Software Engineering-BSCE-301L

Module 2:

Introduction to Software Project Management

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Outline

- Planning
- Scope
- Work break-down structure
- Milestones
- Deliverables
- Cost and Estimates
- Human Resources
- Time-scale
- Costs
- Risk Management
- RMMM Plan
- CASE TOOLS
- Agile Project Management
- Managing team dynamics and communication
- Metrics and Measurement

Outline

- ❑Project Planning
- ❑Scope
- ❑Work break-down structure
- ❑Milestones
- ❑Deliverables
- ❑Cost Estimates COCOMO Model I
- ~~❑Human Resources~~
- ❑ ~~Time-scale~~
- ~~❑Costs~~
- ~~❑Risk Management~~
- ~~❑RMMM Plan~~
- ❑**CASE TOOLS** (Class diagram, Usecase diagram, Sequence Diagram, Collaboration Diagram, State Chart, Activity, Component, Package, Deployment diagrams)
- ❑**Agile Project Management**
- ❑**Managing team dynamics and communication**
- ~~❑Metrics and Measurement~~

Outline

- Project Planning
- Scope
- Work break-down structure
- Milestones
- Deliverables
- Cost Estimates FP Based
- LOC based COCOMO Model I
- Scheduling (PERT and CPM)
- ~~Human Resources~~
- ~~Time-scale~~
- ~~Costs~~
- ~~Risk Management~~
- ~~RMMM Plan~~
- ~~CASE TOOLS (Class diagram, Usecase diagram, Sequence Diagram, Collaboration Diagram, State Chart, Activity, Component, Package, Deployment diagrams)~~
- Agile Project Management
- Managing team dynamics and communication
- ~~Metrics and Measurement~~

Project Planning

→What is Project Planning?

- A project consists of five different phases: initiation, ***planning***, execution, monitoring and controlling, and closure.
- Planning is the second phase of the project life cycle, where a plan after the initiation phase is made so the process of execution may begin.
- The project plan serves as a roadmap for the entire process of project management.

Project Planning

→**What is Project Planning?** Project planning involves:

❑Defining Objectives: The definition must include what the project is comprised of, its main aim, what it intends to accomplish, and what marks its closure

❑Explaining the Scope: The explanation provides details on what the project intends to solve and who will benefit from the project

❑Scheduling Tasks : Each task is given a start date, an end date, and provides an estimate of how much time a task would take to complete

❑Generating Progress Reports :The document includes the work to be performed, deliverables, and the intended outcome of the project

Project Planning

→**Project Planning Fundamentals :** Project Planning refers to defining fundamentals such as the following:

1. Determination of Scope, Cost, and Resources

- The process of determining the scope, cost, and resources help estimate the time required to complete the project, the number of people needed, and the skill set required
- Work Breakdown Structure (WBS) helps this process by dividing the whole task into smaller, manageable segments

2. Identification of the Problem

- A variety of techniques, like surveys or meetings, are used to collect information to assess problems
- There can be multiple problems; then, the project team selects the issue that requires the most immediate attention

Project Planning

→**Project Planning Fundamentals :** Project Planning refers to defining fundamentals such as the following:

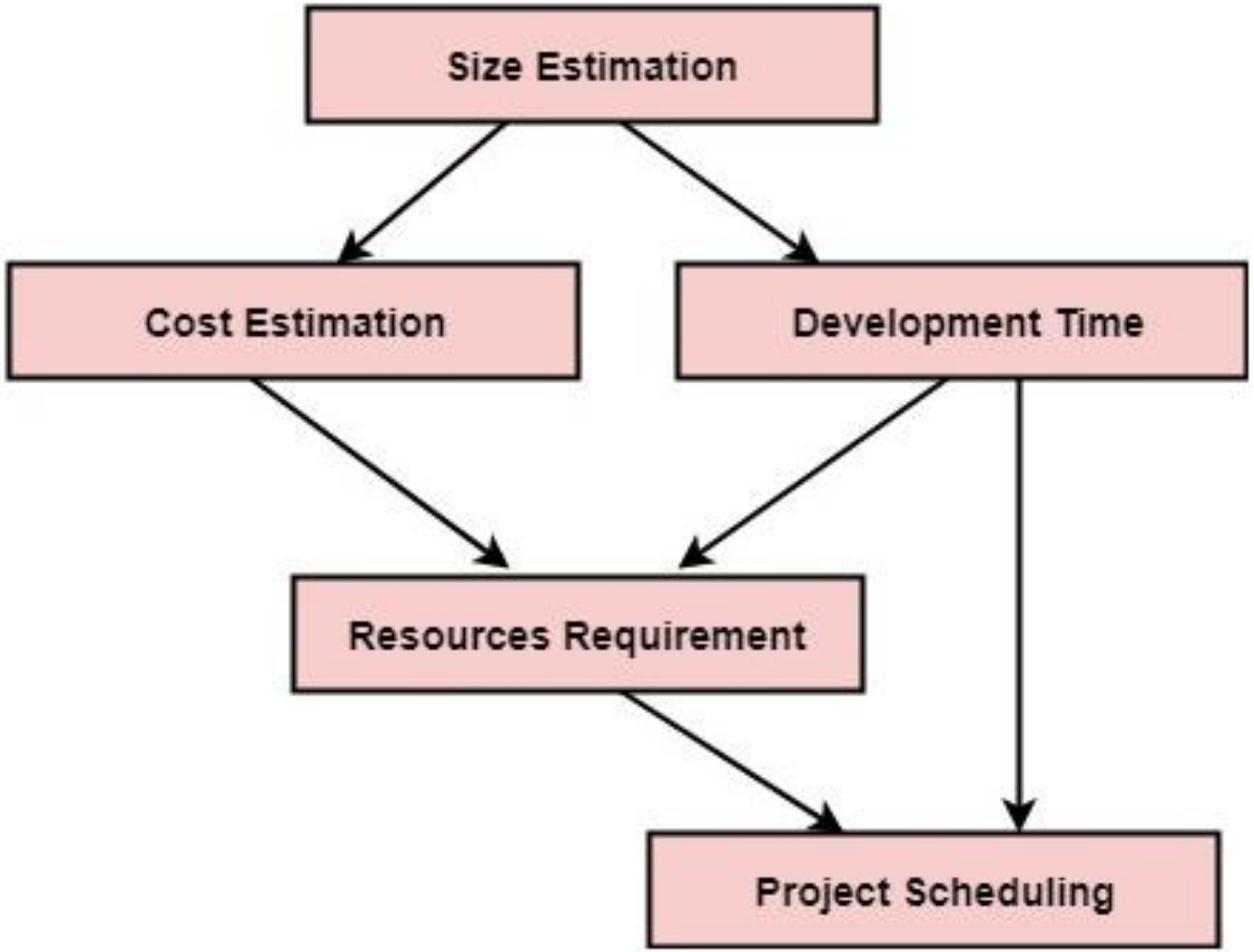
3. Identification of Stakeholders

- Identification of stakeholders gives a clearer image of the real problem, specifically which function or people might be affected by the project
- Stakeholders work with the project team and contribute to the project's success

4. Definition of Project Objectives

- A plan is made, keeping in mind the various expectations of the stakeholders
- The success of the project entirely depends on how much of the expectations the project is able to meet

Project Planning



Project Planning

→Components of a Project Plan:

❑**Scope:** The scope determines what a project team will and will not do. Defining the project's in-scope requirements make the work breakdown structure creation process easier. The project manager must define performance objectives as part of the project scope.

❑**Budget:** To determine the project's cost, project managers consider the amount of labour and other resources needed to complete the project's objectives. Different phases, tasks, and activities require different budget allocations depending on their priorities and needs.

