team systematically enumerates as many project risks as possible to make them explicit before they become problems. There are several ways to look at the kinds of software project risks.

There are some specific factors to consider when examining project, product, and business risks. Some examples of these factors are listed here, although this list is meant to stimulate your thinking rather than to be an all-inclusive list.

People risks are associated with the availability, skill level, and retention of the people on the development team.

Size risks are associated with the magnitude of the product and the product team. Larger products are generally more complex with more interactions. Larger teams are harder to coordinate.

Process risks are related to whether the team uses a defined, appropriate software development process and to whether the team members actually follow the process.

Technology risks are derived from the software or hardware technologies that are being used as part of the system being developed. Using new or emerging or complex technology increases the overall risk.

Tools risks, similar to technology risks, relate to the use, availability, and reliability of support software used by the development team, such as development environments and other Computer-Aided Software Engineering (CASE) tools.

Organizational and managerial risks are derived from the environment where the software is being developed. Some examples are the financial stability of the company and threats of company reorganization and the potential of the resultant loss of support by management due to a change in focus or a change in people.

Customer risks are derived from changes to the customer requirements, customers' lack of understanding of the impact of these changes, the process of managing these requirements changes, and the ability of the customer to communicate effectively with the team and to accurately convey the attributes of the desired product.

Estimation risks are derived from inaccuracies in estimating the resources and the time required to build the product properly.

Sales and support risks involve the chances that the team builds a product that the sales force does not understand how to sell or that is difficult to correct, adapt, or enhance.

20.2 Strategies for Risk Management:

During the software development process various strategies for risk management could be identified and defined according to the amount of risk influence. Based upon the amount of risk influence in software development project, risk strategies could be divided into three classes namely careful, typical, and flexible (Boban, M. et.). Generally, careful risk management strategy is projected for new and inexperienced organizations whose software development projects are connected with new and unproven technology; typical risk management strategy is well-defined as a support for mature organizations with experience in software development projects and used technologies, but whose projects carry a decent number of risks; and flexible risk management strategy is involved in experienced software development organizations whose software development projects are officially defined and based on proven technologies (Boban, M. etc.).

20.3 Categories of risks:

Schedule Risk:

Project schedule get slip when project tasks and schedule release risks are not addressed properly.

Schedule risks mainly effect on project and finally on company economy and may lead to project failure.

Schedules often slip due to following reasons:

- Wrong time estimation
- Resources are not tracked properly. All resources like staff, systems, skills of individuals etc.
- Failure to identify complex functionalities and time required to develop those functionalities.
- Unexpected project scope expansions.

Budget Risk:

- Wrong budget estimation.
- Cost overruns
- Project scope expansion

Operational Risks:

Risks of loss due to improper process implementation, failed system or some external events risks.

Causes of Operational risks:

- Failure to address priority conflicts
- Failure to resolve the responsibilities
- Insufficient resources
- No proper subject training
- No resource planning
- No communication in team.

Security in System Development

- Risk Analysis & Management needs to be a part of system development, not tacked on afterwards
- Baskerville's three generations of methods

1st Generation: Checklists

Example: BS 7799 Part 1

2nd Generation: Mechanistic engineering methods

Example: this risk analysis method

3rd Generation: Integrated design

Not yet achieved

Definitions:

The meanings of terms in this area are not universally agreed. We will use the following

- **Threat**: Harm that can happen to an asset
- **Impact**: A measure of the seriousness of a threat
- **Attack**: A threatening event
- **Attacker**: The agent causing an attack (not necessarily human)
- **Vulnerability**: a weakness in the system that makes an attack more likely to succeed
- **Risk**: a quantified measure of the likelihood of a threat being realised
- **Risk Analysis** involves the identification and assessment of the levels of risk, calculated from the
    - Values of assets

  - Threats to the assets
  - Their vulnerabilities and likelihood of exploitation
- **Risk Management** involves the identification, selection and adoption of security measures justified by
  - The identified risks to assets
  - The reduction of these risks to acceptable levels

Goals of Risk Analysis:

- All assets have been identified
- All threats have been identified
  - Their impact on assets has been valued
- All vulnerabilities have been identified and assessed

Problems of Measuring Risk

- Businesses normally wish to measure in money, but
- Many of the entities do not allow this
  - Valuation of assets
    - Value of data and in-house software - no market value
    - Value of goodwill and customer confidence
  - Likelihood of threats
    - How relevant is past data to the calculation of future probabilities?
    - The nature of future attacks is unpredictable
    - The actions of future attackers are unpredictable
  - Measurement of benefit from security measures
    - Problems with the difference of two approximate quantities
    - How does an extra security measure affect a ~10^{-5} probability of attack?

Risk Levels

- Precise monetary values give a false precision

- Better to use levels, e.g.
  - High, Medium, Low
    - High: major impact on the organisation
    - Medium: noticeable impact (“material” in auditing terms)
    - Low: can be absorbed without difficulty
  - 1 - 10
- Express money values in levels, e.g.
  - For a large University Department a possibility is
    - High
    - Medium
    - Low

Risk Analysis Steps

- Decide on scope of analysis
  - Set the system boundary
- Identification of assets & business processes
- Identification of threats and valuation of their impact on assets (impact valuation)
- Identification and assessment of vulnerabilities to threats
- Risk assessment

Risk Analysis – Defining the Scope

- Draw a context diagram
- Decide on the boundary
  - It will rarely be the computer!
- Make explicit assumptions about the security of neighbouring domains
  - Verify them!

Risk Analysis - Identification of Assets

- Types of asset
    - Hardware
    - Software: purchased or developed programs
    - Data
    - People: who run the system
    - Documentation: manuals, administrative procedures, etc
    - Supplies: paper forms, magnetic media, printer liquid, etc
    - Money
    - Intangibles
        - Goodwill
        - Organization confidence
        - Organisation image

Risk Analysis – Impact Valuation

Identification and valuation of threats - for each group of assets

- Identify threats, e.g. for stored data
    - Loss of **confidentiality**
    - Loss of **integrity**
    - Loss of **completeness**
    - Loss of **availability** (Denial of Service)
- For many asset types the only threat is loss of availability
- Assess impact of threat
    - Assess in levels, e.g H-M-L or 1 - 10
    - This gives the valuation of the asset in the face of the threat

Risk Analysis – Vulnerabilities

- Identify vulnerabilities against a baseline system

For risk analysis of an existing system

- Existing system with its known security measures and weaknesses

For development of a new system

- Security facilities of the envisaged software, e.g. Windows NT
- Standard good practice, e.g. BS 7799 recommendations of good practice

For each threat

- Identify vulnerabilities
  - How to exploit a threat successfully;
- Assess levels of likelihood - High, Medium, Low
  - Of attempt

    Expensive attacks are less likely (e.g. brute-force attacks on encryption keys)
  - Successful exploitation of vulnerability;
- Combine them

Risk Assessment

Assess risk

- If we had accurate probabilities and values, risk would be
  - Impact valuation x probability of threat x probability of exploitation
  - Plus a correction factor for risk aversion
- Since we haven't, we construct matrices such as

Impact valuation

Risk	**Low**	**Med**	**high**
low	**Low**	**Low**	**med**
med	**Low**	**Med**	**High**
high	**Low**	**Med**	**High**

Responses to risk

- Avoid it completely by withdrawing from an activity
- Accept it and do nothing
- Reduce it with security measures

Risk management

- Risk management is concerned with identifying risks and drawing up plans to minimisetheir effect on a project.
- A risk is a probability that some adverse circumstance will occur

  Project risks affect schedule or resources;

  Product risks affect the quality or performance of the software being developed;

  Business risks affect the organisation developing or procuring the software.

The risk management process

Risk identification

Identify project, product and business risks;

Risk analysis

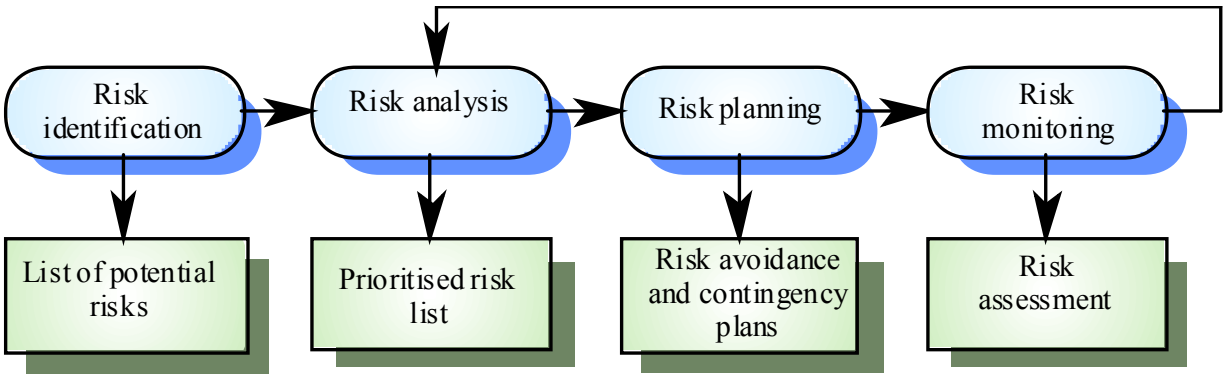
Assess the likelihood and consequences of these risks;

Risk planning

Draw up plans to avoid or minimise the effects of the risk;

Risk monitoring

Monitor the risks throughout the project;



21. Hazard Identification

Systematic Processes

What Constitutes a Hazard?

A real or potential condition that, when activated, can transform into a series of interrelated events that result in damage to equipment or property and or injury to people.

Safety Managers View

- Hazard
  - An implied threat or danger, a potential condition waiting to become a loss

- Stimulus
    - Required to initiate action from potential to kinetic
    - May be a:
        - Component out of tolerance
        - Maintenance failure
        - Operator failure
        - Any combination of other events and conditions

When Do We Look for Hazards?

The 5 Common Phases of a Systems Life Cycle

- Conceptual - Research
- Design (Validation & Verification)
- Development (Full-scale engineering & production)
- Operational Deployment
- Termination & Disposal

Hazard Severity

A key factor in establishing a common understanding of a safety programs goal

MIL-STD 882 suggests four categories

- Cat 1: Catastrophic
- Cat 2: Critical
- Cat 3: Marginal
- Cat 4: Negligible

Hazard Analysis Methods

- Failure Modes & Effects Analysis (FMEA)
    - Systematic look at hardware piece by piece
    - Review of how each component could fail
    - Considers how a failure effects other components, sub-systems and systems as a whole
    - Risk assessment accomplished (severity & probability)
- Risk Assessment Code (RAC) assigned
- Fault Tree Analysis (FTA)
    - Detailed review of a specific undesirable event
    - Deductive in nature
    - Top-down effort

  - Normally reserved for critical failures or mishaps
- May be qualitative or quantitative
- Operating Hazard Analysis (OHA)
  - Also known as Operating & Support Hazard Analysis (O&SHA)
  - "What if" tool brings user into the loop
- Integrates people and procedures into the system
  - Diagrams the flow or sequence of events
- Project Evaluation Tree (PET) may be used for OHA accomplishment
  - Systematic evaluation of man, machine, & procedures

22. PURPOSE OF THE RISK MANAGEMENT PLAN

A risk is an event or condition that, if it occurs, could have a positive or negative effect on a project's objectives. Risk Management is the process of identifying, assessing, responding to, monitoring and controlling, and reporting risks. This Risk Management Plan defines how risks associated with the<Project Name> project will be identified, analyzed, and managed. It outlines how risk management activities will be performed, recorded, and monitored throughout the lifecycle of the project and provides templates and practices for recording and prioritizing risks by the Risk Manager and/or Risk Management Team.

Risks related to IT systems or applications must be identified and documented based on the methodology in NIST SP 800-30, Risk Management Guide for Information Technology Systems. IT system or application weaknesses must be identified on an associated plan of action and milestones (POA&M) and tracked in accordance with HHS POA&M guidelines. Appropriate protective measures must be taken to safeguard sensitive IT system or application weaknesses or vulnerabilities from unauthorized disclosure.

22.1 RISK RESPONSE PLANNING

Each major risk (those falling in the Red & Yellow zones) will be assigned to a risk owner for monitoring and controlling purposes to ensure that the risk will not "fall through the cracks".

For each major risk, one of the following approaches will be selected to address it:

- **Avoid** – Eliminate the threat or condition or to protect the project objectives from its impact by eliminating the cause
- **Mitigate** – Identify ways to reduce the probability or the impact of the risk
- **Accept** – Nothing will be done
- **Contingency** –Define actions to be taken in response to risks
- **Transfer** – Shift the consequence of a risk to a third party together with ownership of the response by making another party responsible for the risk (buy insurance, outsourcing, etc.)

22.3 RISK MONITORING, CONTROLLING, AND REPORTING

The level of risk on a project will be tracked, monitored and controlled and reported throughout the project lifecycle. [Describe the methods and metrics that will be used to track the project's risk status throughout the lifecycle as well as how this status will be reported to the stakeholders/ management.]

Risks will be assigned a risk owner(s) who will track, monitor and control and report on the status and effectiveness of each risk response action to the Project Manager and Risk Management Team on a <insert timeframe>.

A "Top 10 Risk List" will be maintained by the PM/Risk Manager or IPT and will be reported as a component of the project status reporting process for this project.

All project change requests will be analyzed for their possible impact to the project risks.

As Risk Events occur, the list will be re-prioritized during weekly reviews and risk management plan will reflect any and all changes to the risk lists including secondary and residual risks.

Management will be notified of important changes to risk status as a component to the Executive Project Status Report. [State timeframe, i.e., every two weeks]

The Risk Manager (PM) will:

- Review, reevaluate, and modify the probability and impact for each risk item [timeframe, as needed, every two weeks, etc.]
- Analyze any new risks that are identified and add these items to the risk list (or risk database).
- Monitor and control risks that have been identified
- Review and update the top ten risk list [timeframe, as needed, every two weeks, etc.]
- Escalate issues/ problems to management [List factors that would need to be escalated to management. Examples: documented mitigation actions are not effective or producing the desired results; the overall level of risk is rising.]

The Risk Owner will:

- Help develop the risk response and risk trigger and carry out the execution of the risk response, if a risk event occurs.
- Participate in the review, re-evaluation, and modification of the probability and impact for each risk item on a weekly basis.
- Identify and participate in the analysis of any new risks that occur.
- Escalate issues/problems to PM that,

  Significantly impact the projects triple constraint or trigger another risk event to occur.

