Software Project Management

Syllabus

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Reason behind Failure of Software Project

- Non usage of historical software measurement data i.e. metrics

- Non usage of estimation tools

- Non usage of planning tools

- Failure to monitor the progress w.r.to software milestones

- Application of Ineffective Software Architecture

- Failure to use Scientific Development Methods

- Ignorance w.r.to Risk Management

Factors that affect Software Project

- Level of involvement of User. Higher involvement is better
- Executive Management believing and supporting formal SPM Practices.
- RDD has to be Clear, Complete, Correct, Stable and supported by Users.
- Proper planning for estimation of Effort, Size and Risk
- Project Feasibility
- Realistic achievable (Project) Expectations, Features and Functions.

Factors that affect Software Project

- Inefficient Software Project Management Process
- Asynchronous nature of communication between software development teams as well as team members.
- Hardware and Software Architecture
- Incorrect or Inappropriate choice or selection of software technology.

Introduction to Software Project Management

- Software Project Management is an art and discipline of planning and supervising software projects.

- It is a sub – discipline of software project management in which software projects are
  - Planned
  - Implemented
  - Monitored
  - Controlled

Project Management Cycle

- Setting of Goals
- Planning
- Organizing
- Scheduling
- Staffing
- Co–Ordination and Control

Project Management Cycle Steps

- Initiation
- Planning
- Execution
- Control and closure

Software Development Approaches

- Structured System Analysis and Design i.e. Procedural Approach
- Object Oriented System Analysis and Design i.e. Object Oriented Approach

Project Management Keys

- Scope
- Time
- Cost
- Risk
- Quality
- Human Resource
- Communication
- Procurement
- Integration

SPM Focus

- Goal
- Scope
- Time
- Cost
- Quality
- Risk
- Human Resource
- Communication between / among Teams and Team Members

SPM Focus

- Procurement
- Development
- Integration
- Deployment

Project Management Cycle Steps

- Initiation
- Planning
- Execution
- Control and closure

Project Management Phases

- Boehm Proposed following SPM Phases
  - Inception
  - Elaboration
  - Construction
  - Transition

Project Management Phases

- The SPM cycle corresponding to the above phases are
    - Idea Development
    - Design and Architecture
    - Beta Release
    - Software Product Delivery
    - Deployment

Factors Affecting Project Management

- People
- Product(Software)
- Process
- Project

Factors Affecting Project Management: People

- People i.e. Human Resource factor is very important

- People resource falls in following categories

- People from within the organization are developers, analysts, designers, technology specifiers and experts, HR manager and rest of management.

- People from outside the organization belong to customer organization i.e. primary user, secondary user, stake holders, project coordinators and business managers.

Factors Affecting Project Management: People

- People resource falls in following categories
  - **Manager**
    - Responsible for (achieving) Project Goals and Business Goals.
  - **Technocrat i.e. Technical Human Resource**
    - Analyst
    - Designer
    - Solution Architect
    - Tester
    - Implementer

Factors Affecting Project Management: People

- People factor is very important
- People resource falls in following categories
  - **Developer**
    - Responsible for achieving technical excellence and ensuring that the policies and standards are applied in the development of software.
  - **Customer**
    - Responsible for implementing the project as per pre agreed Software Project Implementation Guidelines

Factors Affecting Project Management: People

- People factor is very important
- People resource falls in following categories
  - **End User**
    - Responsible for User Acceptance Testing
    - Responsible for successful use of the software system

Factors Affecting Project Management: People

- People from within the organization are developers, analysts, designers, technology specifiers and experts, HR manager and rest of management.

- People from outside the organization belong to customer organization i.e. primary user, secondary user, stake holders, project coordinators and business managers.

Factors Affecting Project Management: Product i.e. Software

- The product in context of software is the scope of the software that is proposed to solve the user requirements.

- Software and its scope is a product that is defined and described by following four factors
  - Context
  - Objective
  - Functions
  - Performance

Factors Affecting Project Management: Process

- The generic phases of development i.e. define, analyse, design, develop, test and implement are common to tall products. The optimization lies in how these phases will be executed to develop the software. The execution of the above phases is through a process. The process models are
  - LSM
  - Prototype Model
  - RAD
  - INM
  - BSM and Component Based Development Model

Factors Affecting Project Management: Project

- Project is defined as "An activity that has a definite start and definite end, requires multiple resources and is full of uncertainties on a number of counts".