❑**Timeline:** The term "timeline" describes how long it is anticipated for each project stage to be finished. It also entails stating how the project is broken down into tasks and subtasks. The definition of these timelines, the creation of individual and team schedules, and the selection of project milestones are all included in the timeline process.

Project Planning

→How Do You Create a Project Plan?: The following steps will ensure that the project will be executed properly:

1. **Define Stakeholders:** Anyone with interest in the project is a stakeholder. Thus, any person, organisation, or party interested in a company or its actions' results is considered a stakeholder.
2. **Define Roles:** Stakeholders have a variety of responsibilities within the business. They may occasionally participate in making decisions, bringing in money, and performing other duties.
3. **Introduce Stakeholders:** It is essential to schedule formal or informal meetings with each team member at various points throughout the project. Before the project starts, issues like scope, budget, goals, schedule, and roles should be discussed.
4. **Set Goals :** Setting goals is essential to prepare for personal change and achieve project goals. It serves as a basis for managing performance and motivates and focuses attention.
5. **Prioritize Tasks:** You need to set tasks in order of importance. Also, the more significant task can be simplified into smaller objectives and tasks.

Project Planning

6. **Create a Schedule :** You must set up a system to make sure when deadlines are missed, corrective actions are taken. Your timeline may need to be modified, considering your objectives.
7. **Assess Risks :** A risk is a potential issue with your project that may or may not materialise. To avoid being caught off guard later, it is crucial to identify risks in project management and mitigate them during the project planning phase.
8. **Communicate:** Setting up reliable communication lines and expectations for project communication is essential. Hold a meeting or solicit opinions from each team member regarding the risks you should take into account.
9. **Re-assess :** You should reevaluate everything once you've reached the halfway point or other significant milestones. Doing so lets you assess which areas you are doing well in and which require more effort. Your original plan may need to be modified after revaluation.
10. **Final Evaluation :** You need to reflect on the project once it is finished. Learn from your areas of weakness and focus more on improving the ones where you performed better. Your likelihood of project success goes up as a result.

Project Planning

→5 Phases of a Project:

1. **Initiation :** You must create a business plan and define a broad project at this stage. Ensure the project meets business needs and that stakeholders and project teams agree. Creating the project success criteria throughout the project life cycle is the main objective of the Initiation Phase. Also, at this point, the feasibility of the project and its measurement are taken into account.
2. **Planning :** Successful project management depends on good project planning. The project team members focus on specific requirements, tasks, deadlines, and actions during the project planning phase. The project manager collaborates with every team member to develop the design, list the tasks, and determine the budget. S.M.A.R.T. (specific, measurable, attainable, realistic and timely) and C.L.E.A.R. (collaborative, limited, emotional, appreciable, refinable) are two of the most common approaches to setting project goals.

Project Planning

→5 Phases of a Project:

3. **Execution :** To keep the project on track for the remainder of the life cycle, the project manager attempts to manage every task and aspect of project delivery during this phase. During this phase, the project manager also must consistently uphold productive stakeholder collaboration. This ensures everyone is on the same page and everything goes off without a hitch during the project.
4. **Monitoring and Management :** By working in parallel with project execution, the project monitoring and controlling phase guarantees that goals and project deliverables are met. Along with keeping tabs on task progress, the project manager also looks for problems or risks, develops a plan to mitigate them with the team, and regularly communicates the project's status to stakeholders.

→5 Phases of a Project:

5. **Closing and Review:** The project management process ends at this stage. The final crucial tasks must be finished to ensure that the client is satisfied. However, the team should conduct a project retrospective regardless of the life cycle. The project team can consider new lessons learned and ensure that current project management procedures are improved for a future project during this post-mortem activity.

Project Planning

→Project Planning Steps :

Project Planning

→Project Planning Steps :

1. Identify and Meet Stakeholder : The stakeholders might include the project manager, the customer, or the team. The first step is to identify and meet the stakeholders to discuss their expectations and establish the project scope.

2. Define Scope : Project scope involves determining a list of specific project goals, deliverables, budgets, and deadlines. Project scope helps in establishing boundaries of the project and responsibilities of each team member.

3. Set and Prioritize Objectives: The objectives are set and prioritized once the expectations of stakeholders become certain. More exquisite detail to initial ideas is given, which serves as a reference point throughout the project.

4. Determine Deliverables: Deliverables are the reason why the projects are created. It is one of the most critical steps of the project planning to determine what these deliverables will be and how they will be delivered in time.

→Project Planning Steps :

5. Create a Project Schedule: The project schedule outlines when different tasks of a project are supposed to begin and end. The project schedule helps measure the project progress and set up progress reports.

6. Risk Analysis: Identifying risks and considering how to deal with them is an essential step in project planning. Specific steps to prevent risks from happening or limiting their impact should be considered.

7. Set Progress Guidelines: There must be a communication plan to update the stakeholders regarding the project progress. This can be done monthly, weekly, or daily so that all involved members can monitor the progress.

Work Break-Down Structure

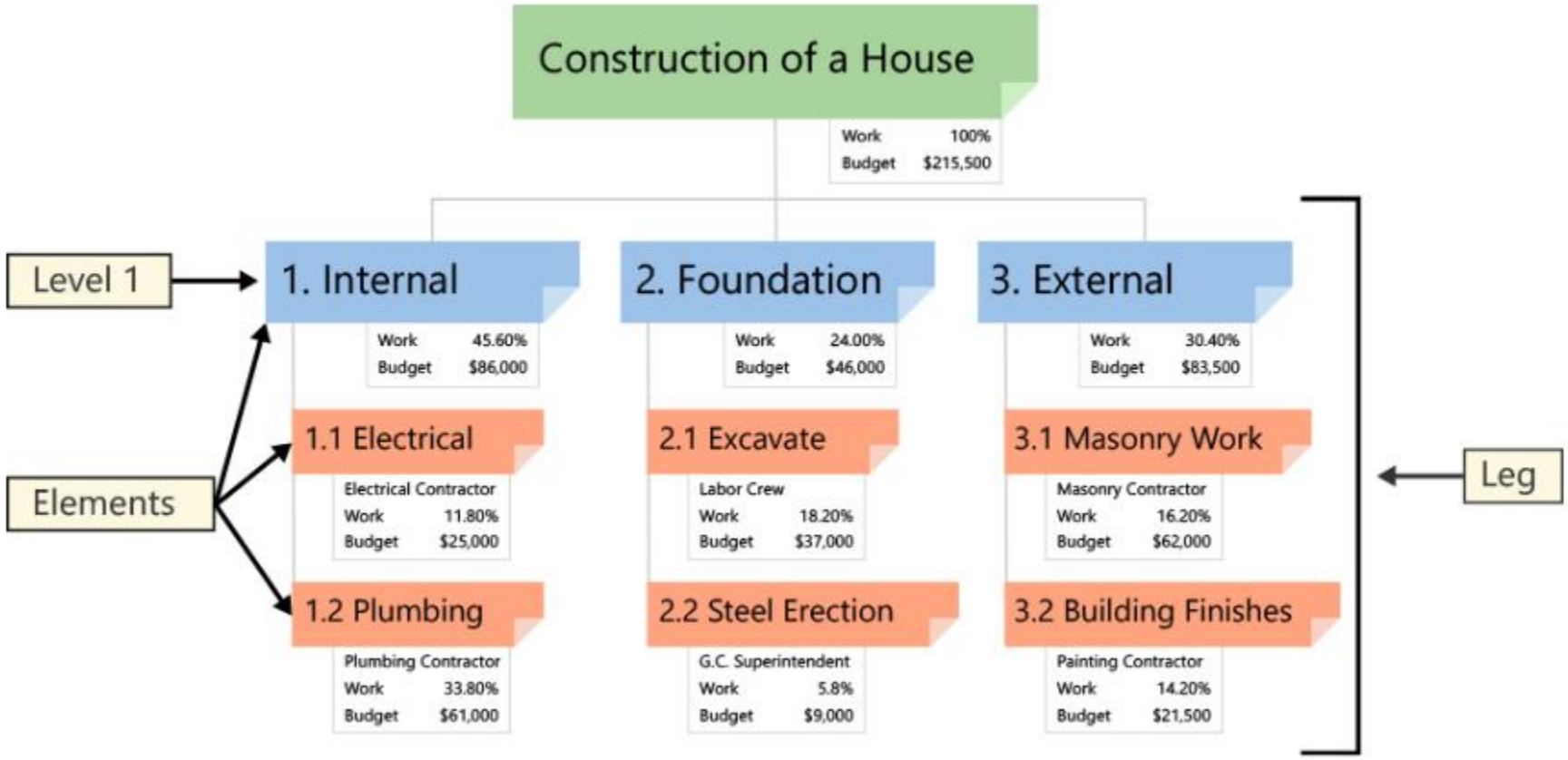
- Breaking work into smaller tasks is a common productivity technique used to make the work more manageable and approachable.
- For projects, the **Work Breakdown Structure (WBS)** is the tool that utilizes this technique and is one of the most important project management documents.
- It singlehandedly integrates scope, cost and schedule baselines ensuring that project plans are in alignment.
- The Project Management Institute (PMI) Work Breakdown Structure as a “deliverable oriented hierarchical decomposition of the work to be executed by the project team.
- ” There are two types of WBS: 1) **Deliverable-Based** and 2) **Phase-Based**.
- The most common and preferred approach is the Deliverable-Based approach.
- The main difference between the two approaches are the **Elements** identified in the first Level of the WBS.