  Require action prior to the next weekly review

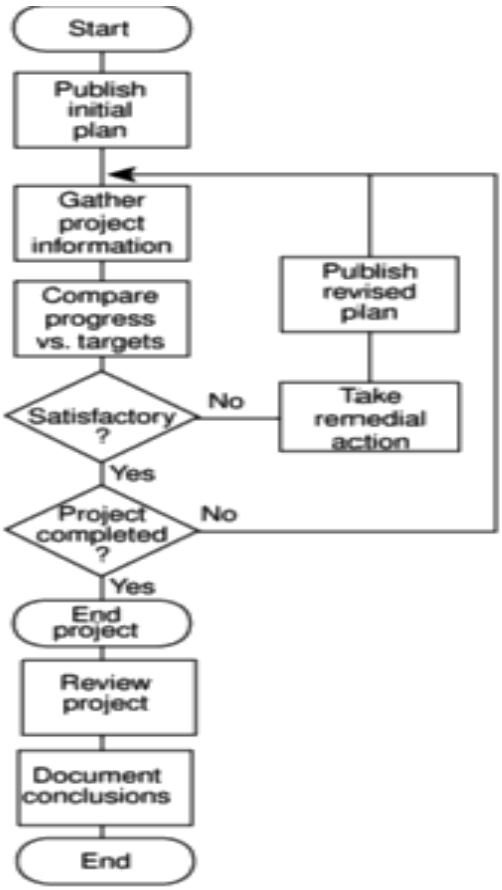
Risk strategy is not effective or productive causing the need to execute the contingency plan.

UNITIV MONITORINGANDCONTROL

CreatingFramework– Collecting TheData–VisualizingProgress –CostMonitoring– EarnedValue–PrioritizingMonitoring–GettingProjectBackToTarget–Change Control– ManagingContracts– Introduction– TypesOfContract–StagesInContract Placement–Typical Terms OfAContract –Contract Management– Acceptance.

23. Creating framework

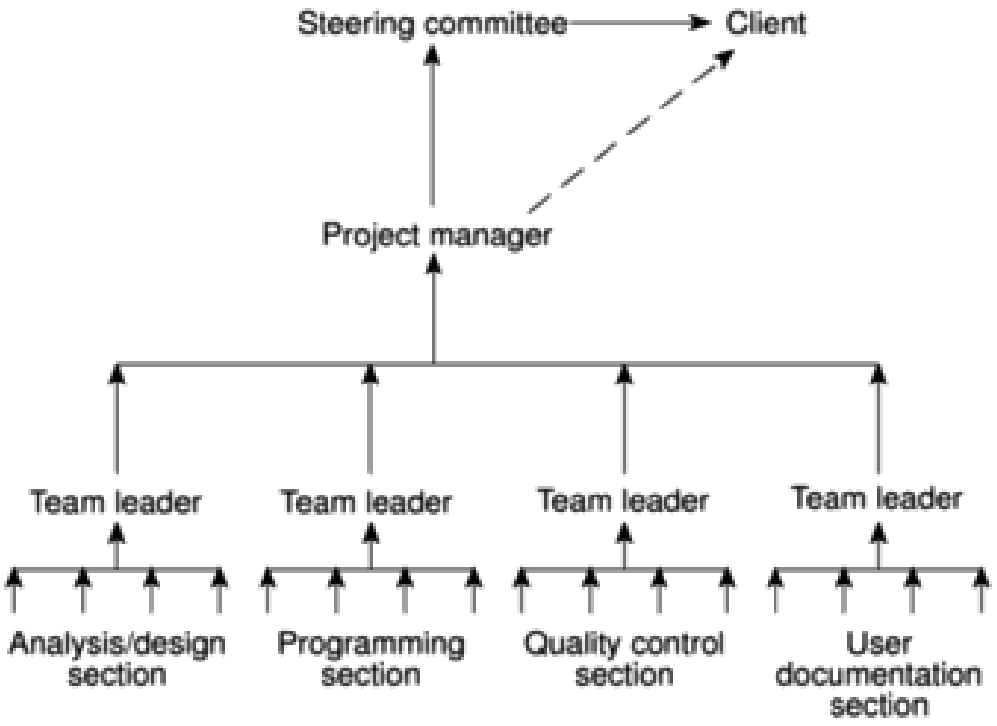
Project control cycle



Responsibility

- Project steering committee
- Project board
- Reporting formal or informal

Assessing progress



Setting checkpoints

- Regular
- Tied to specific events

Taking snapshots

- Review points or control points
- Assess progress daily

24. Collecting data

Contents

- Partial completion reporting
- Risk reporting

Time Sheet:

Time Sheet

Staff John Smith **Week ending** 26/3/99

Rechargeable hours

Project	*Activity code*	*Description*	*Hours this week*	*% Complete*	*Scheduled completion*	*Estimated completion*
P21	A243	Code mod A3	12	30	24/4/99	24/4/99
P34	B771	Document take-on	20	90	1/4/99	29/3/99

Total recharged hours	32

Non-rechargeable hours

Code	*Description*	*Hours*	*Comment & authorization*
z99	day in lieu	8	Authorized by RB

Total non-rechargeable hours	8

Activity Assessment Sheet:

Activity Assessment Sheet

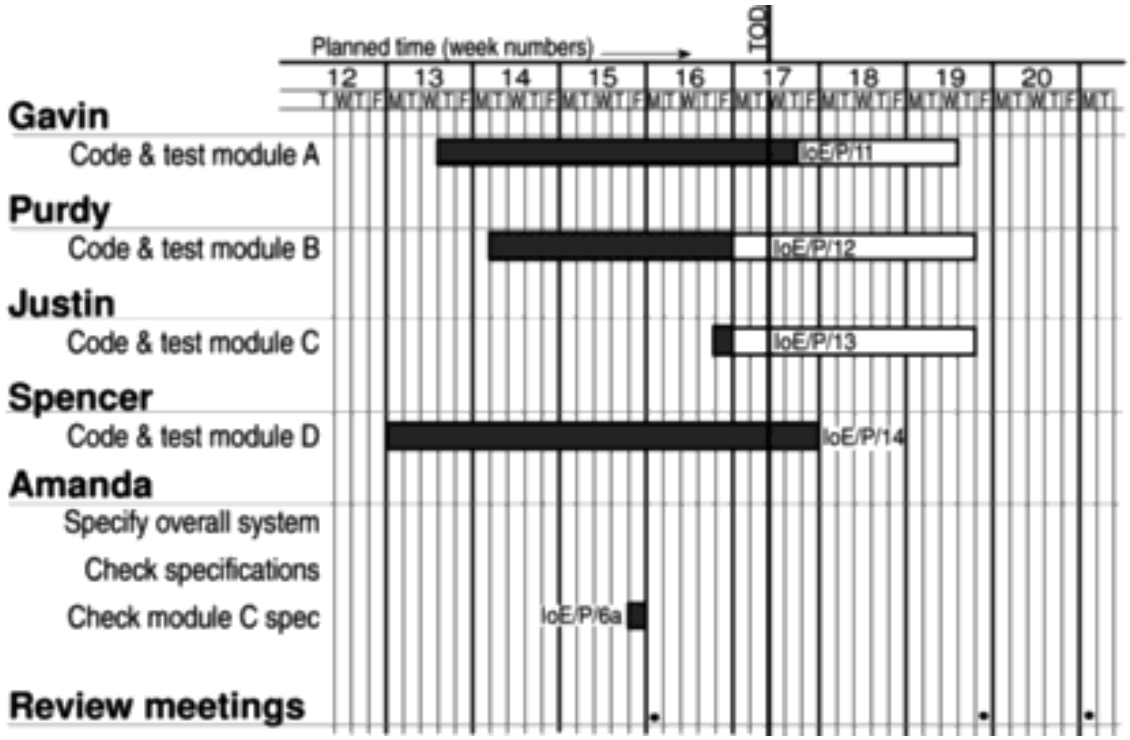
Staff Justin

Ref: IoE/P/13 **Activity: Code & test module C**

Week number	13	14	15	16	17	18	
Activity Summary	G	A	A	R			
Component							*Comments*
Screen handling procedures	G	A	A	G			
File update procedures	G	G	R	A			
Housekeeping procedures	G	G	G	A			
Compilation	G	G	G	R			
Test data runs	G	G	G	A			
Program documentation	G	G	A	R			

25. Visualizing progress:

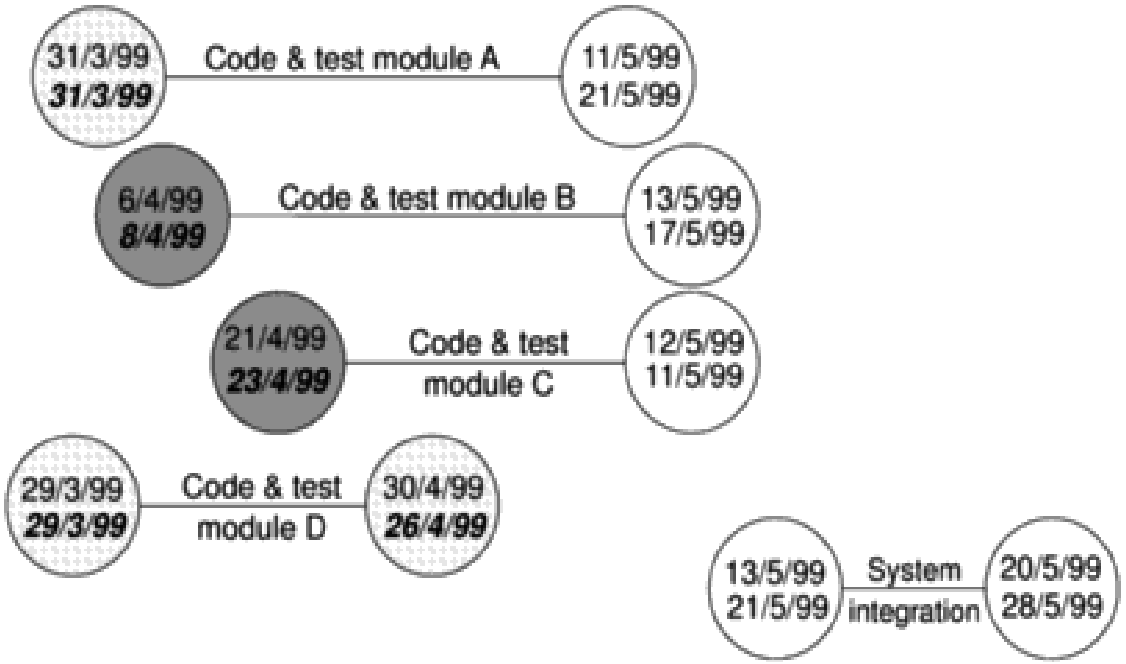
Gantt chart:



Slip chart

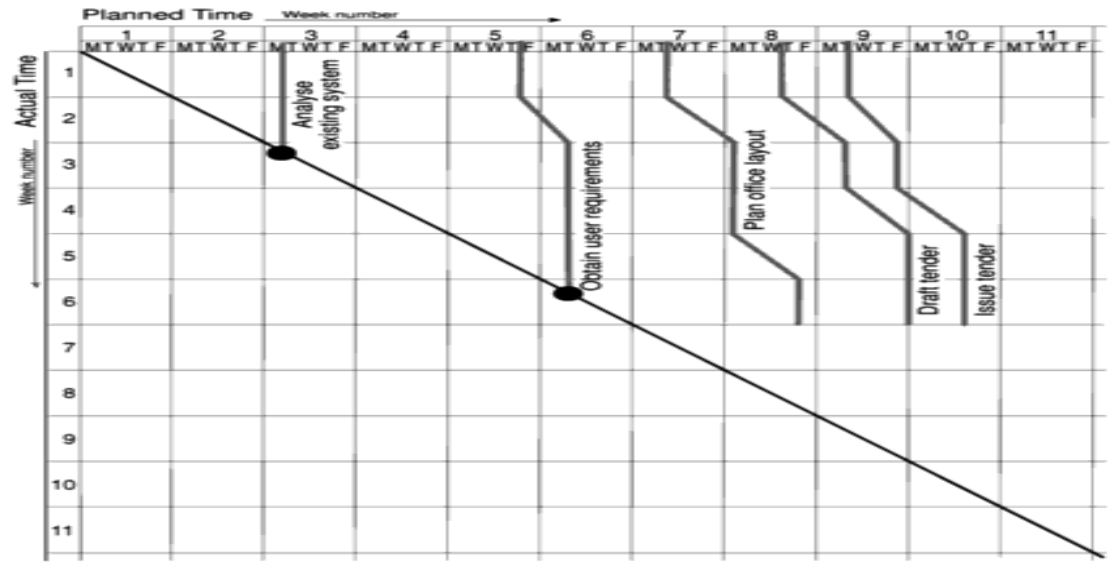
- provides visual indication of activities which are not progressing in schedule

Ball charts -Shows whether or not targets have been met



Time lining:

- Records and displays how the targets have changed throughout the duration of project

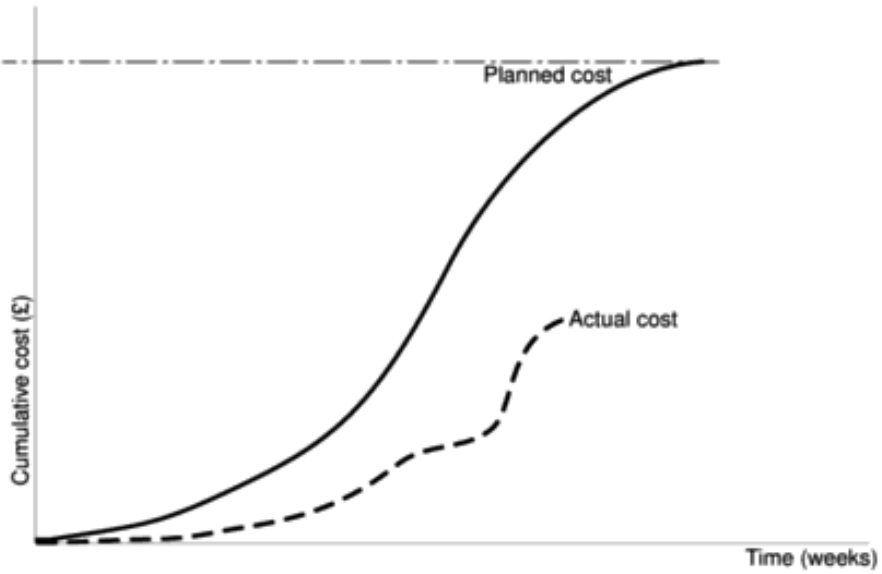


26. Cost monitoring:

- Expenditure monitoring
- Framing cumulative expenditure chart
- Projected future costs

- Computer-based planning tool

Tracking expenditure



26. Earned value:

Earned value analysis

- Assigns a value to each task
- BCWS
- Baseline budget
- BCWP-budgeted cost of work performed