- Project Management is defined as "The application of knowledge, skills, tools and techniques to manage resources to deliver customer needs within agreed terms of cost, time and scope of delivery.

- Effective Project Management process requires that the project team member have knowledge about how to manage the operating and support function.

Factors Affecting Project Management: Project

- The Operating Functions are
  - Scope Management
  - Time Management
  - Cost Management
  - Quality Management

Factors Affecting Project Management: Project

- The Support Management Functions are
  - Human Resource Management
  - Communication Management
  - Risk Management
  - Procurement Management
  - Outsourcing Management

Factors Affecting Project Management: Project

- The Operating Functions are
  - **Scope Management** defines that the requirements that when delivered, will be successful conclusion of project.
  - Time Management means estimating the time for the project completion and time for each activity in the project. Scheduling the activities of the project using activity time. Monitoring the activity progress to complete the project on time as agreed with the customer.

Factors Affecting Project Management: Project

- The Operating Functions are
  - **Cost Management** means estimating the effort and resources required, costing them for budgeting and controlling them throughout the project duration. **Cost Management** also includes cost of outsourcing and cost of procurement. All the cost components are required to be managed to ensure that the costs are within the budget to keep project's profit margin intact.
  - **Quality Management** means producing the quality of all deliverables as expected by the customers and stakeholders.

Factors Affecting Project Management: Project

- The Support Management Functions are
  - **Human Resource Management** means managing people and their skills effectively as estimated to deliver quality products within cost and time.
  - **Communication Management** means control and coordination of all aspects of data on a project and its activities, processing the data and distribution of the same to the concerned people so as to respond effectively to meet the business commitments.
  - **Risk Management** means Identification, Analysis, Build Monitoring and Mitigation Plans to Control the Risk.

Factors Affecting Project Management: Project

- The Support Management Functions are
  - **Procurement Management** means identifying procurement requirements like development and engineering services, hardware and software as a support to the project.
  - **Outsourcing Management** means integrating various tasks in the scope to produce project deliverables as per the expectations of the customer within cost and time.

Factors Affecting Project Management …

Factor	Elaboration	Focus
People	Users, Developers, Stakeholders, Vendors and Partners	Environment, communication, productivity, skills, motivation and team management, PM – CMM
Product	Deliverables, Scope, Form and Format, Objectives	Cost, feasibility, quality, risk
Process	The method through which product will be delivered – process models, choice of technology, processes of development	Plan of SP development catering for SPM framework made of common umbrella activities like scope definition, analysis, estimation, feasibility, risk management and quality assurance and tasks like WBS, milestones, monitoring, and tracking, correcting and reporting
Project	Definition, scope, business goal, economics, resource, budget, configuration, clear start and closure	Key deliverables, cost control, time management, meeting deadline and fulfilling commitments to consumer satisfaction.

Project Management Keys

Knowledge Management Area	Tools	Knowledge	Domain Knowledge
Scope	Requirement Analysis Prototyping Modeling Structuring Partitioning Packaging	Questioning Surveying Behavior Analysis Communication UML Business Knowledge	Business Systems and processes
Time	Gannt Chart PERT Chart Networks Scheduling Critical Path Analysis	MS Project Primavera Capacity Scheduling Resource Optimization	Process Details Transactions Business Rules and Technology
Cost	Activity Costing Product Costing Budgeting and Estimation Analysis Tools for Cost Control	Standard Costing Principles of Accounting and Costing Management Accounting and Budgeting COCOMO Model	Manpower Cost Administration and Management Overheads Account charts Cost Heads

Project Management Keys …

Knowledge Management Area	Tools	Knowledge	Domain Knowledge
Quality	Testing Tools for Design and Coding, Alpha Testing and Beta Testing	Building Quality Standards, Policies and Practices	Industry Performance Standards, TP Standards, Standard Practices
Human Resource	Resource Estimation, FPA, COCOMO foe size and effort estimation	Building productive teams, resolving people issues arising out of conflicts, skills mismatch, training for higher performance	
Risk	Risk Identification Risk Analysis Risk Exposure Risk Management Strategies • Elimination • Prevention • Avoidance • Mitigation	Probability Analysis Decision Tree Analysis Game Theory Trade Off Analysis Domain Specific Technology Specific Risk Awareness	Domain Specific Risk Area Risk Incident Analysis of Risk v/s Claim Settled