Work Break-Down Structure

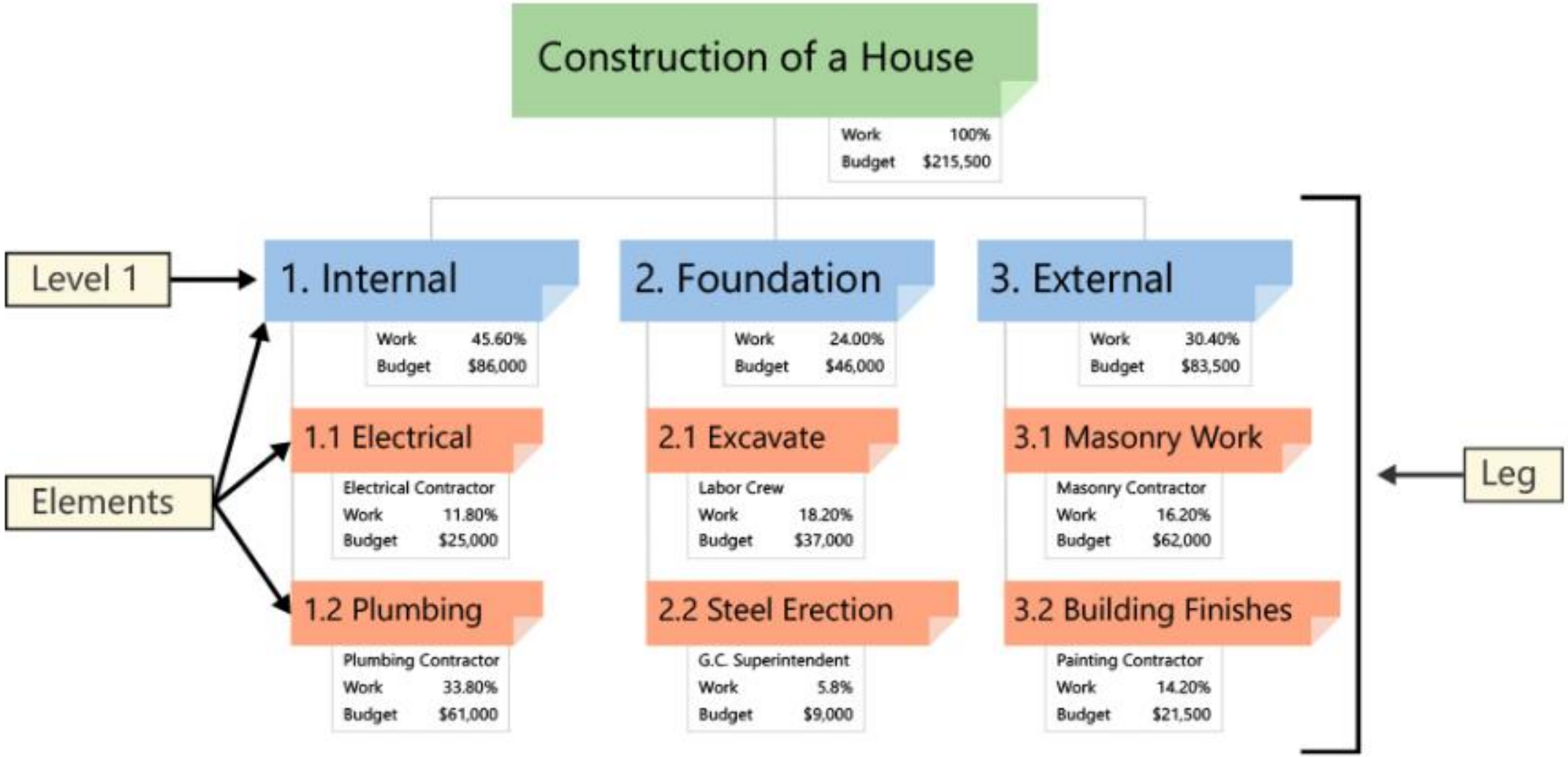
❑Deliverable-Based Work Breakdown Structure

❑A Deliverable-Based Work Breakdown Structure clearly demonstrates the relationship between the project deliverables (i.e., products, services or results) and the scope (i.e., work to be executed).

❑Following figure is an example of a Deliverable-Based WBS for building a house.