Technique

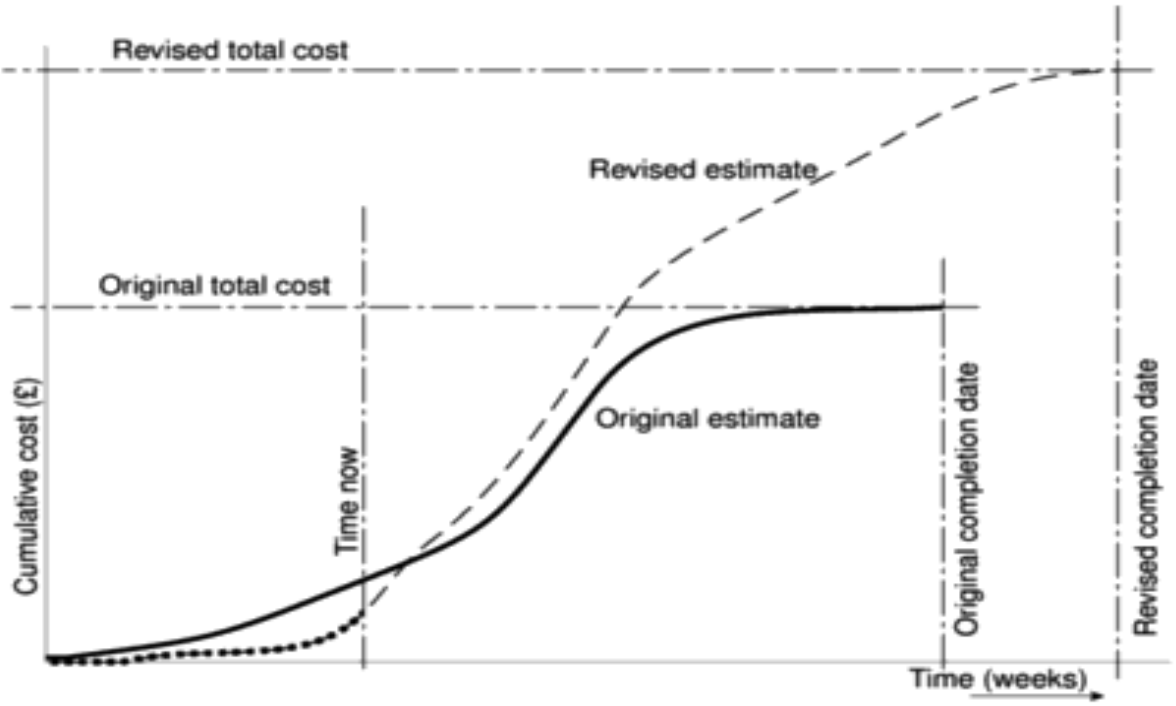
- The 0/100 technique
- The 50/50 technique
- The mile stone technique

The baseline budget

- First stage in baseline budget
- Forecast growth

- Specify overall system

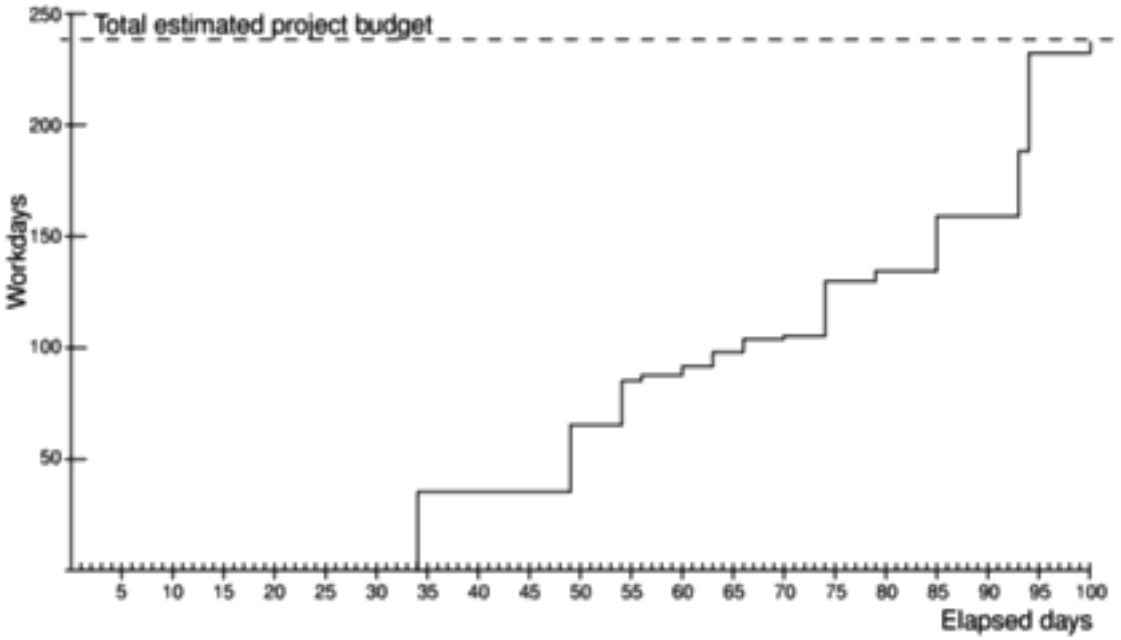
Expenditure chart



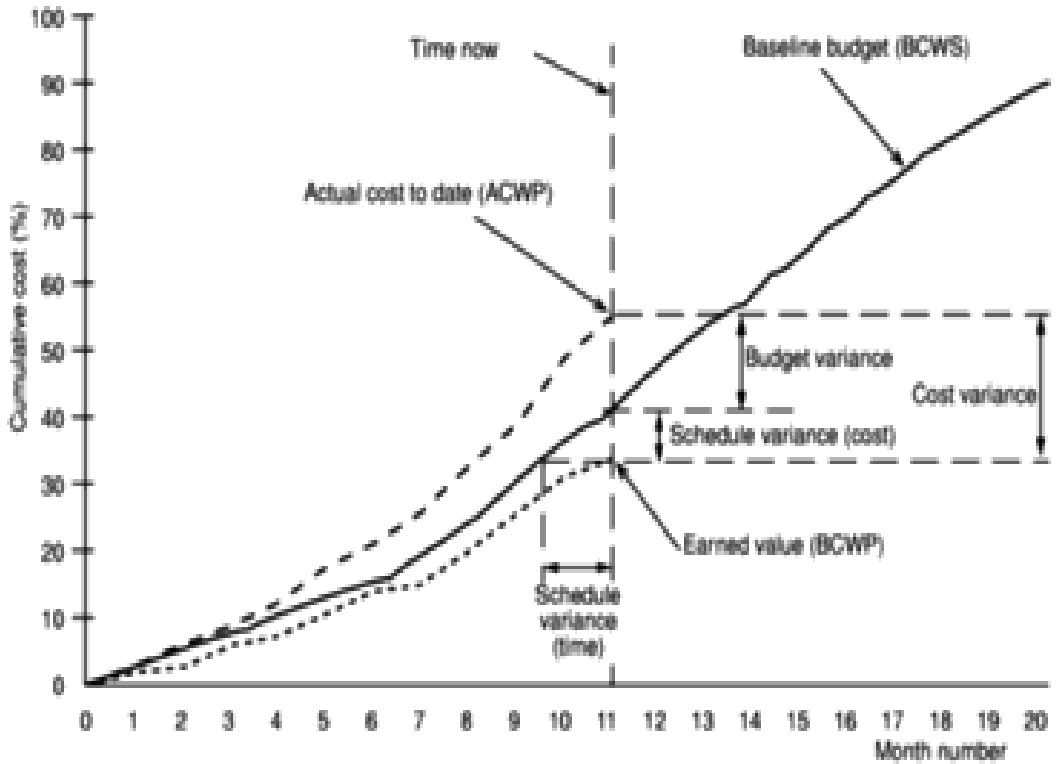
Baseline budget calculation

Task	*Budgeted workdays*	*Scheduled completion*	*Cumulative workdays*	*% cumulative earned value*
Specify overall system	34	34	34	14.35
Specify module B	15	49	} 64	27.00
Specify module D	15	49		
Specify module A	20	54	84	35.44
Check specifications	2	56	86	36.28
Design module D	4	60	90	37.97
Design module A	7	63	97	40.93
Design module B	6	66	103	43.46
Check module C spec	1	70	104	43.88
Specify module C	25	74	129	54.43
Design module C	4	79	133	56.12
Code & test module D	25	85	158	66.67
Code & test module A	30	93	188	79.32
Code & test module B	28	94	} 231	97.47
Code & test module C	15	94		
System integration	6	100	237	100.00

Milestone earned value



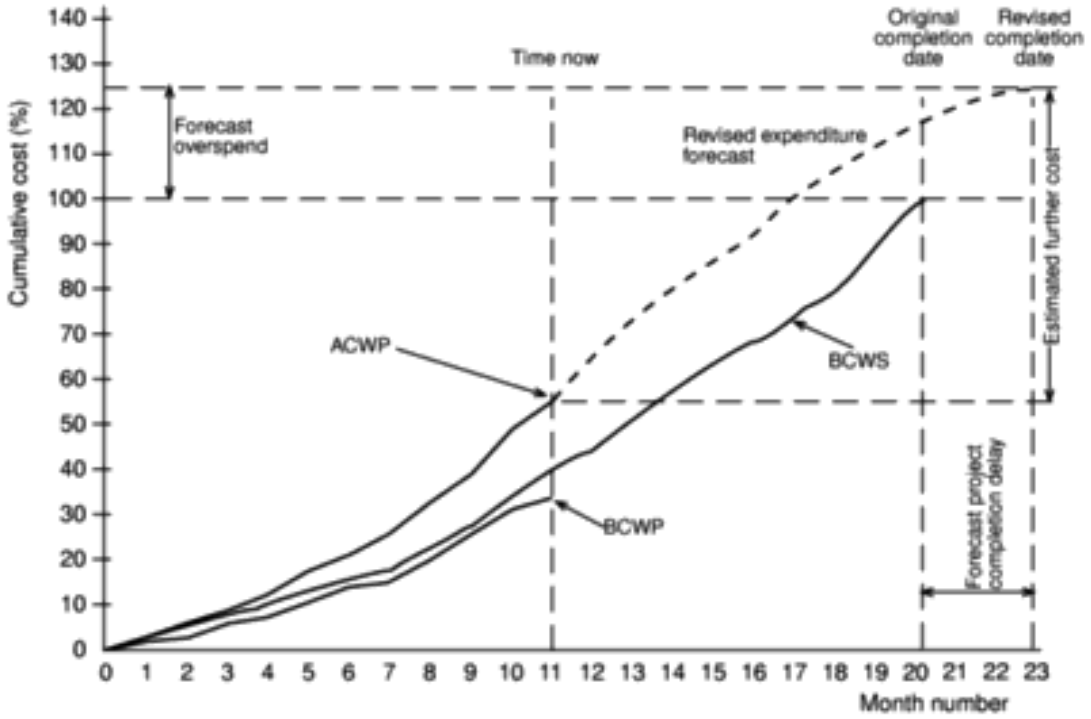
Earned value tracking chart



Performance statistics from earned value chart

- Budget variance
- Schedule variance
- Coast variance
- Performance ratios Schedule performance index SPI=BCWP/BCWS

Earned value charts with revised forecasts



Definition:

Earned value analysis is a method of performance measurement. Earned value integrates cost, schedule and scope and can be used to forecast future performance and project completion dates. It allows projects to be managed better – on time, on budget.

Three quantities form the basis for cost performance measurement using Earned Value Management. They are

1. Budgeted Cost of Work Scheduled (BCWS) or Planned Value (PV)
2. Budgeted Cost of Work Performed (BCWP) or Earned Value (EV) and
3. Actual Cost of Work Performed (ACWP) or Actual Cost (AC).

The above quantities are defined below.

• **Budgeted Cost of Work Scheduled (BCWS)** or **Planned Value (PV)**

– The sum of budgets for all work packages scheduled to be accomplished within a given time period.

• **Budgeted Cost of Work Performed (BCWP)** or **Earned Value (EV)**

– The sum of budgets for completed work packages and completed portions of open work packages.

• **Actual Cost of Work Performed (ACWP)** or **Actual Cost (AC)**

– The actual cost incurred in accomplishing the work performed within a given time period. For equitable comparison, ACWP is only recorded for the work performed to date against tasks for which a BCWP is also reported.

From these three quantities we can determine our total program budget as well as make a determination of schedule and cost performance and provide an estimated cost of the project at its completion. Additional terms are defined to record cost and schedule performance and program budget:

• **Schedule Variance (SV)**

– The difference between the work actually performed (BCWP) and the work scheduled (BCWS). The schedule variance is calculated in terms of the difference in dollar value between the amount of work that should have been completed in a given time period and the work actually completed.

• **Cost Variance (CV)**

– The difference between the planned cost of work performed (BCWP) and actual cost incurred for the work (ACWP). This is the actual dollar value by which a project is either overrunning or under running its estimated cost

Two Performance Ratios:

• **Cost Performance Index (CPI)**

– The ratio of cost of work performed (BCWP) to actual cost (ACWP). CPI of 1.0 implies that the actual cost matches to the estimated cost. CPI greater than 1.0 indicates work is accomplished for less cost than what was planned or budgeted. CPI less than 1.0 indicates the project is facing cost overrun.

• **Schedule Performance Index (SPI)**

– The ratio of work accomplished (BCWP) versus work planned (BCWS), for a specific time period. SPI indicates the rate at which the project is progressing.

• **Estimate at Completion (EAC)**

– It is a forecast of most likely total project costs based on project performance and risk quantification. At the start of the project BAC and EAC will be equal. EAC will vary from BAC only when actual costs (ACWP) vary from the planned costs (BCWP).

4.5.2. Earned Value Management Formula:

Name	Formula
Cost Variance (CV)	EV – AC
Schedule Variance (SV)	EV – PV
Time Variance (TV)	Difference between the time when the achievement of the current earned value was planned to occur and the time now
Cost Performance Index (CPI)	EV / AC
Schedule Performance Index (SPI)	EV / PV

27. Prioritizing monitoring

- Critical path activities
- Activities with no free float
- Activities with less than a specified float
- High risk activities
- Activities using critical resources

28. Getting the project back to target:

2 Strategies

- Shortening the critical path
- Altering the activity precedence requirements

Shorten critical path

- Speed up non-critical path activities
- Fact finding
- Time/cost trade off

Reconsider the precedence requirements

- Normal working practices
- Subdivide to components
- Assess changes

29. Change control:

- A change in program specification
- Change program design and then code

Change control procedures

Change control procedures

A simple change control procedure for operational systems might have the following steps.