Project Management Keys …

Knowledge Management Area	Tools	Knowledge	Domain Knowledge
Communications	Emails Messages Reviews Reports	Formal Communication Skills Informal Communication Skills Conduction of Meeting Seeking Effective Participation Removing the Communication Barriers	Communication Standards Reports • MIS Report • Statutory Respot
Procurement	Vendor Analysis Technology Analysis Configuration Management and Sourcing	Different Vendors Different Products Different Technologies Performance Rating Support Capabilities and Cost	Competition Performance Product Used Best Procedures and variations
Integration	Process Models Life Cycle Change Management Interfacing and Connectivity Tools Beta Testing	Development Implementation Deployment Strategies	System and Process Hierarchy and relationship between / among components Business Practices

Project Management Tools

- Gannt Chart

- PERT(Project Evaluation and Review Technique)/ Critical Path Method Chart

- Logic Network

- Project Breakdown Structure

- Work Breakdown Structure

- Critical Path Analysis

- Resource Histogram

Project Management Tools

- Gannt Chart

- PERT(Project Evaluation and Review Technique)/ Critical Path Method Chart

- Logic Network

- Project Breakdown Structure

- Work Breakdown Structure

- Critical Path Analysis

- Resource Histogram

Gannt Chart

- Developed by Henry Gannt in 1917.

- Handy when we want to see the whole landscape of one or multiple projects.

- Helps to view the dependent functions and forthcoming event.

- Basically used to allocate resource to activities.

- Type of bar chart, where each bar represent one activity. Bars are drawn along time line.

- Distance between each bar is time proportional to the time duration planned for the corresponding event.

Gannt Chart …

- Each bar subsists of a white part and a shaded section.

- Shaded section displays the length of time every task is estimated to take.

- White part displays the slack time i.e. the current time by which a task must complete.

Representation of MIS Problem using Gannt Chart
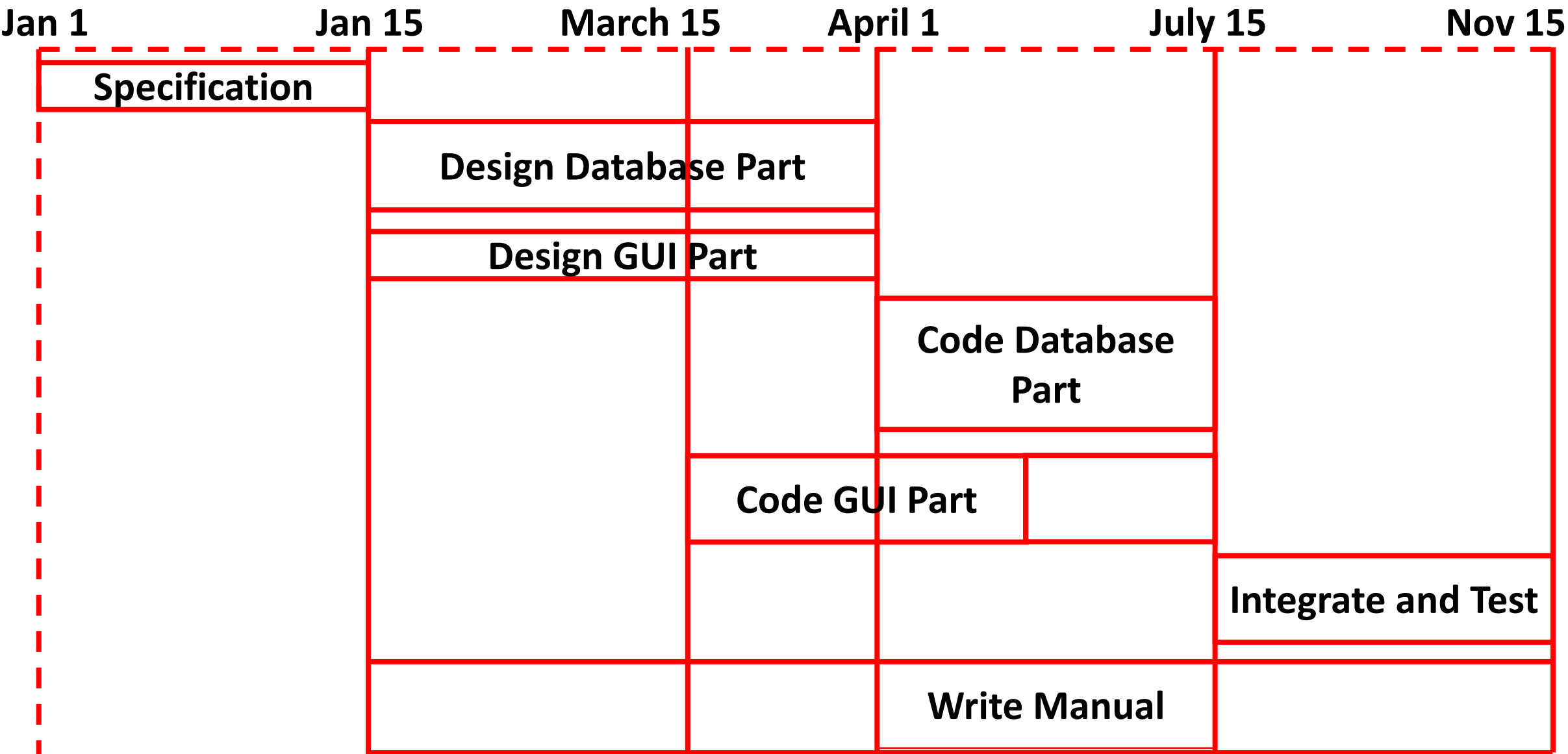
PERT Chart