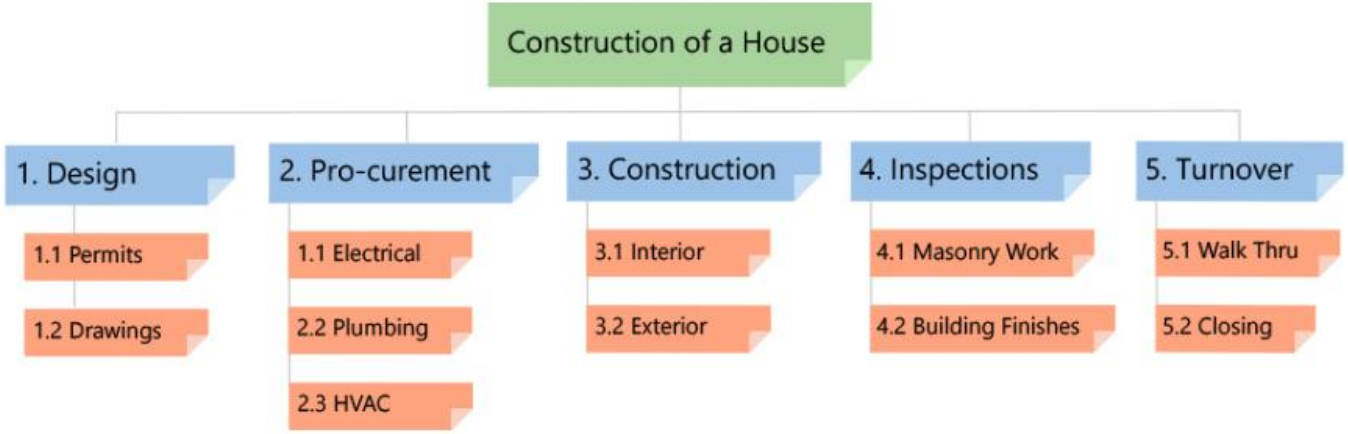
Work Break-Down Structure



Work Break-Down Structure

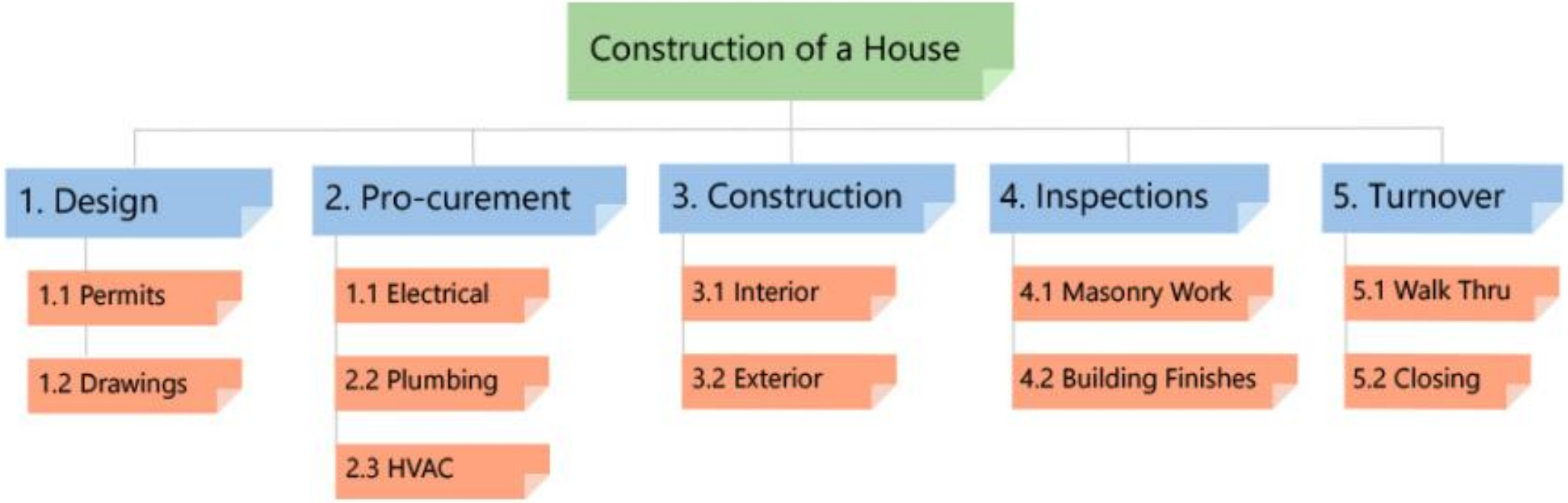
❑Phase-Based Work Breakdown Structure

- ❑In the following Figure, a Phase-Based WBS, the Level 1 has five Elements.
- ❑Each of these Elements are typical phases of a project.
- ❑The Level 2 Elements are the unique deliverables in each phase.
- ❑Regardless of the type of WBS, the lower Level Elements are all deliverables.
- ❑Notice that Elements in different Legs have the same name.
- ❑A Phase-Based WBS requires work associated with multiple elements be divided into the work unique to each Level 1 Element.
- ❑A WBS Dictionary is created to describe the work in each Element.



Work Break-Down Structure

❑Phase-Based Work Breakdown Structure



Work Break-Down Structure

❑How to Make a Work Breakdown Structure:

1. GATHER CRITICAL DOCUMENTS

I. Gather critical project documents.

II. Identify content containing project deliverables, such as the Project Charter, Scope Statement and Project Management Plan (PMP) subsidiary plans.

2. IDENTIFY KEY TEAM MEMBERS

I. Identify the appropriate project team members.

II. Analyze the documents and identify the deliverables.

3. DEFINE LEVEL 1 ELEMENTS

I. Define the Level 1 Elements. Level 1 Elements are summary deliverable descriptions that must capture 100% of the project scope.

II. Verify 100% of scope is captured. This requirement is commonly referred to as the 100% Rule.

Work Break-Down Structure

❑How to Make a Work Breakdown Structure:

3. DECOMPOSE (BREAKDOWN) ELEMENTS

I. Begin the process of breaking the Level 1 deliverables into unique lower Level deliverables. This “breaking down” technique is called Decomposition.

II. Continue breaking down the work until the work covered in each Element is managed by a single individual or organization. Ensure that all Elements are mutually exclusive.

III. Ask the question, would any additional decomposition make the project more manageable? If the answer is “no”, the WBS is done.

4. CREATE WBS DICTIONARY

I. Define the content of the WBS Dictionary. The WBS Dictionary is a narrative description of the work covered in each Element in the WBS. The lowest Level Elements in the WBS are called Work Packages.

II. Create the WBS Dictionary descriptions at the Work Package Level with detail enough to ensure that 100% of the project scope is covered. The descriptions should include information such as, boundaries, milestones, risks, owner, costs, etc.

Work Break-Down Structure

❑How to Make a Work Breakdown Structure:

5. CREATE GANTT CHART SCHEDULE

I. Decompose the Work Packages to activities as appropriate.

II. Export or enter the Work Breakdown Structure into a Gantt chart for further scheduling and project tracking.

Cost Estimation COCOMO Model

- Boehm proposed COCOMO (Constructive Cost Estimation Model) in 1981.
- COCOMO is one of the most generally used software estimation models in the world.
- COCOMO predicts the efforts and schedule of a software product based on the size of the software.
- **The necessary steps in this model are:**

1. Get an initial estimate of the development effort from evaluation of thousands of delivered lines of source code (KDLOC).
2. Determine a set of 15 multiplying factors from various attributes of the project.
3. Calculate the effort estimate by multiplying the initial estimate with all the multiplying factors i.e., multiply the values in step1 and step2.

Cost Estimation COCOMO Model

- The initial estimate (also called nominal estimate) is determined by an equation of the form used in the static single variable models, using KDLOC as the measure of the size.
- To determine the initial effort E_i in person-months the equation used is of the type is shown below.

$$E_i = (a_1*(KLOC))^{a2}$$

- The value of the constant a_1 and a_2 are depends on the project type.

Cost Estimation COCOMO Model

❑**In COCOMO, projects are categorized into three types:**

1.Organic: A development project can be treated of the organic type, if the project deals with developing a well-understood application program, the size of the development team is reasonably small, and the team members are experienced in developing similar methods of projects.

Examples: Business systems, Inventory management systems, and Data processing systems.

2. Semidetached: A development project can be treated with semidetached type if the development consists of a mixture of experienced and inexperienced staff. Team members may have finite experience in related systems but may be unfamiliar with some aspects of the order being developed.

Example: Developing a new operating system (OS), a Database Management System (DBMS), and Complex inventory management system.

3. Embedded: A development project is treated to be of an embedded type, if the software being developed is strongly coupled to complex hardware, or if the stringent regulations on the operational method exist.

Example: ATM, Air Traffic control.

Cost Estimation COCOMO Model

❑For three product categories, Bohem provides a different set of expression to predict effort (in a unit of person month)and development time from the size of estimation in KLOC(Kilo Line of code) efforts estimation takes into account the productivity loss due to holidays, weekly off, coffee breaks, etc.

Software Projects	a_1	a_2	b_1	b_2
Organic	2.4	1.05	2.5	0.38
Semi-Detached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

Cost Estimation COCOMO Model

❑**Basic COCOMO Model:** The basic COCOMO model provide an accurate size of the project parameters.