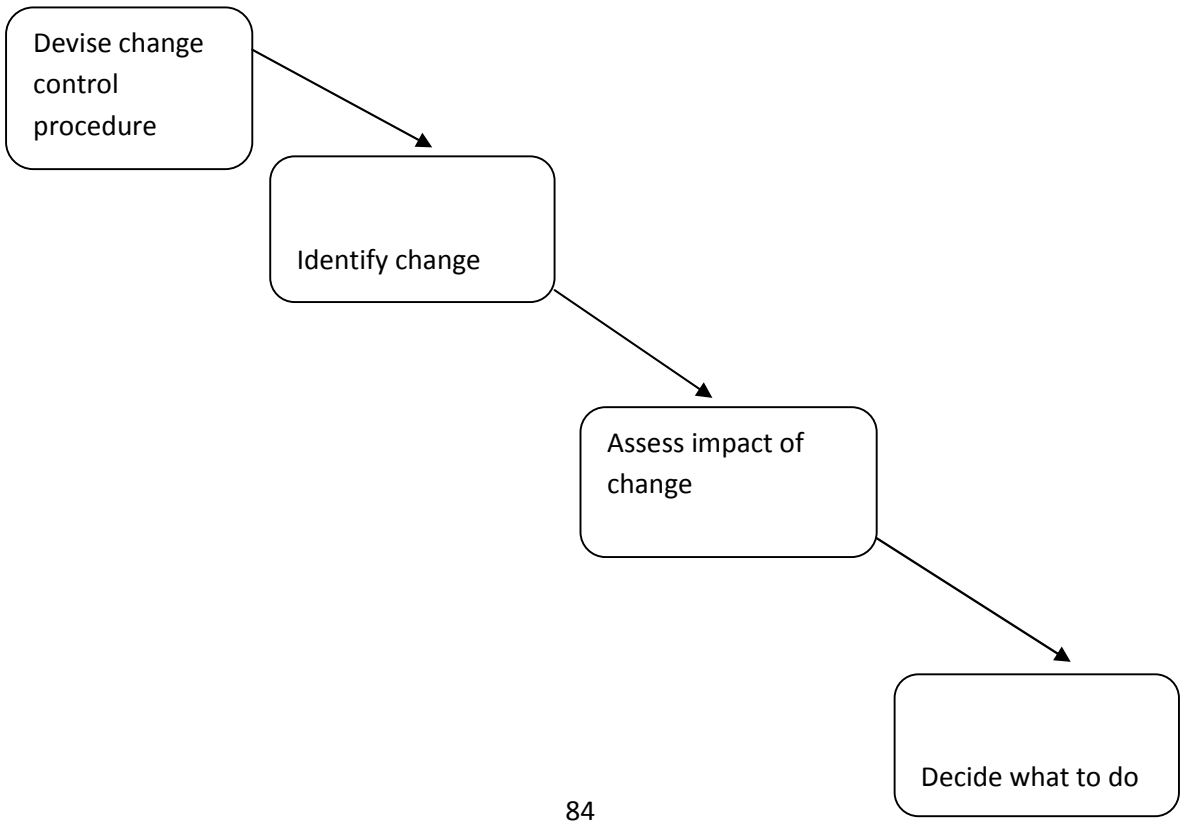
1. One or more users might perceive a need for a modification to a system and ask for a change request to be passed to the development staff.
2. The user management consider the change request and if they approve it pass it to the development management.
3. The development management delegate a member of staff to look at the request and to report on the practicality and cost of carrying out the change. They would, as part of this, assess the products that would be affected by the change.
4. The development management report back to the user management on the findings and the user management decide whether, in view of the cost quoted, they wish to go ahead.
5. One or more developers are authorized to take copies of the master products that are to be modified.
6. The copies are modified. In the case of software components this would involve modifying the code and recompiling and testing it.
7. When the development of new versions of the product has been completed the user management will be notified and copies of the software will be released for user acceptance testing.
8. When the user is satisfied that the products are adequate they will authorize their operational release. The master copies of configuration items will be replaced.

The role of configuration librarian:

- Identifying items that need to be subject to change control
- Management of a central repository of the master copies of software and documentation
- Administering change procedure.
- Maintenance of access records

Typical change control process

- One or more users might perceive the need for a change
- User management decide that the change is valid and worthwhile and pass it to development management
- A developer is assigned to assess the practicality and cost of making the change
- Development management report back to user management on the cost of the change; user management decide whether to go ahead
- One or more developers are authorized to make copies of components to be modified
- Copies modified. After initial testing, a test version might be released to users for acceptance testing .
- When users are satisfied then operational release authorized – master configuration items updated .



Change control and configuration management

- **Change control**

  – Set of procedures to ensure that changes made only after a consideration of the full impacts.

- **Configuration management**

  – Version control to ensure that all changes are properly recorded and managed – and so that knock-on effects on other projects can be identified.

30. Managing contracts:

Contract administration is the management of contracts made with customers, vendors, partners, or employees.The personnel involved in Contract Administration required to negotiate, support and manage effective contracts are expensive to train and retain. Contract management includes negotiating the terms and conditions in contracts and ensuring compliance with the terms and conditions, as well as documenting and agreeing on any changes or amendments that may arise during its implementation or execution. It can be summarized as the process of systematically and efficiently managing contract creation, execution, and analysis for the purpose of maximizing financial and operational performance and minimizing risk.

CHANGE MANAGEMENT:

There may be occasions where what is agreed in a contract needs to be changed later on. A number of bases may be used to support a subsequent change, so that the whole contract remains enforceable under the new arrangement.

A change may be based on:

- A mutual agreement of both parties to vary the contract, outside the framework of the existing contract. This would be an independent basis for changing the contract.
- A unilateral decision to vary the contract, contemplated and allowed for by the existing contract. This would normally have notice periods for fairness and often the right of the other, especially in consumer contracts, to cease the contractual relationship. Be careful that any one-way imposition of change is contractually justified, otherwise it may be interpreted as a repudiation of the original contract, enabling the other party to terminate the contract and seek damages.
- A bilateral decision to vary the contracting, within the variation or change control process outlined in the existing contract. These are often called change control provisions.

31. Types of contract

- Completed software application
  - Bespoke
  - Off-the shelf

- Customized off-the shelf

- Payment calculation
    - Fixed price contracts
    - Time and material contracts
    - Fixed price per delivered unit contracts

31.1 Fixed price contracts:

- Advantage:
    - Known customer expenditure
    - Supplier motivation
- Disadvantage
    - Higher prices to allow for contingency
    - Difficulties in modifying
    - Upward pressure on the cost changes
    - Thread to system quality

31.2 Time and material contracts

- Advantage:
    - Ease of changing requirements
    - Lack of price pressure
- Disadvantage:
    - Customer liability
    - Lack of supplier

31.3 Fixed price per unit delivered contracts:

Function point count	*Function design cost per FP*	*Implementation cost per FP*	*Total cost per FP*
Up to 2,000	$242	$725	$967
2,001–2,500	$255	$764	$1,019
2,501–3,000	$265	$793	$1,058
3,001–3,500	$274	$820	$1,094
3,501–4,000	$284	$850	$1,134

Fixed price per unit delivered contracts

- Advantage:
    - Customer understanding
        - Comparability
        - Emerging functionality
        - Supplier efficiency
        - Life cycle change
- Disadvantage:
    - Difficulties with s/w size measurement
    - Changing

Based on contractor selection

- Open tendering
- Restricted
- negotiated

Stages in contract placement

- Requirement analysis

- OR
- Mandatory
- Desirable

Sections in requirement document:

	Section name
1	Introduction
2	A description of any existing systems and the current environment
3	The customer's future strategy or plans
4	System requirements • mandatory • desirable
5	Deadlines
6	Additional information required from potential suppliers

Evaluation plan:

- Draw up plan account to proposals
- Opposed to off the shelf application
- Mandatory requirements are identified
- Value for money

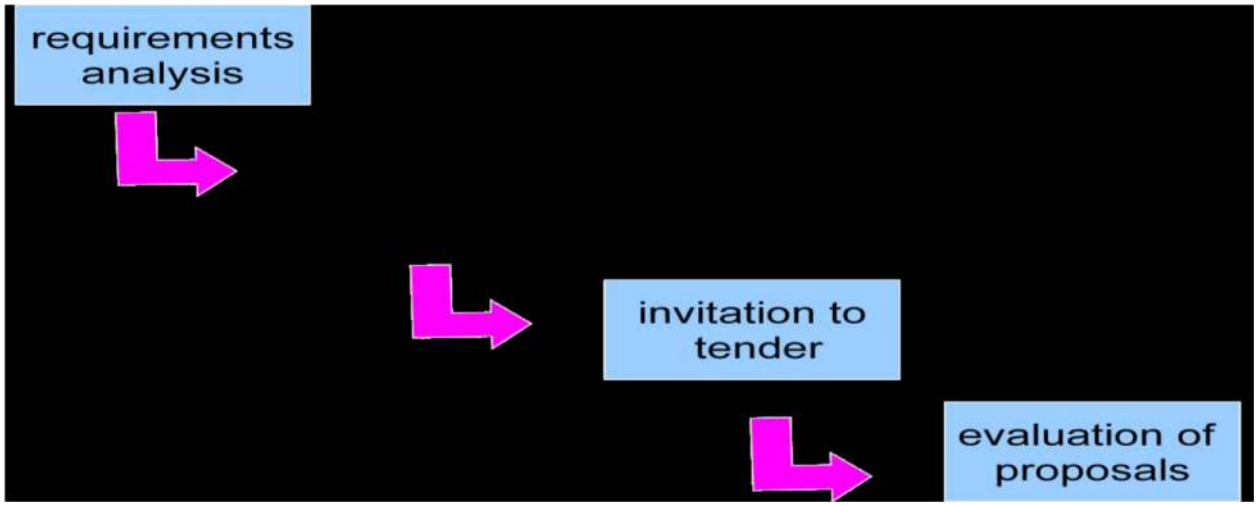
31.4 Typical terms of a contract:

- Definitions
- Forms of a agreement
- Goods and services to be supplied
- Services to be provided
- Ownership of the software

Acceptance

- Acceptance tests
- Internal test plans
- Pitfalls
- Very short warranty period

STAGES IN CONTRACT PLACEMENT AND TYPICAL TERMS OF A CONTRACT



Requirements document

• Introduction

• Description of existing system and current environment

• Future strategy or plans
• System requirements -
– Mandatory/desirable features
• Deadlines
– Functions in software, with necessary inputs and outputs
– Standards to be adhered to
– Other applications with which software is to be compatible
– Quality requirements e.g. response times
• Additional information required from bidders

Evaluation plan

• How are proposals to be evaluated?
• Methods could include:
– reading proposals

– Interviews
– Demonstrations
– Site visits
– Practical tests

Invitation to tender (ITT)

• Note that bidder is making an offer in response to ITT
• Acceptance of offer creates a contract
• Customer may need further information
• Problem of different technical solutions to the same problem

Memoranda of agreement (MoA)

• Customer asks for technical proposals
• Technical proposals are examined and discussed
• Agreed technical solution in MoA
• Tenders are then requested from suppliers based in MoA
• Tenders judged on price
• Fee could be paid for technical proposals by customer

32. CONTRACT MANAGEMENT

Contracts should include agreement about how customer/supplier relationship is to be managed e.g.

– Decision points - could be linked to payment
– Quality reviews
– Changes to requirements

33.ACCEPTANCE

• When work is completed, customer needs to carry out acceptance testing.
• Contract may put a time limit to acceptance testing – customer must perform testing bf time expired.
• Part or all payment to the supplier should depend on acceptance testing

Acceptance criteria are defined as "the list of requirements that must be satisfied prior to the customer accepting delivery of the product".

This document defines the acceptance process, the acceptance criteria, and the review/approval required for customer acceptance of the (Agency name) (project name) project deliverables.

The purpose of this document is to define a standardized Deliverable Review Process, which will provide a structured method to support the Agency Software Verification and Validation Plan (SVVP) to ensure that appropriate, correct, consistent, and complete deliverables are created for the project.

This document describes:

- Goals of the review process;
- Definitions;
- Meeting participants, roles, and responsibilities;
- Review process;
- Dispositions for the review meeting; and
- Review exit criteria.

The primary goal of the Deliverable Review Process is to detect and remove deliverable defects as early as possible in the Software Development Life Cycle (SDLC) process.

Secondary goals to be attained are:

- Consistency with IEEE Std 1028-1997, Standard for Software Reviews;
- Ensure correctness, completeness, consistency, and accuracy of deliverables and products for all life cycle activities within the development process;

Acceptance Process for Project Deliverables

The acceptance process for (Project Name) provides a roadmap for incremental acceptance by the customer of the software application and associated project deliverables at the following key milestones.

- Project Phase Concept Complete
- Phase Requirements Complete
- Phase Design Complete
- Phase Application Ready For Pilot
- Phase Application Ready For Statewide Rollout
- Phase Complete

Milestone	**Deliverables**
Project Phase Concept Complete	Project Initiation and Implementation Document, Software Project Management Plan
Phase Requirements Complete	Software Requirements Specification Template
Phase Design Complete	Software Design Specification
Phase Application Ready For Pilot	Application, Software Test Plan, Software Transition Plan, Training Plan, User's Handbook, Business

Milestone	Deliverables
Phase Application Ready For Statewide Rollout	Application, Software Test Plan, Software Transition Plan, Training Plan, User's Handbook, Business
Phase Complete	Closeout Review, Lessons-learned

Activity	Individual(s) Responsible
Define acceptance criteria for milestones and deliverables in the current project phase	QA Manager, Project Manager, IS Sponsor, and Business Sponsor(s) for
Identify and plan for verification and validation activities necessary to support acceptance criteria	QA Manager and Project Manager
Complete project deliverables for milestone	Project team members responsible for project deliverable
Ensure completion of any necessary verification and validation activities for deliverables	QA Manager and Project Manager

Acceptance Criteria for Milestones and Deliverables

The acceptance criteria in the table below define the conditions under which the PROJECT Business Sponsor(s), the PROJECT IS Sponsor, and the Project Manager agree that they will accept completion of the milestones and deliverables subject to these acceptance criteria.

Milestone	Deliverable	Acceptance Criteria
Project Phase Concept Complete	Project Initiation and Implementation Document	Document has been reviewed and approved by: Prioritized scope and high level requirements have
Project Phase Concept Complete	Software Project Management Plan	Document has been reviewed and approved by: Prioritized scope and high level requirements have
Phase Requirements Complete	Software Requirements Specification	The Software Requirements Specification describes what capabilities the application should have and includes:

UNITV MANAGINGPEOPLEAND ORGANIZINGTEAMS

Introduction–UnderstandingBehaviour–Organizational Behaviour: ABackground–SelectingTheRightPersonForTheJob–InstructionInTheBestMethods–Motivation –TheOldman–HackmanJobCharacteristicsModel–WorkingInGroups–Becoming ATeam–DecisionMaking–Leadership–OrganizationalStructures– Stress–Health AndSafety–CaseStudies.

34. INTRODUCTION

- OB = organizational behaviour
- There are 3 main concerns in OB; staff selection, staff development, and staff motivation
- We will look at how the project leader can encourage effective group working and decision making while giving purposeful leadership where needed.
- The issues in this chapter have impact at all stages of project planning and execution, particularly in;
    - Some objectives can address health and safety during the project (step 1: Identify project scope and objectives)
    - Although project leaders might have little control over organizational structure, they need to be aware of its implications (step2: Identify project infrastructure)
    - The scope and nature of activities can be set in a way they will enhance staff motivation (Step 4: Identify the products and activities)
    - Many risks to project success relate to staffing (Step 6: Identify activity risks)
    - The qualities of individual members of staff should be taken into account when allocating staff to activities (Step 7: Allocate resources)

35. Understanding behaviour

Behaviours associated with complex and challenging mental health, dementia or other neurological conditions include aggression, wandering, agitation. These apparent changes in the personality of the person with the disease are a major source of distress both to the person who is presenting the behaviours and to those who experience them – the caregiver, the family members, and the service providers in all sectors of the health-care system.