- Network of boxes and arrows.

- Each box show activity and arrow shows functional dependency.

- PERT chart shows the numerical variation in the plan estimates.

- In a PERT chart consist of making a single estimate for each function, pessimistic, likely, and optimistic size is made.

- The boxes of PERT charts are generally annotated with the pessimistic, likely, and optimistic estimates for each method.

# Representation of MIS Problem using PERT Chart
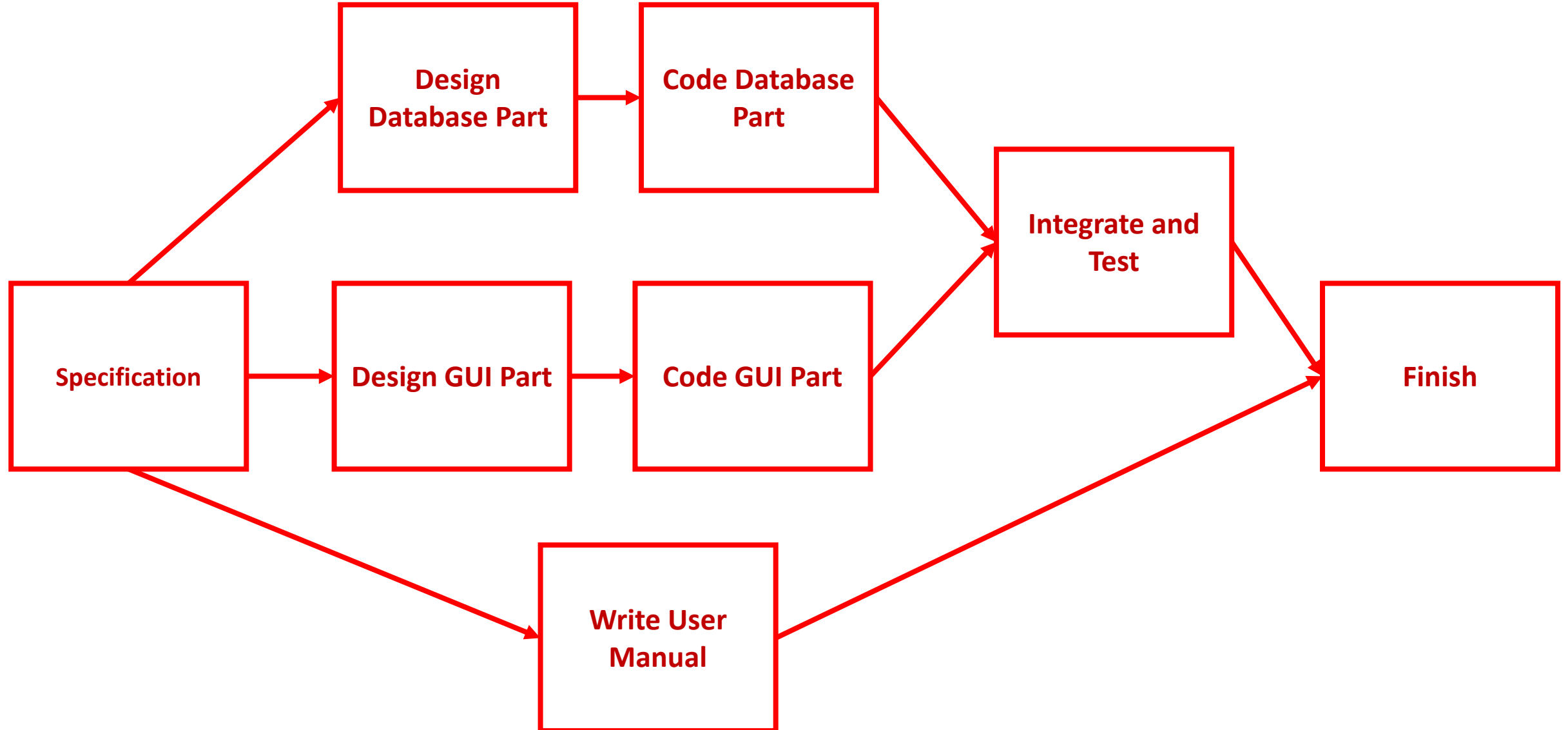
Logical Network

- The Logic Network shows the order of activities over time.

- It shows the sequence in which activities are to do.

- Distinguishing events and pinning down the project are the two primary uses.