❑The following expressions give the basic COCOMO estimation model:

$$\textbf{Effort}=(a_1*(KLOC))^{a2} \quad PM$$

$$\textbf{Tdev}=(b_1*(efforts))^{b2} \quad Months$$

❑Where,

- **KLOC** is the estimated size of the software product indicate in Kilo Lines of Code,
- a_1, a_2, b_1, b_2 are constants for each group of software products,
- **Tdev** is the estimated time to develop the software, expressed in months,
- **Effort** is the total effort required to develop the software product, expressed in **person months (PMs)**.

Cost Estimation COCOMO Model

❑**Estimation of development effort:** For the three classes of software products, the formulas for estimating the effort based on the code size are shown below:

Organic: Effort = $(2.4(KLOC))^{1.05}$ PM

Semi-detached: Effort = $(3.0(KLOC))^{1.12}$ PM

Embedded: Effort = $(3.6(KLOC))^{1.20}$ PM

❑**Estimation of development time:** For the three classes of software products, the formulas for estimating the development time based on the effort are given below:

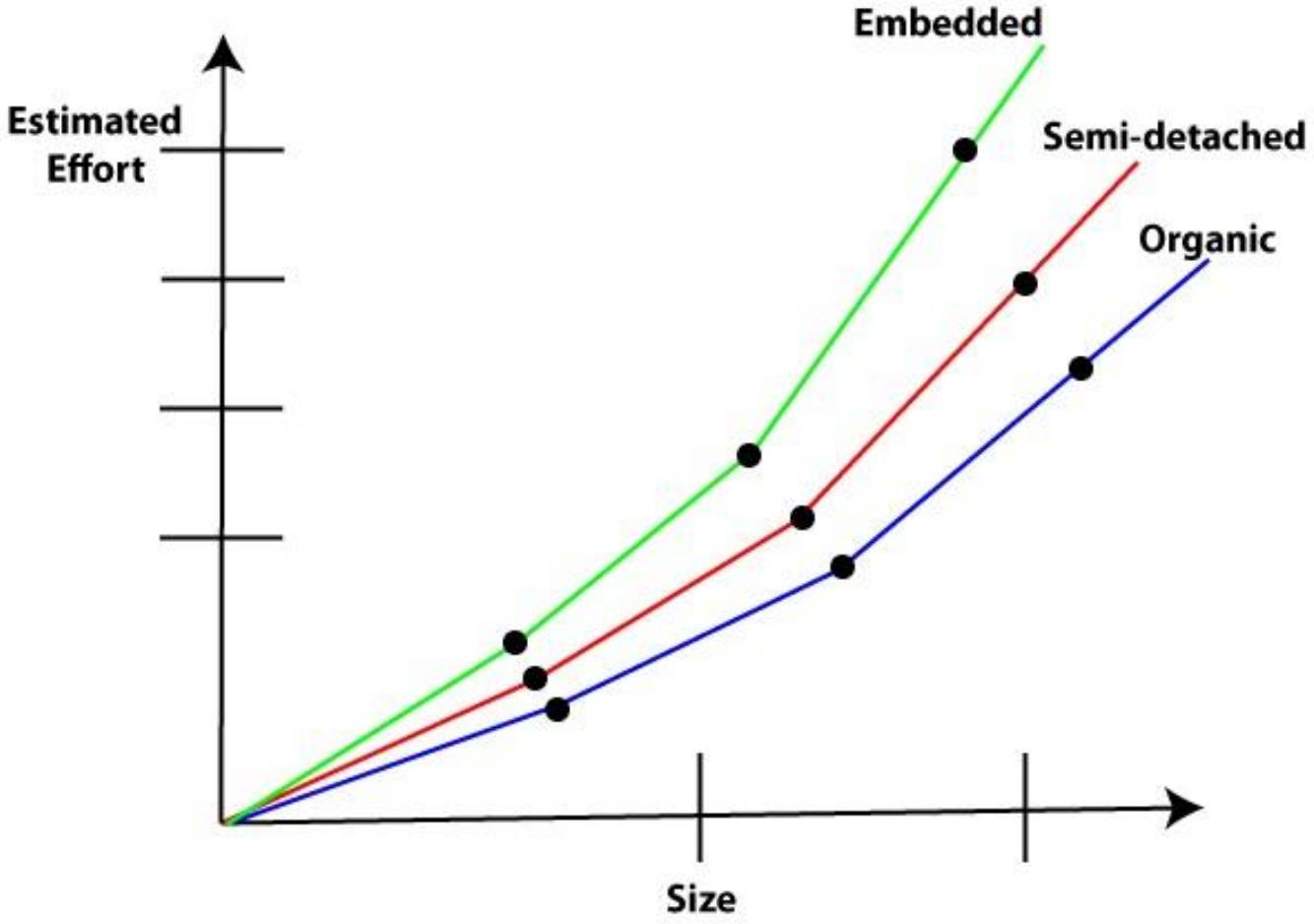
Organic: Tdev = $(2.5(Effort))^{0.38}$ Months

Semi-detached: Tdev = $(2.5(Effort))^{0.35}$ Months

Embedded: Tdev = $(2.5(Effort))^{0.32}$ Months

Cost Estimation COCOMO Model

- Some insight into the basic COCOMO model can be obtained by plotting the estimated characteristics for different software sizes.
- Fig shows a plot of estimated effort versus product size.
- From fig, we can observe that the effort is somewhat superliner in the size of the software product.
- Thus, the effort required to develop a product increases very rapidly with project size.