People differ from each other in their needs and values. Group effort eases their task of achieving organizational goals effectively. Human relations can be defined as motivating people in organizations to work as a team. Although human relationships have existed from quite some time in the past, the study of human relations has developed only recently. Social sciences like sociology, psychology, anthropology, economics and political science have contributed to the development of OB and human relations.

Goal of Human Relations

- Create a win-win situation by:
  - satisfying employee needs
  - while achieving organizational objectives
- Win-win situation:
  - occurs when the organization and the employees get what they want

Four Myths of Human Relations

- Myth 1: Technical skills are more important than human relations skills
- Myth 2: Human relations is just common sense
- Myth 3: Diversity is overemphasized
- Myth 4: Leaders are born not made

The Total Person Approach

- Realizes that an organization employs the whole person, not just his or her job skills
- People play many roles
  - throughout their lives
  - throughout each day
- Organizations view employees as total people
- Organizations are trying to give employees a better quality of work life

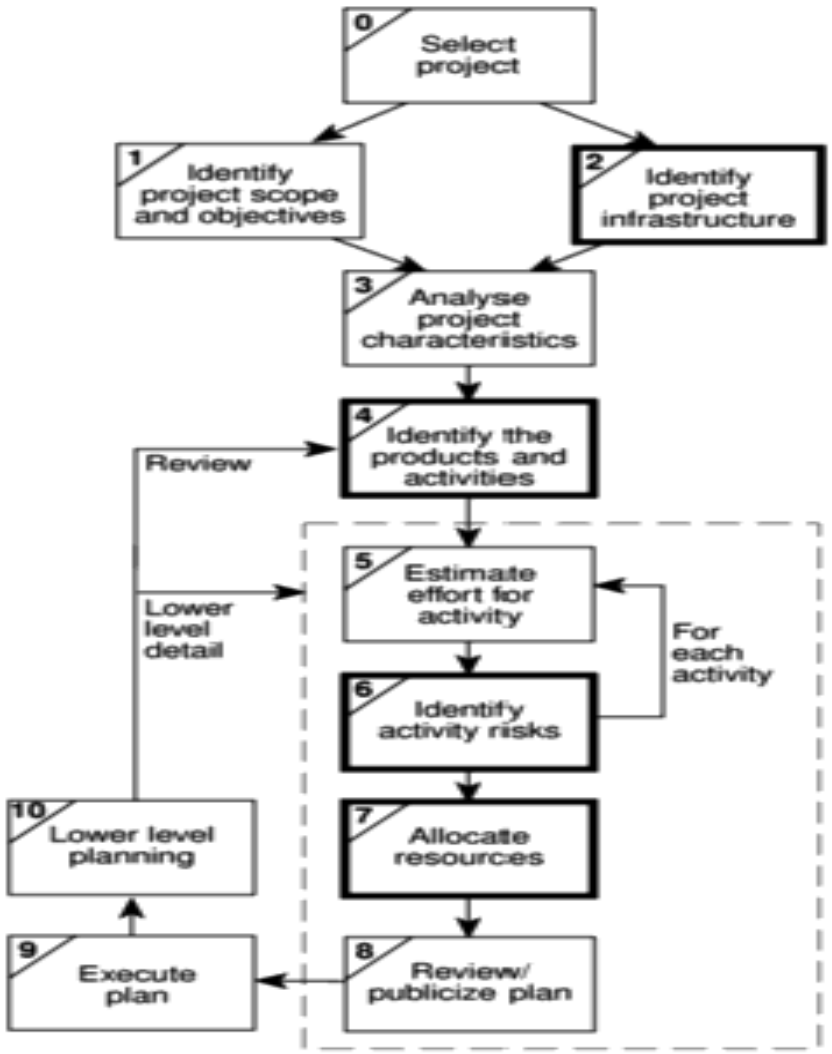
Levels of Behavior

- **Individual behavior –** influences group behavior
- **Group Level Behavior-–** consists of the things two or more people do and say as they interact

Organizational Level Behavior

- Organization – a group of people working to achieve an objective
- Created to produce goods and services for the larger society
- Organizational behavior – the collective behavior of an organization's individuals and groups

STEPWISE FRAMEWORK:



36. ORGANIZATIONAL BEHAVIOUR: A BACKGROUND

- OB was studied by Frederick Taylor in the late 19th and early 20th centuries
- Taylor attempted to analyse the most productive way of doing manual tasks
- Taylor had 3 basic objectives:
  - to select the best people for the job
  - to instruct them in the best methods
  - to give incentives in the form of higher wages to the best workers

- Taylor's view emphasize on the financial basis of staff motivation, however, the other issues of motivation should be encouraged staff not just on such rewards.

- Theory X and Theory Y by Donald McGregordraws attention to the way that expectations influence behaviour

Theory X holds that:

- The average human has an innate dislike of work
- There is a need therefore for coercion, direction and control
- People tend to avoid responsibility

Theory Y holds that:

- Work is as natural as rest or play
- External control and coercion are not the only ways of bringing about effort directed towards and organization's ends
- Commitment to objectives is a function of the rewards associated with their achievement
- The average human can learn to accept and further seek responsibility
- The capacity to exercise imagination and other creative qualities is widely distributed

- One way of judging whether a manager espouses Theory X or Theory Y is to observe how staff react when the boss is absent:
- If there is no discernible change then this is a Theory Y environment;
- If everyone visibly relaxes, it is a Theory X environment

Therefore,

- A "reward" does not have to be a financial reward- it could be something like a sense of achievement
- Theory X and Theory Y illustrated how the state of mind of workers influenced their productivity

37. SELECT HE RIGHT PERSON FOR THE JOB

Taylor stressed " the need for the right person for the job".

Examples of question;

- What sort of characteristics should they be looking for?
- Is an experienced programmer better than a new graduate with a first class mathematics degree?

Recruitment is often an organizational responsibility

- There are 2 types of candidates that are distinguished by Meredith Belbin:

  @eligible candidate

  @suitable candidate

  - Eligible candidates have curriculum vitae (CV) which shows, for example, the 'right' number if years in some previous post and the 'right' paper qualifications.
  - Suitable candidates can actually do the job well
  - A mistake is to select an eligible candidate who is not in fact suitable
  - Thus, Belbin suggests we should try to assess actual skills rather than past experience and provide training to make good minor gaps in expertise
  - And it also has the general approach for recruitment process

38. INSTRUCTION IN THE BEST METHODS

- Create a job specification
- Create a job holder profile
- Obtain applicants
- Examine CVs
- Interviews (e.g. aptitude tests, personality tests and the examination of samples of previous work)
- Other procedures (e.g. medical examination)

What is the purpose of instruction?

- The purpose of instruction is to help people learn. The goal of instructional designers is to make learning easier, quicker, and more enjoyable. Some people view training as a process of finding out who the brightest employees are. But performance in a course is not very highly correlated with the basic ability to be good on the job. We believe that an instructional designer's job is to help everyone to learn and be successful.

Challenge: How to make good instruction?

- The key to improving our instruction is to know what methods of instruction to use when. It's helpful to think of different methods of instruction as different tools for a carpenter. If you only have a hammer, then everything looks like a nail to you. And you won't be able to make a very good piece of furniture. So what we need is a **knowledge base** about methods of instruction to supplement the creative, "art" aspect of training. Such a knowledge base would offer optimal **methods** for given situations.

- But what are the important **situations** that call for different methods? How can we tell what methods (tools) to use when?

What are the relevant kinds of learning?

Perhaps the most important aspect of the situation is the kind of learning that is to be facilitated. Knowing about the kinds of learning helps us to do a better job of teaching them. The most basic distinction is Benjamin Bloom's three domains:

• Cognitive learning (thoughts), such as teaching someone to add fractions.
• Affective learning (feelings, values), such as teaching someone to not want to smoke.
• Physical or motor learning (actions), such as teaching someone to touch type.

39. MOTIVATION

- The taylorist model
- Masloww's hierarchy of needs
- Herzberg's two factor theory
    - Hygiene or maintenance factors
    - Motivators
- The expectancy theory of motivation
    - Expectancy
    - Instrumentality
    - Perceived value

      The third of Taylor's concerns was that of motivating people to work
    - Thus, we are going to look at some models of motivation.
        - The Taylorist model
        - Maslow's hierarchy of needs
        - Herzberg's two-factor theory
        - The expectancy theory of motivation

The Taylorist model:

- Taylor's viewpoint is reflected in the use of piece-rates in manufacturing industries and sales bonuses amongst sales forces.
- Piece-rates can cause difficulties if a new system will change work practices.
- If new technology improves productivity, adjusting piece-rates to reflect this will be a sensitive issue.
- "Piece-rates" are where workers are paid a fixed sum for each item they produce.
- "Day-rates" refer to payment for time worked
- Rewards based on piece-rates need to relate directly to work produced
- So, this model emphasizes on the reward system

Maslow's hierarchy of needs:

- The motivation of individual varies.
- Money is a strong motivator when you are broke
- However, as the basic need for cash is satisfied, other motivations are likely emerge.
- In practice, people are likely to be motivated by different things at different stages of their life .

Herzberg's two-factor theory:

- Some things about a job can make you dissatisfied.
- If the causes of this dissatisfaction are removed, this does not necessarily make the job more exciting
- There are two sets of factors about a job:
    - Hygiene or maintenance factors
    - Motivators

- Hygiene or maintenance factors, which can make you dissatisfied if they are not right, for example the level of pay or the working conditions;

- Motivators, which make you feel that the job is worthwhile, like a sense of achievement or the challenge of the work itself

- A model of motivation developed by Vroom and his colleagues.
- It identifies three influences on motivation:
- expectancy: the belief that working harder will lead to a better performance
- instrumentality: the belief that better performance will be rewarded
- perceived value: of the resulting reward
- Motivation will be high when all three factors are high
- A zero level for any one of the factors can remove motivation

40. HACKMAN JOB CHARACTERISTICS MODEL:

- Managers should group together the elements of tasks to be carried out so that they form meaningful and satisfying assignments.
- Oldham and Hackman suggest that the satisfaction that a job gives is based on 5 factors
- The first three factors make the job 'meaningful' to the person who is doing it
- These three factors:

- skill variety: the number of different skills that the job holder has the opportunity to exercise

- task identify: the degree to which your work and its results are identifiable as belonging to you

- task significance: the degree to which your job has an influence on others

- The other two factors are:

  - **autonomy:** the discretion you have about the way that you do the job

  -**feedback**: the information you get back about the results of your works

- Methods of improving motivation;

  - Set specific goals: these goals need to be demanding and yet acceptable to staff. Involving staff in the setting of goals helps to gain acceptance for them.

  - Provide feedback: Not only do goals have to be set but staff have to have regular feedback about how they are progressing

  - Considering job design: Jobs can be altered to make them more interesting and give staff more feeling of responsibility

- Two measures are often used to enhance job design;

  - job enlargement-> The person doing the job carries out a wider variety of activities. It is opposite of increasing specialization

  - job enrichment -> The job holder carries out tasks that are normally done at a managerial or supervisory level

41. WORKING IN GROUPS:

- A problem with major software projects is that they always involve working in groups, and many people attracted to software development find this difficult.
- It is not easy for people from different backgrounds to work together as a team so it is suggested that teams should go through five basic stages of development.

42. BECOMING A TEAM:

- Forming
- Storming
- Norming
- Performing
- Adjourning

Forming: The members of the group get to know each other and try to set up some ground rules about behaviour

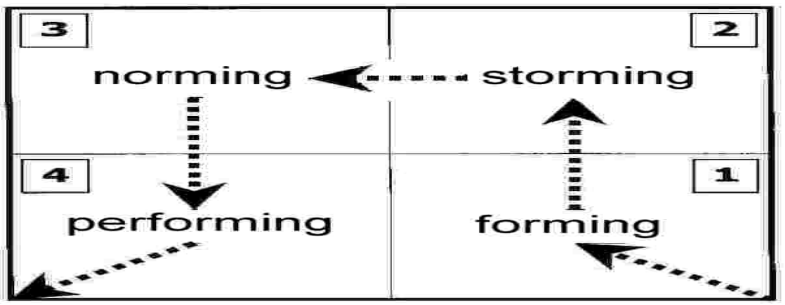
Storming: Conflicts arise as various members of the group try to exert leadership and the group's methods of operation are being established

Norming: Conflicts are largely settled and a feeling of group identity emerges .

Performing: The emphasis is now on the tasks at hand

Adjourning: The group disbands .

Model of Team Development



- Belbin suggests that 'co-ordinator' and 'implementer' are better descriptions than 'chair' and 'team worker'. A new role is added: the 'specialist', the 'techie' who likes to acquire knowledge for its own sake.
- A team need a balance of different types of people:
  - The chair
  - The plant
  - The monitor evaluator
  - The shaper
  - The team worker
  - The resource investigator
  - The complete-finisher
  - The company worker

The chair: not necessarily brilliant leaders but they must be good at running meeting, being calm, strong but tolerant

The plant: someone who is essentially very good at generating ideas and potential solutions to problems

The monitor-evaluator: good at evaluating ideas and potential solutions and helping to selecting the best one

The shaper: rather a worrier, who helps to direct the team's attention to the important issues

The team worker: skilled at creating a good working environment

The resource investigator: adept at finding resources in terms of both physical resources and information

The complete-finisher: concerned with completing tasks

The company worker: a good team player who is willing to undertake less attractive tasks if they are needed for team success

To be a good team member you must be able to:

- time your interventions, e.g. not overwhelm the others in the team;

- be flexible;

- be restrained;

- keep the common goals of the teamin mind all the time.

Group performance:

- Categories
    - Additive tasks
    - Compensatory tasks
    - Disjunctive tasks
    - Conjunctive tasks

43. DECISION MAKING:

- Structured
- Unstructured
    - Some mental obstacles in good decision making
        - Faculty heuristics
        - Escalation of commitment
        - Information overload
    - Group decision making
    - Obstacles

- Measure to reduce disadvantages in group decision making

- Decision can be categorized as being:
  - **structured**: generally relatively simple, routine decisions where rules can be applied in a fairly straightforward way
  - **Unstructured:** more complex and often requiring a degree of creativity

Another way to categorize decisions is by the amount if risk and uncertainty that is involved

- To make it more efficient and effective -> training members to follow a set procedure
- Brainstorming techniques can help groups to create more ideas .