- It helps in understanding task dependencies, a timescale, and overall project workflow.

Product Breakdown Structure

- Product Breakdown Structure (PBS) is a management tool and necessary a part of the project designing.

- PBS is a task-oriented system for subdividing a project into product parts.

- The product breakdown structure describes subtasks or work packages and represents the connection between work packages.

- The project work has diagrammatically pictured with various types of lists.

- The product breakdown structure is just like the work breakdown structure (WBS).

Product Breakdown Structure [Macro Level]
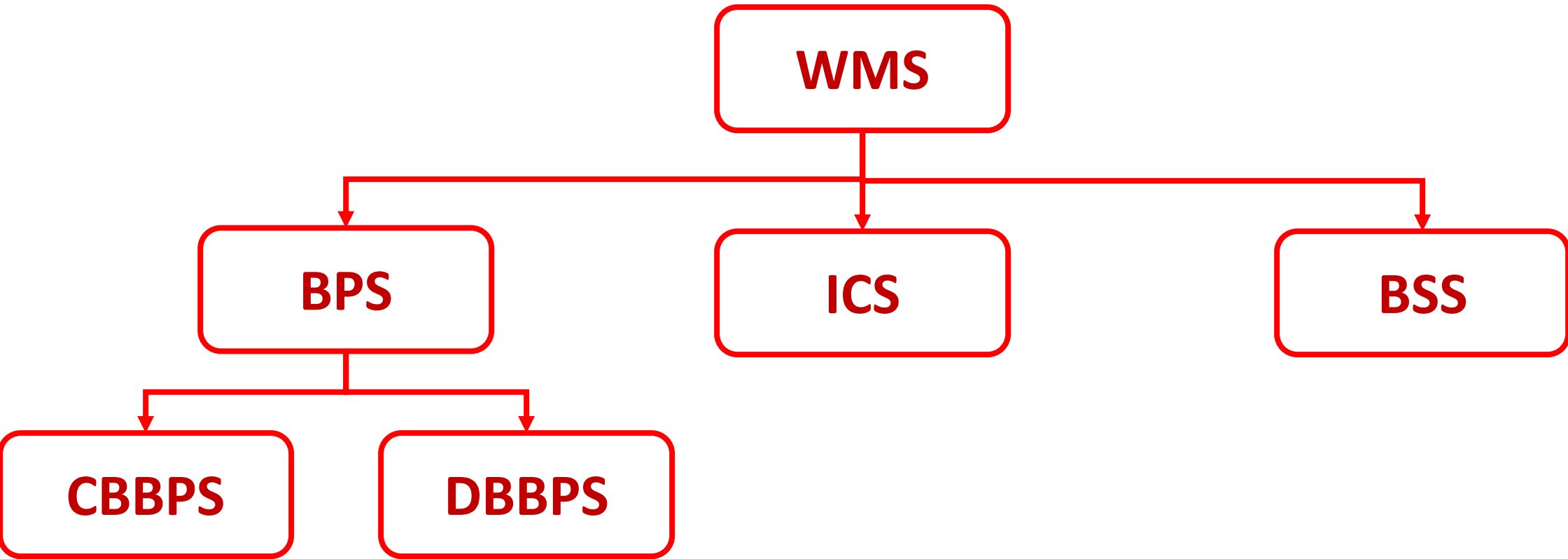
Work Breakdown Structure [Micro i.e. Function Level]