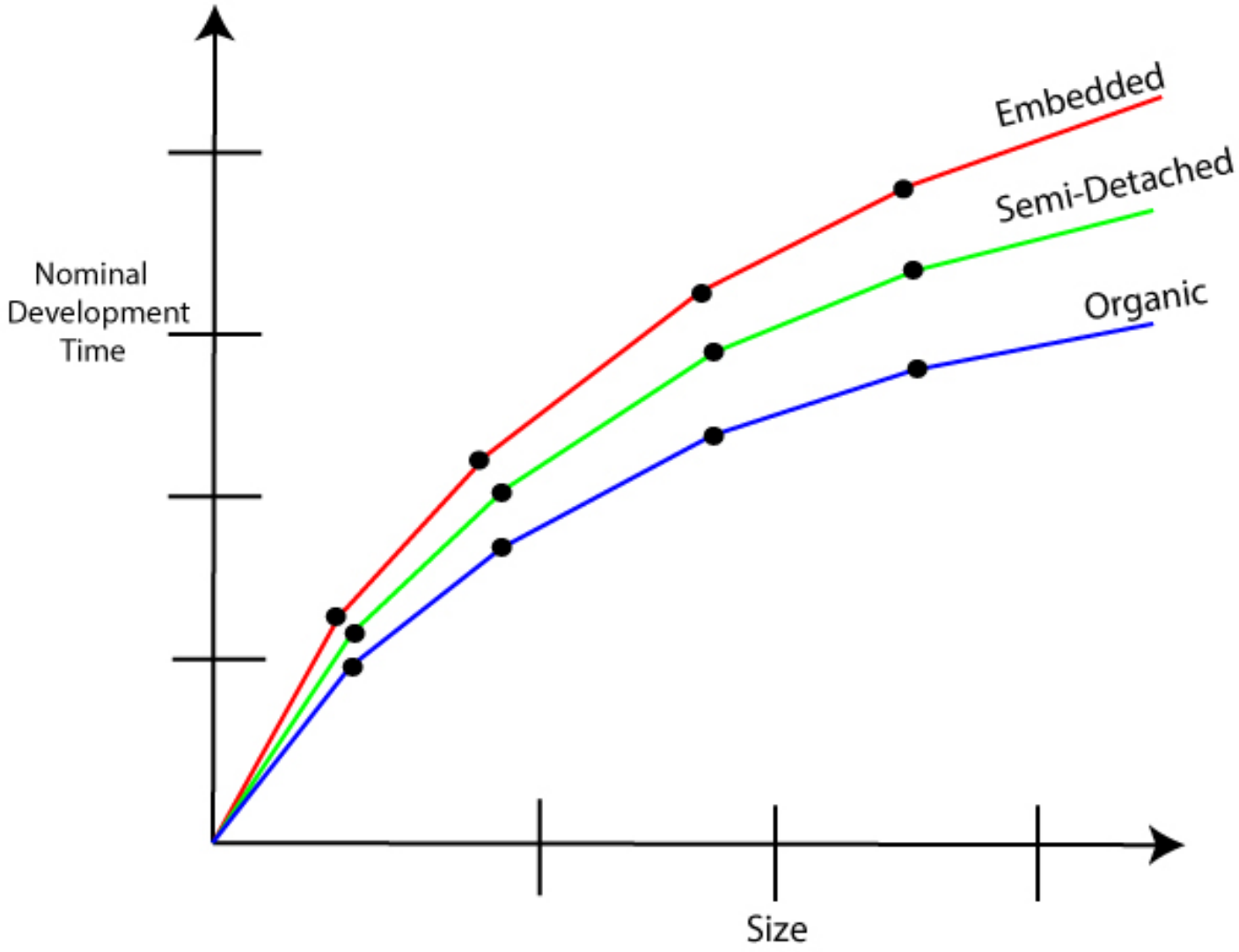


Effort versus product size

Cost Estimation COCOMO Model

- The development time versus the product size in KLOC is plotted in fig.
- From fig it can be observed that the development time is a sub linear function of the size of the product, i.e. when the size of the product increases by two times, the time to develop the product does not double but rises moderately.
- This can be explained by the fact that for larger products, a larger number of activities which can be carried out concurrently can be identified.
- The parallel activities can be carried out simultaneously by the engineers.
- This reduces the time to complete the project.
- Further, from fig, it can be observed that the development time is roughly the same for all three categories of products.
- For example, a 60 KLOC program can be developed in approximately 18 months, regardless of whether it is of organic, semidetached, or embedded type.

Cost Estimation COCOMO Model



Development time versus size

Cost Estimation COCOMO Model

❑**Example1:** Suppose a project was estimated to be 400 KLOC. Calculate the effort and development time for each of the three model i.e., organic, semi-detached & embedded.

❑**Solution:** The basic COCOMO equation takes the form:

Effort=(a_1*(KLOC))^{a2} PM

Tdev=(b_1*(efforts))^{b2} Months

Estimated Size of project= 400 KLOC

(i)Organic Mode

$E = (2.4 * (400))^{1.05} = 1295.31$ PM

$D = (2.5 * (1295.31))^{0.38} = 38.07$ PM

(ii)Semidetached Mode

$E = (3.0 * (400))^{1.12} = 2462.79$ PM

$D = (2.5 * (2462.79))^{0.35} = 38.45$ PM

(iii) Embedded Mode

$E = (3.6 * (400))^{1.20} = 4772.81$ PM

$D = (2.5 * (4772.8))^{0.32} = 38$ PM

Agile Project Management

- Agile project management is an interactive approach to manage software development.
- The agile project management focuses on continuous releases and covers customer feedback with every iteration.
- Traditionally the agile project management is classified into two frameworks: **scrum** and **kanban**.
- The scrum framework focused fixed-length project iterations, whereas kanban framework focused on continuous releases.
- After competition of project first iteration (or steps) project management activity immediately moves on to the next.
- The agile project management calls for teams to regularly evaluate cost and time as they move through their work.
- They use velocity, **burnup** and **burndown** charts to measure their work, rather than Gantt charts and project milestones to track progress.

Agile Project Management

- The agile team practices to continuous development and continuous integration using technology that automates steps to speed up the release and use of products.
- The presence and participation of the project manager are not required in agile project management.
- Although the presence of the project manager is essential for success under the traditional (waterfall model) project delivery.
- The role of the project manager is to distribute task among team members.
- However, the project manager is not obsolete in agile project management, and many organizations use them in a large, more complex project.
- The organization mostly places them in the project coordinator role.
- Agile Project Management demands that team members know how to work in this new agile methodology.
- The team member must be able to coordinate with each other, as well as with users.

Agile Project Management – Scrum

- **Scrum is a framework** that helps agile teams to work together. Using it, the team members can deliver and sustain the complex product.
- It encourages the team to learn through practice, self-organize while working on the problem.
- Scum is a work done through the framework and continuously shipping values to customers.
- It is the most frequent software that is used by the development team.
- Its principle and lessons can be applied to all kinds of teamwork.
- Its policy and experiences is a reason of popularity of Scrum framework.
- The Scrum describes a set of tools, meetings, and roles that help the teams structure.
- It also manages the work done by the team.