44. LEADERSHIP:

- Position power
  - Coercive power
  - Connection power
  - Legitimate power
  - Reward power
- Personal power
  - Expert power
  - Information power
  - Referent power

- Leadership is based on the idea of authority or power
- Power may come either from the person's position (position power), from the person's individual qualities (personal power) or may be a mixture of the two
- Position power;
  - **coercive power**: the ability to force someone to do something by threatening punishment
  - **connection power:** which is based on having access to those who have power
  - **legitimate power:** which is based on a person's title conferring a special status

- **reward power:** where the holder can give rewards to those who carry out tasks to his or her satisfaction

▪ Personal power;
- **expert power:** which comes from being the person who is able to do a specialized task
- **information power:** where the holder has exclusive access to information
- **referent power**: which is based on the personal attractiveness of the leader

Leadership style:

There are 2 axes: directive vs. permissive and autocratic vs. democratic:

- Directive autocrat
- Permissive autocrat
- Directive democrat
- Permissive democrat

-**directive autocrat:** makes decisions alone, close supervision of implementation

- permissive autocrat: makes decision alone, subordinates have latitude in implementation

- **Directive democrat**: makes decisions participatively, close supervision of implementation

- **Permissive democrat:** makes decisions participatively, subordinates have latitude in implementation .

45. OrganizationalStructures

An **organizational structure** defines how activities such as task allocation, coordination and supervision are directed towards the achievement of organizational aims.[1] It can also be considered as the viewing glass or perspective through which individuals see their organization and its environment.

- **Structure gives members clear guidelines for how to proceed.** A clearly-established structure gives the group a means to maintain order and resolve disagreements.
- **Structure binds members together.** It gives meaning and identity to the people who join the group, as well as to the group itself.
- **Structure in any organization is inevitable** -- an organization, by definition, implies a structure. Your group is going to have some structure whether it chooses to or not. It

might as well be the structure which best matches up with what kind of organization you have, what kind of people are in it, and what you see yourself doing.

It is important to deal with structure early in the organization's development. Structural development can occur in proportion to other work the organization is doing, so that it does not crowd out that work. And it can occur in parallel with, at the same time as, your organization's growing accomplishments, so they take place in tandem, side by side. This means that you should think about structure from the beginning of your organization's life. As your group grows and changes, so should your thinking on the group's structure.

ELEMENTS OF STRUCTURE

While the need for structure is clear, the best structure for a particular coalition is harder to determine. The best structure for any organization will depend upon who its members are, what the setting is, and how far the organization has come in its development.

Regardless of what type of structure your organization decides upon, three elements will always be there. They are inherent in the very idea of an organizational structure.

They are:

- Some kind of governance
- Rules by which the organization operates
- A distribution of work

46. HEALTH AND SAFETY:

- Top-management-safety policy
- Delegation of authorities regarding safety must be clear
- Job descriptions reg-safety
- Deployment of safety officer
- Consultation on safety
- Adequate budgeting for safety costs

Responsibility for safety must be clearly defined at all levels. Some points that will need to be considered include:

- Top management must be committed to the safety policy
- The delegation of responsibilities for safety must be clear
- Those to whom responsibilities are delegated must understand the responsibilities and agree to them

- Deployment of a safety officer and the support of experts in particular technical areas
- Consultation on safety
- An adequate budgeting for safety costs

GLOSSARY

Agile software development-Set of fundamental principles about how software should be developed based on an agile way of working in contrast to previous heavy-handed software development methodologies.

Aggregate planning is an operational activity which does an aggregate plan for the production process, in advance of 2 to 18 months, to give an idea to management as to what quantity of materials and other resources are to be procured and when, so that the total cost of operations of the organization is kept to the minimum over that period.

Allocation is the assignment of available resources in an economic way.

Budget -A list of all planned expenses and revenues.

Budgeted cost of work performed (BCWP) -Measures the budgeted cost of work that has actually been performed, rather than the cost of work scheduled.

Budgeted cost of work scheduled(BCWS)-The approved budget that has been allocated to complete a scheduled task (or Work Breakdown Structure (WBS) component) during a specific time period.

Business model -is a profit-producing system that has an important degree of independence from the other systems within an enterprise.

Business analysis -The set of tasks, knowledge, and techniques required to identify business needs and determine solutions to business problems. Solutions often include a systems development component, but may also consist of process improvement or organizational change.

Business operations -Ongoing recurring activities involved in the running of a business for the purpose of producing value for the stakeholders. They are contrasted with project management, and consist of business processes.

Business process -Collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers. There are three types of business processes: Management processes, Operational processes, and Supporting processes.

Business Process Modeling (BPM) -Tthe activity of representing processes of an enterprise, so that the current ("as is") process may be analyzed and improved in future ("to be").

Capability Maturity Model (CMM) -Software engineering is a model of the maturity of the capability of certain business processes. A maturity model can be described as a

structured collection of elements that describe certain aspects of maturity in an organization, and aids in the definition and understanding of an organization's processes.

Change control -The procedures used to ensure that changes (normally, but not necessarily, to IT systems) are introduced in a controlled and coordinated manner. Change control is a major aspect of the broader discipline of change management.

Change management i-s a field of management focused on organizational changes. It aims to ensure that methods and procedures are used for efficient and prompt handling of all changes to controlled IT infrastructure, in order to minimize the number and impact of any related incidents upon service.

Case study is a research method which involves an in-depth, longitudinal examination of a single instance or event: a case. They provide a systematic way of looking at events, collecting data, analyzing information, and reporting the results.

Certified Associate in Project Management is an entry-level certification for project practitioners offered by Project Management Institute.

Communications Log -is an on-going documentation of communication events between any identified project stakeholders, managed and collected by the project manager that describes: the sender and receiver of the communication event; where, when and for how long the communication event elapsed; in what form the communication event took place; a summary of what information was communicated; what actions/outcomes should be taken as a result of the communication event; and to what level of priority should the actions/outcomes of the communication event be graded

Constructability is a project management technique to review the construction processes from start to finish during pre-construction phrase. It will identify obstacles before a project is actually built to reduce or prevent error, delays, and cost overrun.

Costsin economics, business, and accounting are the value of money that has been used up to produce something, and hence is not available for use anymore. In business, the cost may be one of acquisition, in which case the amount of money expended to acquire it is counted as cost.

Cost engineeringis the area of engineering practice where engineering judgment and experience are used in the application of scientific principles and techniques to problems of cost estimating, cost control, business planning and management science, profitability analysis, project management, and planning and scheduling."

Construction, in the fields of architecture and civil engineering, is a process that consists of the building or assembling of infrastructure. Far from being a single activity, large scale construction is a feat of multitasking. Normally the job is managed by the project manager and supervised by the construction manager, design engineer, construction engineer or project architect.

Cost overrun is defined as excess of actual cost over budget.

Critical path method (CPM) is a mathematically based modeling technique for scheduling a set of project activities, used in project management.

Critical chain project management(CCPM) is a method of planning and managing projects that puts more emphasis on the resources required to execute project tasks.

Dependency in a project network is a link amongst a project's terminal elements.

Dynamic Systems Development Method (DSDM) is a software development methodology originally based upon the Rapid Application Development methodology. DSDM is an iterative and incremental approach that emphasizes continuous user involvement.

Durationof a project's terminal element is the number of calendar periods it takes from the time the execution of element starts to the moment it is completed.

Deliverable A contractually required work product produced and delivered to a required state. A deliverable may be a document, hardware, software or other tangible product.

Earned schedule (ES) is an extension to earned value management (EVM), which renames 2 traditional measures, to indicate clearly they are in units of currency or quantity, not time.

Earned value management (EVM) is a project management technique for measuring project progress in an objective manner, with a combination of measuring scope, schedule, and cost in a single integrated system.

Effort management is a project management sub discipline for effective and efficient use of time and resources to perform activities regarding quantity, quality and direction.

Enterprise modeling is the process of understanding an enterprise business and improving its performance through creation of enterprise models. This includes the modelling of the relevant business domain (usually relatively stable), business processes (usually more volatile), and Information technology

Estimationin project management is the processes of making accurate estimates using the appropriate techniques.

Event chain diagram : diagram that show the relationships between events and tasks and how the events affect each other.

Event chain methodology is an uncertainty modeling and schedule network analysis technique that is focused on identifying and managing events and event chains that affect project schedules.

Extreme project management(XPM) refers to a method of managing very complex and very uncertain projects.

Float in a project network is the amount of time that a task in a project network can be delayed without causing a delay to subsequent tasks and or the project completion date.

Focused improvement in Theory of Constraints is the ensemble of activities aimed at elevating the performance of any system, especially a business system, with respect to its goal by eliminating its constraints one by one and by not working on non-constraints.

Fordism, named after Henry Ford, refers to various social theories. It has varying but related meanings in different fields, and for Marxist and non-Marxist scholars.

Henry Gantt was an American mechanical engineer and management consultant, who developed the Gantt chart in the 1910s.

Gantt chart is a type of bar chart that illustrates a project schedule. It illustrates the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project.

Goal or objective consists of a projected state of affairs which a person or a system plans or intends to achieve or bring about — a personal or organizational desired end-point in some sort of assumed development. Many people endeavor to reach goals within a finite time by setting deadlines

Goal setting involves establishing specific, measurable and time targeted objectives

Graphical Evaluation and Review Technique (GERT) is a network analysis technique that allows probabilistic treatment of both network logic and activity duration estimated.

Hammock activity is a grouping of subtasks that "hangs" between two end dates it is tied to (or the two end-events it is fixed to).

HERMES is a Project Management Method developed by the Swiss Government, based on the German V-Modell. The first domain of application was software projects.

Integrated Master Plan(IMP) is an event-based, top level plan, consisting of a hierarchy of Program Events.

ISO 10006 is a guidelines for quality management in projects, is an international standard developed by the International Organization for Standardization.

Iterative and Incremental development is a cyclic software development process developed in response to the weaknesses of the waterfall model. It starts with an initial planning and ends with deployment with the cyclic interaction in between

Kickoff meeting is the first meeting with the project team and the client of the project.

Level of Effort (LOE) is qualified as a support type activity which doesn't lend itself to measurement of a discrete accomplishment. Examples of such an activity may be project budget accounting, customer liaison, etc.

Linear scheduling method (LSM) is a graphical scheduling method focusing on continuous resource utilization in repetitive activities. It is believed that it originally adopted the idea of Line-Of-Balance method.

Lean manufacturing or lean production, which is often known simply as "Lean", is the practice of a theory of production that considers the expenditure of resources for any means other than the creation of value for the presumed customer to be wasteful, and thus a target for elimination

Managementin business and human organization activity is simply the act of getting people together to accomplish desired goals. Management comprises planning, organizing, staffing, leading or directing, and controlling an organization (a group of one or more people or entities) or effort for the purpose of accomplishing a goal.

Management process is a process of planning and controlling the performance or execution of any type of activity.

Management science (MS), is the discipline of using mathematical modeling and other analytical methods, to help make better business management decisions.

Megaproject is an extremely large-scale investment project.

Motivationis the set of reasons that prompts one to engage in a particular behavior.

Nonlinear Management(NLM) is a superset of management techniques and strategies that allows order to emerge by giving organizations the space to self-organize, evolve and adapt, encompassing Agile, Evolutionary and Lean approaches, as well as many others.

Operations managementis an area of business that is concerned with the production of good quality goods and services, and involves the responsibility of ensuring that business operations are efficient and effective. It is the management of resources, the distribution of goods and services to customers, and the analysis of queue systems.

Operations Research (OR) is an interdisciplinary branch of applied mathematics and formal science that uses methods such as mathematical modeling, statistics, and algorithms to arrive at optimal or near optimal solutions to complex problems.

Organization is a social arrangement which pursues collective goals, which controls its own performance, and which has a boundary separating it from its environment.

Organization development (OD) is a planned, structured, organization-wide effort to increase the organization's effectiveness and health.

Planning in organizations and public policy is both the organizational process of creating and maintaining a plan; and the psychological process of thinking about the activities required to create a desired goal on some scale.

Portfolio in finance is an appropriate mix of or collection of investments held by an institution or a private individual.

PRINCE2 : PRINCE2 is a project management methodology. The planning, monitoring and control of all aspects of the project and the motivation of all those involved in it to achieve the project objectives on time and to the specified cost, quality and performance.

Process is an ongoing collection of activities, with an inputs, outputs and the energy required to transform inputs to outputs.

Process architecture is the structural design of general process systems and applies to fields such as computers (software, hardware, networks, etc.), business processes (enterprise architecture, policy and procedures, logistics, project management, etc.), and any other process system of varying degrees of complexity.

Process management is the ensemble of activities of planning and monitoring the performance of a process, especially in the sense of business process, often confused with reengineering.

Product breakdown structure (PBS) in project management is an exhaustive, hierarchical tree structure of components that make up an item, arranged in whole-part relationship.

Product description in project management is a structured format of presenting information about a project product

Program Evaluation and Review Technique (PERT) is a statistical tool, used in project management, designed to analyze and represent the tasks involved in completing a given project.

Program Management is the process of managing multiple ongoing inter-dependent projects. An example would be that of designing, manufacturing and providing support infrastructure for an automobile manufacturer.

Project : A temporary endeavor undertaken to create a unique product, service, or result.

Project accounting Is the practice of creating financial reports specifically designed to track the financial progress of projects, which can then be used by managers to aid project management.

Project Cost ManagementA method of managing a project in real-time from the estimating stage to project control; through the use of technology cost, schedule and productivity is monitored.

Project management : The complete set of tasks, techniques, tools applied during project execution'.

Project Management Body of Knowledge(PMBOK): The sum of knowledge within the profession of project management that is standardized by ISO.

Project management office: The Project management office in a business or professional enterprise is the department or group that defines and maintains the standards of process, generally related to project management, within the organization. The PMO strives to standardize and introduce economies of repetition in the execution of projects. The PMO is the source of documentation, guidance and metrics on the practice of project management and execution.

Project management processis the management process of planning and controlling the performance or execution of a project.

Project Management Professional is a certificated professional in project management.

Project Management Simulators are computer-based tools used in project management training programs. Usually, project management simulation is a group exercise. The computer-based simulation is an interactive learning activity.

Project management software is a type of software, including scheduling, cost control and budget management, resource allocation, collaboration software, communication, quality management and documentation or administration systems, which are used to deal with the complexity of large projects.

Project Management Triangleis a model of the constraints of project management.

Project manager : professional in the field of project management. Project managers can have the responsibility of the planning, execution, and closing of any project, typically relating to construction industry, architecture, computer networking, telecommunications or software development.

Project network is a graph (flow chart) depicting the sequence in which a project's terminal elements are to be completed by showing terminal elements and their dependencies.

Project planis a formal, approved document used to guide both project execution and project control. The primary uses of the project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document

approved scope, cost, and schedule baselines. A project plan may be summary or detailed.

Project planning is part of project management, which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment.

Project stakeholders are those entities within or without an organization which sponsor a project or, have an interest or a gain upon a successful completion of a project.

Project teamis the management team leading the project, and provides services to the project. Projects often bring together a variety number of problems. Stakeholders have important issues with others.

Proportrefers to the combination of the unique skills of an organization's members for collective advantage.

Quality can mean a high degree of excellence ("a quality product"), a degree of excellence or the lack of it ("work of average quality"), or a property of something ("the addictive quality of alcohol").[1] Distinct from the vernacular, the subject of this article is the business interpretation of quality.