- Work Breakdown Structure (WBS) is used to decompose a given function set recursively into small activities.

- WBS provides a notation for representing the significant tasks that need to be carried out to solve a problem.

- The problem name labels the root of the tree.

- Each node of the tree is broken down into smaller activities that are building the children for the node.

Work Breakdown Structure …

- Each activity is recursively decomposed into smaller sub-activities until at the leaf level; the activities require approximately two weeks to develop.

- When a function is broken down into smaller tasks, the manager has to make some hard decisions.

- If a task is broken down into a large number of minimal activities, these can be carried out independently.

Work Breakdown Structure …

- Thus, it becomes feasible to develop the product faster.

- Therefore, to be able to do a project in the least amount of time, the manager needs to break the vital function into smaller ones, expecting to find more parallelism.

- In general, it is not useful to subdivide tasks into units which take less than a week or two to execute.

- Excellent subdivision measure that a disproportionate amount of time must be spent on preparing and revising various charts.

Critical Path Analysis

- Critical path analysis is the technique that is used to categorize the activities which are required to complete a task, as well as classifying the time which is needed to finish each activity and the relationships between the activities.

- It is also called a critical path method.

- CPA helps in predicting whether a project will expire on time.

- From the activity network representation following method can be made.

Critical Path Analysis …

- The minimum time (MT) to complete the project is the maximum of all way from start to finish.

- The earliest start (ES) time of a method is the maximum of all paths from the start to the task.

- The current start time is the difference between MT and the maximum of all paths from this method to the finish.

- The earliest finish time (EF) of a function is the sum of the earliest start time of the function and the duration of the function.

Critical Path Analysis ...

- The latest finish (LF) time of a function can be obtained by subtracting maximum of all paths from this method to complete from MT.

- The slack time (ST) is LS - EF and equally can be indicated as LF - EF.

- The slack time (or float time) is the total time that a function may be delayed before it will affect the last time of the project.

- The slack time means the "flexibility" in the starting and completion of tasks.

Critical Path Analysis …

- A critical method is one with a zero slack time.

- A path from the begin node to the last node containing only critical tasks is called a critical path.

- These parameters for various methods for the MIS problem are shown in the following table.

Critical Path Analysis ...

Task	Earliest Start (ES)	Earliest Finish (EF)	Latest Start (LS)	Latest Finish (LF)	Slack Time (ST)
Specification	0	15	0	15	0
Design database	15	60	15	60	0
Design GUI part	15	45	90	120	75
Code database	60	165	60	165	0
Code GUI part	45	90	120	165	75
Integrate and test	165	285	165	285	0
Write user manual	15	75	225	285	210

Resource Histogram

- The resource histogram is precisely a bar chart that used for displaying the amounts of time that a resource is scheduled to be worked on over a prearranged and specific period.

- Resource histograms contains the related feature of resource availability, used for comparison on purposes of contrast.