Agile Project Management – Scrum

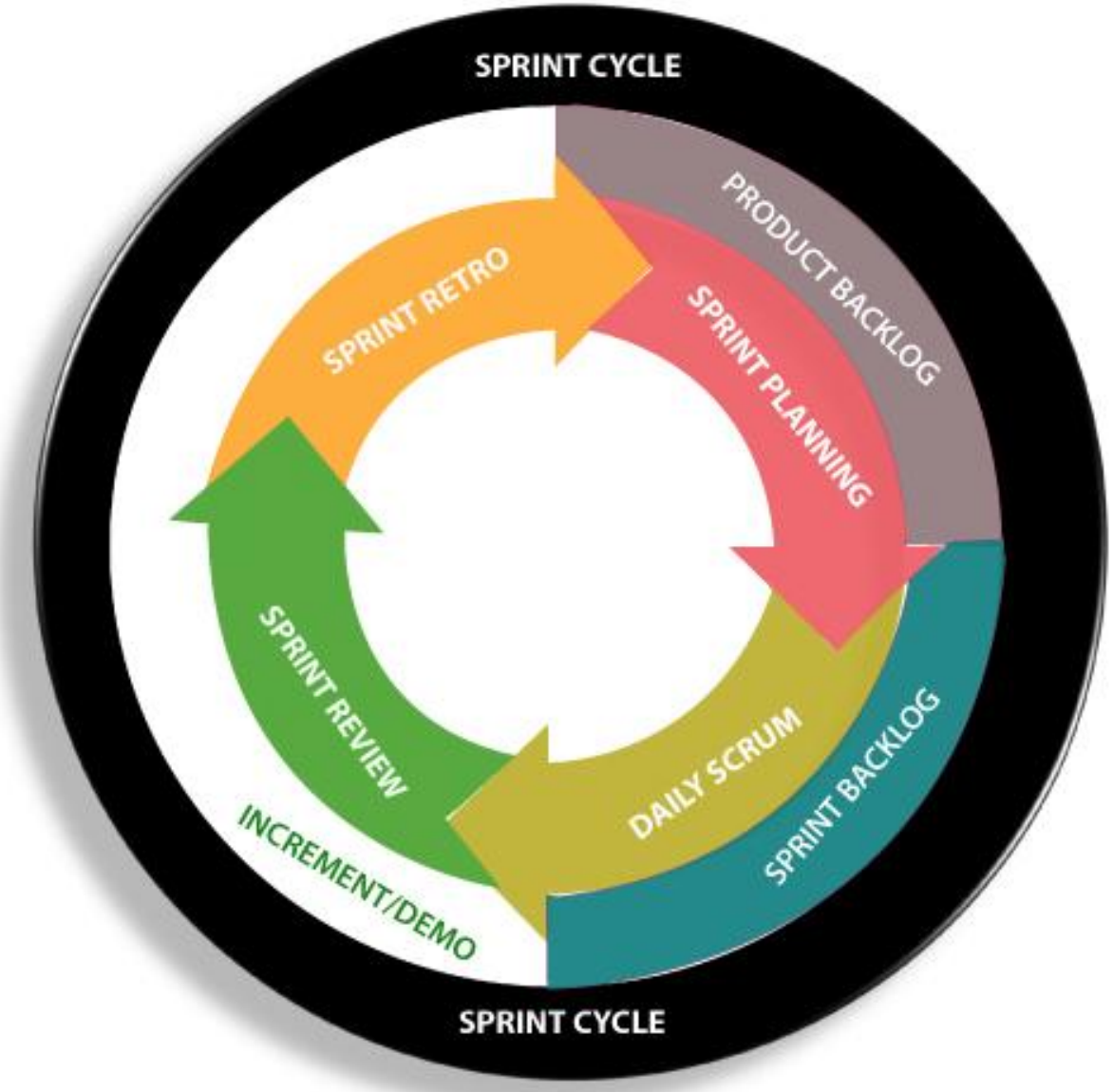
❑The framework

- Scrum and agile are not the same thing because Scrum focused on continuous improvement, which is a core foundation of agile.
- Scrum framework focuses on ongoing getting work done.

❑What are sprints?

- With scrum, a product is built in a series of repetition called **sprints**.
- It breaks down big complex projects into bite-size pieces.
- It makes projects more manageable, allows teams to ship high quality, work faster, and more frequently.
- The sprints give them more flexibility to adapt to the changes.
- Sprints are a short, time-boxed period for Scrum team that works to complete a set amount of work.
- Sprints are the core component of Scrum and agile methodology. The right sprints will help our agile team to ship better software.

Agile Project Management – Scrum



❑What is sprint plan?

- Sprint plan is an action in Scrum that kicks off the sprint.
- The primary purpose of sprint plan is to define what can deliver in the sprint.
- It also focuses on how the work will be achieved. It is done in combination with the whole Scrum team members.
- The sprint is a set of the period where all the work to be done.
- Before we start the development, we have to set up the sprint.
- We need to describe how long time is required to achieve the sprint goal and where we are going to start.

❑Factors affecting Sprint planning

- **The What:** The product owner describes the goal of the sprint and the backlog items which contribute to achieve that goal.
- **The How:** Agile development team plans its necessary work on how to achieve and deliver the sprint goal.
- **The Who:** The product owner defines the goal based on the value that the customers seek. And the developer needs to understand how they can or cannot deliver that goal.
- **The Inputs:** The product backlog provides the list of input stuff that could potentially be part of the current sprint. The team looks over the existing work done in incremental ways.
- **The Outputs:** The critical outcome of sprint planning is to meet described team goal. The product set the goal of sprint and how they will start working towards the goal.

❑Factors affecting Sprint planning

Agile Project Management – Scrum

❑What is the product backlog?

▪A product backlog is a registered list of work for the development team. It is driven from the roadmap and its requirements.

▪The essential task is represented at the top of the product backlog so that the team member knows what to deliver first.

▪The developer team doesn't work through the backlog from the product owner's side and product owner doesn't push the work to the developer team.

▪The developer team pulls work from the product backlog.

❑Backlog starts with the two "R"s

▪The fundamental product backlog is provided by a team's **roadmap** and **requirements**.

▪Roadmap repetition breaks down into several epics, and each epic will have several requirements and user stories.

▪The product owner organizes each of the customer stories into a single list. This story is organized for the development team. The product owner chooses to deliver first complete epic.

Agile Project Management – Kanban

❑What is Kanban?

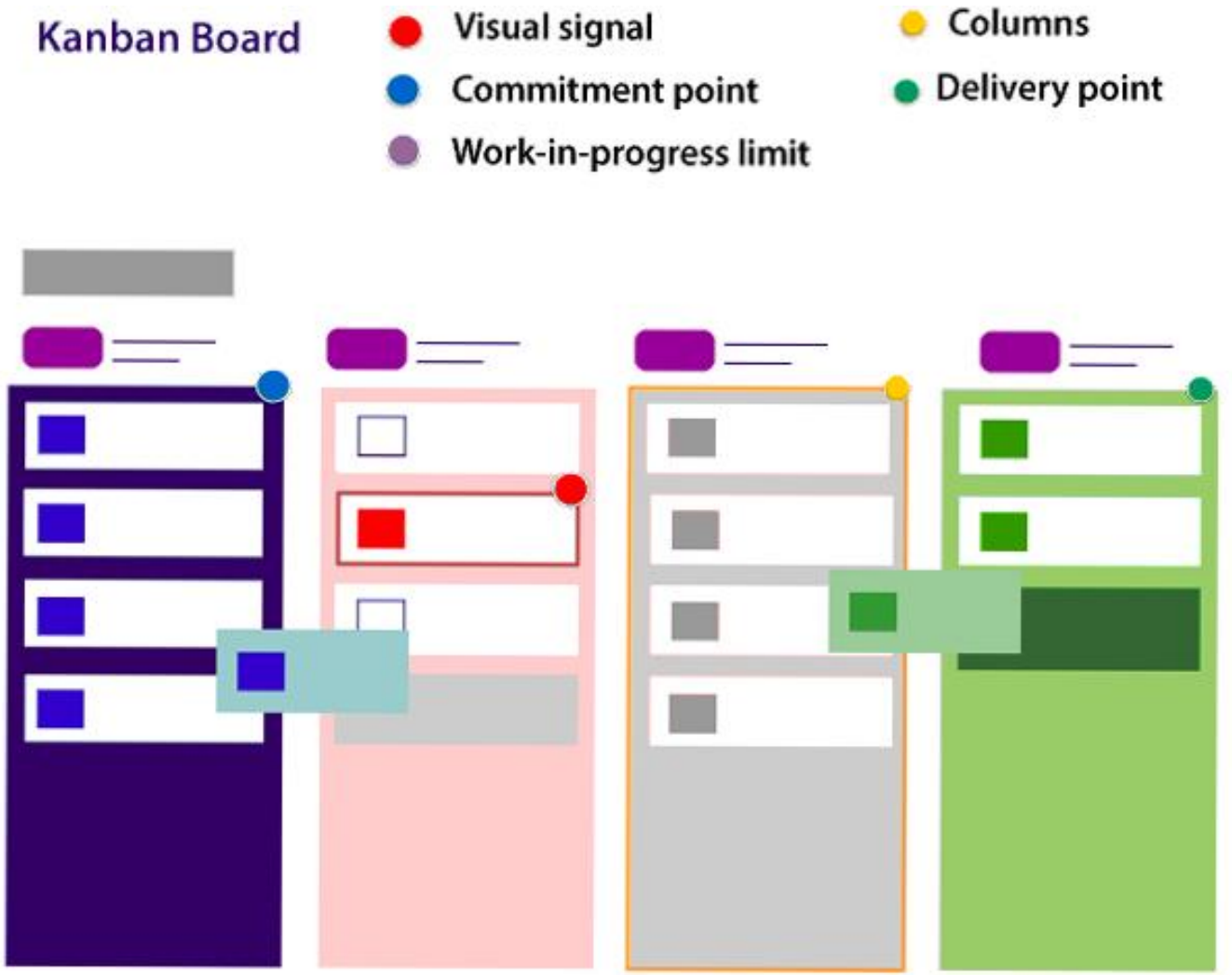
- Kanban is a popular framework which is used to implement agile software development.
- It takes real time communication of capacity and complete transparency of work.
- The work items are represented in a kanban board visually, allowing team members to see the state of every piece of work at any time.

❑Boards

- The kanban board is the agile project management tool that designed the necessary visualized work, limited work-in-progress, and maximizes flow (or efficiency).
- It uses cards, columns, and provides continuous improvement to help technology and service teams who commit the right amount of work and get it done.