Quality, Cost, Delivery (QCD) as used in lean manufacturing measures a business's activity and develops Key performance indicators. QCD analysis often forms a part of continuous improvement programs

Reengineering is radical redesign of an organization's processes, especially its business processes. Rather than organizing a firm into functional specialties (like production, accounting, marketing, etc.) and considering the tasks that each function performs; complete processes from materials acquisition, to production, to marketing and distribution should be considered. The firm should be re-engineered into a series of processes.

Resources are what is required to carry out a project's tasks. They can be people, equipment, facilities, funding, or anything else capable of definition (usually other than labor) required for the completion of a project activity.

Risk is the precise probability of specific eventualities.

Risk management is a management specialism aiming to reduce different risks related to a preselected domain to the level accepted by society. It may refer to numerous types of threats caused by environment, technology, humans, organizations and politics.

Risk register is a tool commonly used in project planning and organizational risk assessments.

Schedules in project management consist of a list of a project's terminal elements with intended start and finish dates.

Scientific managementis a theory of management that analyzes and synthesizes workflow processes, improving labor productivity.

Scope of a project in project management is the sum total of all of its products and their requirements or features.

Scope creep refers to uncontrolled changes in a project's scope. This phenomenon can occur when the scope of a project is not properly defined, documented, or controlled. It is generally considered a negative occurrence that is to be avoided.

Scrum is an iterative incremental process of software development commonly used with agile software development. Despite the fact that "Scrum" is not an acronym, some companies implementing the process have been known to adhere to an all capital letter expression of the word, i.e. SCRUM.

Six Sigma is a business management strategy, originally developed by Motorola, that today enjoys widespread application in many sectors of industry.

Software engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software.

Systems Development Life Cycle (SDLC) is any logical process used by a systems analyst to develop an information system, including requirements, validation, training, and user ownership. An SDLC should result in a high quality system that meets or exceeds customer expectations, within time and cost estimates, works effectively and efficiently in the current and planned Information Technology infrastructure, and is cheap to maintain and cost-effective to enhance.

Systems engineeringis an interdisciplinary field of engineering that focuses on how complex engineering projects should be designed and managed.

Task is part of a set of actions which accomplish a job, problem or assignment.

Task analysis is the analysis or a breakdown of exactly how a task is accomplished, such as what sub-tasks are required

Timelineis a graphical representation of a chronological sequence of events, also referred to as a chronology. It can also mean a schedule of activities, such as a timetable.

Unified Process: The Unified process is a popular iterative and incrementalsoftware development process framework. The best-known and extensively documented refinement of the Unified Process is the Rational Unified Process (RUP).

QUESTION BANK
UNIT-I

PART-A(2 MARKS)

1. Define software project management.
Software Project Management has key ideas about the planning, monitoring, and control of software projects

2. What is a phase?
A phase is a collection of related activities or tasks that produce a deliverable or work product.

3. Define system.
A system is a group of elements organized and arranged so that the elements can act as a whole toward achieving a common goal; is a collection of interacting subsystems.

4. What is an activity?
An element of work performed during the course of the project.

5. Define method.
A method is a manner, means, or process for accomplishing something.

6. Write any five competencies of project management skills.
Documenting plans, estimating cost, estimating effort, managing risks,scheduling, tracking processes

7. What is software engineering?
Software Engineering is a practical application of scientific knowledge in the design and construction of computer programs and the associated documentation required to develop, operate, and maintain them.

8. Write two types of processes.
Product process, project process.

9. Define technology.
Technology is the application of scientific knowledge in industry or business.

10. Name five maturity levels of CMM.
Initial, repeatable, defined, managed, optimizing

11. Define process.
A software process provides the framework from which a comprehensive plan for software development can be established.

12. Write any two goals of organizational process focus.

S/W process development and improvement activities are coordinated across the organization.

The strength and weakness of the s/w processes used are identified relative to a process standard.

13. Write any four process standards.

IEE, SEI, ISO, PMI.

14. Write any two goals of organizational process definition.

1. A standard s/w process for the organization is developed and maintained.
2. Information related to the use of the organization's standard s/w process by the s/w projects
is collected, reviewed, and made available.

15. Write the difference between project process and product process.

Project process-Describe and organize the work of the project.
Defined by the PMI PMBOK.
Product process-Specify and create the project product.
Defined by the life cycle used.
Defined by the American society of quality(ASQ),
Certified Software Quality Engineer(CSQE)

16. Name the six classes of product domain.

Customer, business, industrial, real_time, really_timely, scientific.

17. Name any three individual personality models.

The Myers_Briggs Type Indicator, fundamental Interpersonal Relations Orientation – Behavior(FIRO-B) model, the Keirsey Temperament sorter.

18. What are the two kinds of stress in McFletcher Work style Patterns Inventory?

Personal, Organizational.

19. Mention the Leader's style

Telling, selling, participating, delegating.

20. Write the five processes of Project Management Institute(PMI)

Initiating, planning, executing, controlling, closing.

PART-B(16 MARKS)

1. Briefly explain about product development techniques.

Explain-Assessing processes, Awareness of process standards,defining the product, evaluating alternative processes, managing requirements,performing initial assessment, selecting methods and tools, Tailoring processes.

2. Briefly explain about project management skills.

Explain- Documenting plan, Building a work breakdown structure, estimating cost, estimating plan, estimating effort, Managing risks, Scheduling, Scheduling metrics.

3. Briefly explain about people management skills.

Explain- Appraising performance, Holding effective meeting,interaction and communication, leadership, managing change, planningcareers, Recruiting, Selecting a team.

4. Explain about SEI CMM.

Define SEI CMM, five levels of maturity - Initial, repeatable, defined,managed, optimizing.

5. Short notes on the following.

1. process (8)
2. International organization for standardization.(8)

(1). process- definition, product process, project process,Organizational process focus,organizational process definition (8)

(2). Explain 12 engineering activities for International organization for standardization. (8)

UNIT-II

PART-A(2 MARKS)

1. What is milestone?

A milestone is a significant event in a project, usually associated with a major work product or
deliverable. Stages or phases are not milestones but are collections of related product activities.

2. What is Work Breakdown Structure (WBS)?

A WBS is a hierarchical list of the work activities required to complete a project.

3. What are the three project activities that are needed for WBS?

Cost estimating, cost accounting, schedule performance.

4. Write the stages of Team Formation Model.

Forming, Storming, Norming, Performing, Adjouring.

5. Differentiate Leaders and managers.

Leaders- set direction, do the right thing

Managers- Follow process, do things right.

6. Define charter.

A charter is a documentation that formally recognizes the existence of a project.

7. Give some unites for measuring the size of the software.

Lines of code (LOC), Function points, feature points, number of bubbles on the data flow diagram, number of entities on entity relationship diagram.

8. Write the any two advantages of LOC.
   1. It is widely used and universally accepted.
   2. LOC are easily measured upon project completion.

9. What are dependencies?
   Dependencies are one form of constraints for any project. Dependencies are any relationship connections between activities in a project that may impact their scheduling.

10. Write the special types of relationship in dependencies.
   1. Lag and lead relationship
   2. Hard versus soft relationship

11. Define project portfolio?
   Project portfolio is group of project carried out under this sponsorship and/or management.

12. What are the project charter contents?
   Objectives, Fucntions, Performance, constraints, scope, cost or benefits.

13. Write the disadvantage of feature point analysis.
   The disadvantage of feature point analysis is the subject to classification of algorithmic complexity.

14. What is modified code?
   The code developed for previous application that is suitable for a new application after a modest amount of modification.

15. Write the goal of software project planning?
   Software estimates or documented for use in planning and tracking the software project.

16. Give any two examples for product attributes.
   Database size (DATA), Product complexity (CPLX)

17. Write the advantages of COCOMO.
   1. It is repeatable process.
   2. It is easy to use.
   3. It is thoroughly documented.

18. Define gold plating.
   The work that does not drive towards a deliverable is called gold plating.

19. Write the three COCOMO Modes.
   Organic, Semidetached, Embedded.

20. What is Legacy code?

Code developed for a previous application that is believed to be of use for a new application.

PART-B(16 MARKS)

1. Briefly explain about software size and reuse estimating

Explain- competencies, SEI CMM and estimating, WBS, size measures, LOC, function points as a unit of size, feature points as a unit of size

2. Briefly explain about the categories of cost drivers and advantages of a SLIM.

Categories of cost drivers -Product attributes, computer attributes, project attributes, personnel attributes Write advantages of SLIM.

3. Briefly explain about Individual Personality Type.

Explain- The Myers_Briggs Type Indicator, fundamental Interpersonal Relations Orientation – Behavior(FIRO-B) model, the Keirsey Temperament sorter,process communication model.

4. Briefly explain about project planning.

Define - project planning.

Explain –project process, product process, explain the steps why, what, how, do it, did it.

5. Explain the following

(i). Work Breakdown Structure (WBS) (8)

(ii). Short notes on Leader's style (8)

Explain the following

(i). Work Breakdown Structure(WBS)-competencies, milestone, approaches to build a WBS.

(ii). Short notes on Leader's style -Telling , selling, participating, delegating.

UNIT-III

PART-A(2 MARKS)

1. Write the categories of cost drivers.

Product attributes, computer attributes, project attributes, personnel attributes

2. What are the characteristics of an organization?

Model, Maturity, Thickness, Size, Structure.

3. Short notes on Finish- to-Start(FS) Dependency Relationship

One activity can start only when the preceding activity finishes.

4. What is RISK management?

Risk management is the procedure that explains the process of managing risk through analysis. This procedure does not provide solutions to perceived risks.

5. What is brainstorming?

Brainstorming refers to the process of a group of colleagues meeting and working collaboratively to generate creative solutions and new ideas.

6. What is knowledge management?

Knowledge management is the combination of activities involved in gathering, organizing, sharing, analyzing, and disseminating knowledge to improve an organization's performance.

7. How you can collect internal data and external data?

Internal data are collected within the organization, usually by transaction processing systems, but also through employee and customer surveys. External data is collected from a wide array of sources outside the organization.

8. What is unstructured data?

Unstructured data are the data drawn from meeting discussions, private conversations, textual documents, graphical representations and other "non uniform" sources.

9. What is structured data?

Structured data are numbers and facts that can be conveniently stored and retrieved I an orderly manner for operations and decision-making.

10. What are the phases in systems development life cycle (SDLC)?

1. Planning
2. Analysis
3. Design
4. Implementation
5. Support

11. What is ROI?

The Return on Investment is a calculation of the difference between the stream of benefits and the stream of costs over the life of the system, discounted by the applicable interest rate.

12. Write some ways to collect information for system requirements.

1. Interviews
2. Questionnaires
3. Examination of documents
4. On-the-job observation

13. Write the goals of project management.

1. Complete the project on time
2. Complete the project within budget.
3. Meet requirements.
4. Meet expectations

14. What is outsourcing?

Outsourcing-trusting all or part of an organization's IS operation to an outside company.

15. Write any four competencies to define goal and scope of the software project.

Defining the product, documenting plan.Estimating cost, estimating effort.

16. Write the characteristics of activities.

Label, size, source.

17. Differentiate product view and project view

Product view-hierarchical relationship among product elements Project view- hierarchical relationship among work activities.

18. Name any four guiding principles for selecting a project team.

Public, client and employer, product, judgment.

19. Write any two disadvantages of using LOC

LOC is difficult to estimate for new software early in the life cycle There are no industry standards for counting lines of code.

20. What is regression model?

A regression model is derived from a statistical interpretation of historical data to describe a mean or typical relationship between variables.

PART-B(16 MARKS)

1. Briefly explain about COCOMO: A Regression Model.

Explain -COCOMO: A Regression Model with examples
Modes of COCOMO, levels of COCOMO, Advantages and disadvantages of COCOMO.

2. Briefly explain about function points to measure the software size.

Guidelines for counting Function points
-Count number of function in each category
-Apply Complexity weighting factors.
-Apply Environmental factors
-Calculate Complexity Adjustment Factor (CAF)
-Compute Adjusted Function Points (AFP)
-Convert to LOC.
-Write the Formulas and explain with example.

3. (a). Intermediate COCOMO Example:

A10 KLOC embedded mode software product is to perform communications processing functions on a embedded mode. Find effort.-using the formula find effort.
Effort (E)= a* (Size)b
Where a, b are constants.
Size- thousand of lines of code (KLOC) (8)

E-effort expressed in staff months.

(b). Short notes on Effects of reuse on software size (8)

-new code, modified code, reused code, legacy code

4. (i) A development project is sized at 7.5 KLOC and is evaluated as being simple -in the organic mode. Find Effort, Development time, average number of staff members (6)

(ii)SEI CMM and estimating (10)

(i).Effort – 20 staff months

Development time - 8 months

Average number of staff members-2.5 staff members

(ii)SEI CMM and estimating-goals, activities

5. Briefly explain about PERT and CPM Scheduling

PERT-Program evaluation and review technique-draw graph and explain with example

CPM-Critical Path Method-explain forward pass and backward pass

Explain with example to find critical path

UNIT-IV

PART-A(2 MARKS)

1. Write the three levels of COCOMO.

Basic, Intermediate, detailed.

2. Give basic COCOMO effort formula.

Effort (E) = a* (Size)b

Where a, b are constants.

Size- thousand of lines of code (KLOC)

E-effort expressed in staff months.

3. Write the three models of COCOMO II.

The application composition model, the early design model, the post architecture model.

4. Write the putnam equation

S= C*K1/3*td 4/3 Where

S= software size in LOC

C=Environmental factor= S/K1/3 td 4/3

K=Total effort for the overall project

td=Delivery time constraint in years

5. Give any two disadvantages of SLIM.

1. To use the model, the software size must be identified in advance.
2. Estimates are extremely sensitive to the technology factor.

6. Give any two advantages of SLIM.

1. Offers value-added effective planning, especially on large projects.
2. Simplifies decision making.

7. Write the types of roles.

Database designers, Configuration Management experts, Human interface Designers, Web Masters, Network Specialists, System architects, Programming language experts.

8. Characteristics of roles

Responsibility, authority, accountability.

9. What is Activity-on-arrow (AOA)?

One Representation of Network diagram puts the activity information on The arrows between the nodes are called an activity-on-arrow representation (AOA).

10. What is Activity-on-Node (AON)?

One Representation of Network diagram puts the activity information on nodes and is called an activity-on- node representation(AON).

11. Define Load Leveling.

Load Leveling is the process of rescheduling tasks that have available slack to achieve a more balances distribution of resource usage.

12. Name the three forms of presenting a project schedule

Table, Gantt chart, Network diagram.

13. What is Software Quality Assurance?

It is an ongoing process to ensure that the plan is being carried out according to the procedures laid down. The role of quality assurance is to ensure that the quality of the procedures and processes results in a product that fully meets users' requirements

14. Write any three network diagram methods.

PERT- Program evaluation and review Technique
CPM- Critical Path Method
ADM- Arrow Diagramming Method

15. Define Quality?

ISO provides the definition of Quality as "The totality of features and characteristics of a product or service that bear on its ability to satisfy specified or implied needs.

16. Define scope?

It defines the requirements of the company for software design and development work within the project.

17. What are the measures of software quality?

Correctness
Maintainability
Usability
Integrity

18. What is LOC?

A line of code is any line of program text that is not a comment or blank line regardless of the no. of statements or fragments of statements o the line.

19. Write the four basic requirements for an SCM System.

Identification, Control, Auditing, Status Accounting.

20. Draw the Software Configuration Management (SCM) Pyramid.

Problem solving, Creative decision making, ideas generating situations

PART-B(16 MARKS)

1. Explain about Assigning resources.

Explain- Organizational planning, Project roles, types of roles,Assigning responsibilities to individuals.

2. Explain the following
(i).Organizational form (8)
(ii).Map the schedule to a real calendar (8)

(i).Organizational form

(ii).Map the schedule to a real calendar –explain the four components -work, units, duration, dates

3. Briefly explain about Quality Function Deployment

-Explain QFD method, goals of QFD, Advantages of QFD.

4. Explain about Project charter and software project Management plan (SPMP).

Project charter- definition, Project charter contents.
Software project Management plan- it includes charter,organization, process , work breakdown structure, schedule, budget.
Explain the elements of SPMP

5. Explain in detail about the types of software development dependencies.

Explain- external versus internal dependencies, resource versus activity dependencies, possible dependency relationships, and special types of relationships.

UNIT-V

PART-A(2 MARKS)

1Write the legal issues in product development techniques.

Advertising and Consumer, Communications, Contracts, Privacy and Tort.

2. Name the six product component classes.

Software, Hardware, people, Database, documentation and Procedures.

3. Write any two advantages of function print analysis

1. It can be apply early in the S/W development life cycle.
2. It is dependent of programming language, technology & techniques except for the adjustments at the end.

4. Write the disadvantages of function point analysis
1. It requires subjective evaluation.
2. There is more research data on LOC than on function points.

5. Give any two examples for personnel attributes.
Analyst capability (ACAP), Programming language (LEXP)

6. Give any two examples for Computer attributes.
Execution time constraint (TIME), Main storage constraint (STOR).

7. Name any two external dependencies.
Supplier, Stakeholders

8. What is start-to-start relationship(SS)
It means that one activity can start if and only if another activity starts.

9. What are the uses of Nominal group techniques?
Problem solving, Creative decision making, ideas generating situations

10. Difference between earliest start and earliest finish.
The earliest time period that the activity can start.
The earliest finish means the earliest time period that the activity can finish.

11. Give any one example for Activity on Arrow.

12. Write the relationship between distance, time & speed.
Distance = Time/speed

13. What are three kinds of interfaces?
Personal, organizational, and system.

14. What is Critical path?
The path with Zero flexibility is called the critical path, because it will have zero float b/w all of its activities.

15. What are the Managerial activities?
Project planning, tracking, control, risk analysis.

16. What are the types of process communication model?
Dreamer, Rector, Rebel, workaholic

17. Difference b/w personal and organizational stress.

Personal stress include apathy low productivity, irritability, frequent complaints and health disorders Organizational stress include misunderstandings of work expectations, product quality and customer service problems.

18. Define tort.

A tort is defined as a wrongful act other than a breach of contract that injures another and for which the law imposes civil liability.

19. Name any four selection criteria for SCM tools.

Multi user support, Scalability, Easy to setup, Process management.

20. Write the legal issues for project Management skills.

Alternative Dispute Resolution, arbitration, Negotiation and mediation.

PART-B(A6 MARKS)

1. Explain in detail about Building the quality assurance plan.

Explain- Purpose, Reference documents, Management,Documentation, Standards, practices, conversions and metrics, Reviews and audits, Risk Management, Problem reporting and corrective action, Tools, techniques and methodologies, Supplier Control, Training, record Collection, maintenance, and retention.

2. Explain in detail about Software Configuration Management (SCM) Principles.

Draw SCM Pyramid, explain- Understanding of SCM, SCM plan and policies, SCM processes, Metrics, Tools for SCM, SCM Configuration items.

3. Explain about Planning and Organizing for SCM.

Explain- Potential SCM problem Classes- Multiple developer syndrome, multiple releases, product family, requirements change, schedule change, software changes, staff change, documentation change

4. Explain the Benefits of SCM process and tools.

Explain- Control, Management, Cost savings, Quality.

5. Briefly explain about the legal issues in software.

Product development techniques - Advertising and Consumer, Communications, Contracts, Privacy and Tort.
Project Management skills- Alternative Dispute Resolution,Arbitration, Negotiation, and Mediation.
People Management skills- Contracts, handicap, Employment, Intellectual property.

Reg. No. :

Question Paper Code : 20336

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Seventh Semester

Information Technology

IT 2403/IT 73 — SOFTWARE PROJECT MANAGEMENT

(Common to Eighth Semester Computer Science and Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the characteristics that make Software Projects different from other projects?

2. What is a Product Breakdown Structure(PBS)? Show the hierarchical diagram of a Sample PBS.

3. What is called Return On Investment? Give an example.

4. What is the significance of a "Project Risk Matrix"? Give an example.

5. What are called "Free Floats" and "Interfering Floats"? How are they calculated?

6. What is a "Dangle" in an Activity Network? Show an example.

7. List the important roles of the Configuration Librarian.

8. Name the popular visual tools used for monitoring and tracking the project progress.

9. What is "Maslow's Hierarchy of Needs"?

10. What do you understand by "Egoless Programming"?

PART B — (5 × 16 = 80 marks)

11. (a) Give an overview of the "Step Wise Project Planning Activities" with a neat diagram. (16)

Or

(b) (i) Explain the various SDLC activities as outlined by ISO 12207 with a neat diagram. (10)

(ii) Explain the various activities to be performed in "Analyzing the Project Characteristics". (6)

12. (a) (i) Describe "Cash Flow Forecasting" and its application in projects. (8)

(ii) Explain the "Internal Rate of Return" method for measuring the profitability of a project. Also mention its advantage over the NPV method. (8)

Or

(b) Explain the various issues to be addressed in evaluating the risks before deciding to take up a project. (16)

13. (a) Calculating the earliest start and completion dates of the activities using the Forward Pass of the Critical path method for the following project details and Draw the Activity Network at the completion of the forward pass. Clearly indicate the steps followed in the calculation. (16)

Activity–ID	Activity Description	Duration (weeks)	Precedents
A	Hardware selection	6	
B	Software design	4	
C	Install hardware	3	A
D	Code and test software	4	B
E	File take on	3	B
F	Write user manuals	10	
G	User training	3	E, F
H	Install and test systems	2	C, D

Or

(b) List the top 10 software project risks and explain the strategies for reducing each of the risks. (16)

2 20336

14. (a) (i) Explain the Change Control Process applicable for an operational system. (8)

(ii) Explain the advantages and disadvantages of Fixed Price Contract model. (8)

Or

(b) List down the typical Terms in a Contract and explain them in detail. (16)

15. (a) Name and explain salient features of the various organizational structures used in software projects. (16)

Or

(b) Write short notes on the following :

(i) Oldham-Hackman Job characteristic model (8)

(ii) Stress and its significance in IT projects. (8)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 21518

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Eighth Semester

Computer Science and Engineering

IT 2403/IT 73 – SOFTWARE PROJECT MANAGEMENT

(Common to Seventh Semester Information Technology)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List some problems with software projects.
2. What is contract management?
3. Differentiate between Strategic Assessment and Technical Assessment.
4. What is the use of decision tree in Risk Evaluation?
5. List out the objectives of activity planning.
6. Give an example of activity on arrow networks.
7. Draw the project control cycle model.
8. What are the levels of prioritizing monitoring?
9. List some obstacles for good group decision making.
10. Write down any four selection criteria for SCM tools.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the activities covered by software project management? Explain. (8)

(ii) Identify the actions that could prevent each of the following risks from materializing or could reduce the impact if it occur. (8)

(1) A key member of the team leaving.

(2) Introducing a new version of the operating system that has errors in it.

(3) A disk containing copies of the most up-to-date version of the software under development being corrupted.

(4) Government changes the taxation rules, altering the way that Value Added Tax (VAT) is to be calculated in an order processing system under development.

Or

(b) Explain the various steps involved in step wise project planning with neat diagram. (16)

12. (a) Explain in detail about cost benefit evaluation techniques and its methods with examples. (16)

Or

(b) (i) Discuss about Risk planning and control. (8)

(ii) Explain why discounted cash flow techniques provide better criteria for project selection that net profit or return on investment. Justify your answer with an example. (8)

13. (a) Draw an activity network using precedence network conventions for organizing and carrying out a survey on users opinion of an information system. Assuming your own durations, identify the critical path on your network and calculate the earliest completion date for the project (16)

Or

(b) Explain how will you identify the major risks that might affect your project and identify the strategies for minimizing each of those risks. (16)

14. (a) (i) Discuss the different methods of visualizing the progress of the project. (8)

(ii) Explain how the delayed projects can be brought back on track. (8)

Or

(b) (i) Discuss the steps in managing the contracts. (8)

(ii) Explain in detail about the types of contract. (8)

15. (a) (i) How will you ensure that a right person is selected for the job? Explain (8)

(ii) Discuss about the different models of motivation. (8)

Or

(b) Discuss about

(i) Organizational structure. (8)

(ii) Decision making. (8)

P549

B.E./B.TECH. DEGREE EXAMINATIONS, NOV/DEC–2011

REGULATIONS 2008

SEVENTH SEMESTER

IT 73 – SOFTWARE PROJECT MANAGEMENT

INFORMATION TECHNOLOGY

Time: Three Hours Maximum: 100 marks

ANSWER ALL QUESTIONS

PART–A (10×2=20 marks)

1. What are the key characteristics that distinguish projects?
2. What products must exist before the activity 'test program' can take place? What products does this activity create?
3. List the typical issues to be considered during strategic assessment.
4. What are the two ways of evaluating the economic benefits of any project to carry out a cost-benefit analysis?
5. What are the objectives of an activity planning?
6. Sketch the Boehm's risk engineering task breakdown.
7. List any four change control procedures.
8. Give the various stages involved in contract placement.

9. In what extent is the Belbin approach to balanced teams compatible with having chief programmer teams?

10. Give any four stress management tips.

PART–B (5×16=80 marks)

11. (a) (i) Draw and explain the typical architecture of project life-cycle. (8)

(ii) Explain the hierarchy of information control in software organizations. (8)

Or

(b) Give and explain the outline of step wise project planning activities. (16)

12. (a) Explain why discounted cash flow techniques provide better criteria for project selection than net profit or return on investment. (16)

Or

(b) What is the need for evaluating risks? Explain the risk evaluation process with suitable example. (16)

13. (a) (i) Explain the process of constructing a Critical Path Method (CPM) networks with an example. (8)

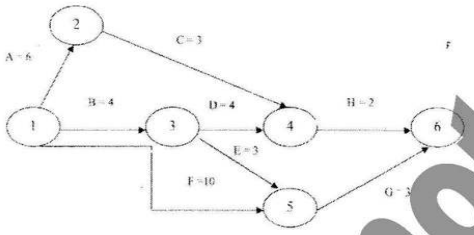
(ii) What is the difference between forward pass and backward pass? Brief with an example. (8)

2

P549

Or

(b) Consider the following CPM network. (16)



The following table provides activity duration estimates for the network and there are new estimates for a and b and the original activity duration estimates have been used as the most likely times, m.

Activity	Activity durations (weeks)		
	Optimistic (a)	Most likely (m)	Pessimistic (b)
A	5	6	8
B	3	4	5
C	2	3	3
D	3.5	4	5
E	1	3	4
F	8	10	15
G	2	3	4
H	2	2	2.5

Calculate the expected duration, t_e, for each activity.

3

P549

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 11482

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2012.

Seventh Semester

Information Technology

IT 2403/IT 73 – SOFTWARE PROJECT MANAGEMENT

(Common to Eighth Semester Computer Science and Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the characteristics of software projects.
2. Which factor decides the success of a project?
3. Give the significance of cost benefit analysis.
4. When Net Present Value is calculated for a project?
5. Define the objectives of activity planning.
6. List the factors used to identify the risk.
7. What is bespoke system?
8. What is the use of check points in monitoring?
9. Define stress.
10. List the steps involved in selecting the right person for the job.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the activities of software project management with example. (8)

(ii) Illustrate few problems associated with software projects. (8)

Or

(b) Discuss step wise project planning with an example. (16)

12. (a) Explain how risks are handled in a project. Give example. (16)

Or

(b) Discuss the cash flow forecasting with different cost-benefit evaluation techniques. (16)

13. (a) Explain the different network planning models. Give example for precedence construction. (16)

Or

(b) (i) Describe the steps involved in risk planning. (8)

(ii) Give the methodology used to evaluate Risk in a project. (8)

14. (a) (i) Describe the various ways in visualizing the progress of the project. (8)

(ii) Explain the process of prioritizing monitoring. Give example. (8)

Or

(b) Discuss the types of contracts with example. (16)

15. (a) (i) Give an example for becoming a team and explain working within groups with example. (8)

(ii) Explain the different ways of decision making. (8)

Or

(b) Discuss the organizational behavior with example. (16)

Reg. No. :

Question Paper Code : 51565

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2014.

Eighth Semester

Computer Science and Engineering

IT 2403/IT 73/10144 IT 704 — SOFTWARE PROJECT MANAGEMENT

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for contract management in Software Project Management?

2. How do you define project activities in software project management?

3. What are the assessment needed in technical part for Software Project Management?

4. What is meant by known risk?

5. List any two risk planning and control methods.

6. How do you identify hazards in software Project Management?

7. What is cost monitoring? Write its importance.

8. How can changing control be managed in Software Project Management?

9. What is the significance of "working in groups"?

10. Draw the hierarchy of the organizational structure.

PART B — (5 × 16 = 80 marks)

11. (a) With a suitable example explain the different activities handled by software project management.

Or

(b) If Project cannot be delivered with in the deadline, explain how it will be changed in stepwise project planning. Explain your answer with a suitable example.

12. (a) Explain how cost benefit analysis is evaluated in Software Project Management.

Or

(b) How do you assess the strategic infrastructure management in Project Evaluation? Explain with a suitable illustration.

13. (a) How does PERT work in activity planning while tracking the project? Discuss.

Or

(b) With a suitable illustration, explain how Risk management is managed during critical part in software Project Management.

14. (a) Explain the types of contracts and their stages in contract placement in detail.

Or

(b) How do you prioritize the data collection using Earned Value analysis? Discuss with suitable illustrations.

15. (a) "Assume there are eight members in a Team Management, two members of the team are not attending the work due to health issue problems." Illustrate how decision making works in Team Management according to Hackman Job charactersitics model.

Or

(b) (i) Discuss with a suitable example the process of "selecting the right person for the job" in detail. (8)

(ii) What is the role of the "team" in decision making? Discuss. (8)