Agile Project Management – Kanban

- **Elements of a kanban board:** David Anderson divides the kanban board into five different components.
- These are Visual signals, columns, work-in-progress limits, a commitment point, and a delivery point.



Agile Project Management – Kanban

1. **Visual Signals:** The kanban board is a visual card (stickies, tickets, or otherwise). Kanban team write their projects and work items onto cards, usually per person each card. For agile teams, each card could encapsulate into one user story. Once the board completed, this visual team helps team members and stock members quickly to understand what the team is working.
2. **Columns:** The column represents the specific activities that compose a "workflow" together. The card flows through a workflow until its completion. The workflow may be a simple as "To Do," "In Progress," "Complete," or much more complicated.
3. **Work in progress (WIP) Limits:** The work in progress limits are the maximum number of cards which can be in one column. This is at any given time. It gives the alert signal that you committed too much work.

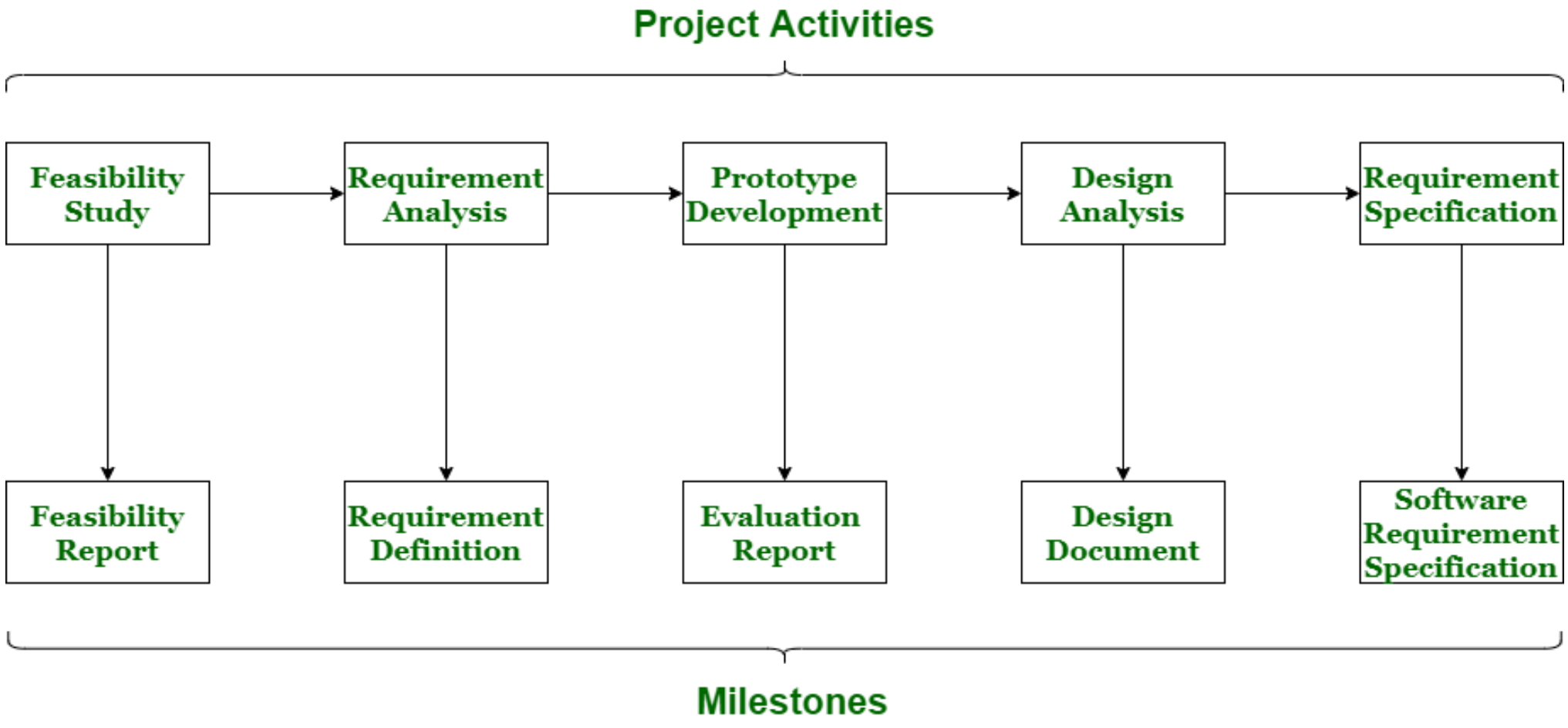
4. **Commitment point:** Kanban teams also maintain a backlog for their board. This is where the customers and team member put ideas for projects that the team can pick up. The team members pick up plans when they are ready. The committed point is a movement where the design is picked up by the team, and work starts on the project.
5. **Delivery point:** It is the end point of a kanban team's workflow. Mostly the delivery point for every team is when the product and services are handed to the customer.

Milestones and Deliverables

❑ Milestones

- When project begins then it is expected that project related activities must be initiated.
- In project planning, series of milestones must be established.
- Milestone can be defined as recognizable endpoint of software project activity.
- At each milestone, report must be generated.
- Milestone is distinct and logical stage of the project.
- It is used as signal post for project start and end date, need for external review or input and for checking budget, submission of the deliverable, etc.
- It simply represents clear sequence of events that are incrementally developed or build until project gets successfully completed.
- It helps in signifying change or stage in development.

Milestones and Deliverables



Various Project Activities and Milestones

Milestones and Deliverables

❑ Deliverables

- Outcome or Result or software product, designed document, or asset of project plan that can be submitted to customers, clients, or end-users.
- The deliverables have a due date, and measurable.
- The deliverable is simply given to client or customer and satisfies milestone or due date that is often created and produced during project planning.
- Deliverables are generally milestones but it not necessary that milestone is deliverable.

Milestones and Deliverables

❑ Agile Web App Development for Artists' Social Media Platform: Sample Sprints

- Here's an example breakdown of the first few sprints based on your project goal:
- Sprint 1 (1-2 weeks):
- Goal: Establish a solid foundation and core functionalities.
- Milestones:
  - ➢ User registration and login system implemented.
  - ➢ User profiles with basic information and artwork showcase.
  - ➢ Ability to follow other artists and view their profiles.
  - ➢ Prototype demonstrating core interaction and navigation.
- Deliverables:
  - ➢ User stories for core functionalities implemented.
  - ➢ Functional prototype for user testing.
  - ➢ Test reports for registration, login, and profile features.

Milestones and Deliverables

- Sprint 2 (1-2 weeks):
- Goal: Add essential interaction and engagement features.
- Milestones:
  - Implement artwork upload and editing functions.
  - Commenting and interaction on artworks.
  - Basic search functionality for artists and artwork.
  - User notification system for mentions and activity.
- Deliverables:
  - User stories for interaction and engagement implemented.
  - Updated prototype with new features for user testing.
  - Test reports for new interaction features and notification system.
  - Documentation of search algorithm and performance.

Milestones and Deliverables

- Sprint 3 (1-2 weeks):
- Goal: Enhance user experience and personalize content.
- Milestones:
  - Implement personalized recommendations for artists and artwork.
  - Create curated collections and galleries.
  - Integrate social media sharing features.
  - Improve user interface based on feedback from previous sprints.
- Deliverables:
  - User stories for personalization and social features implemented.
  - Refined prototype with updated UI and new features.
  - Test reports for personalization and social integration.
  - User feedback analysis and UI improvement documentation.

Milestones and Deliverables

- **Non- Agile Web App Development for Artists' Social Media Platform.**
- **Project Plan Phases:**

▪Discovery & Requirements (1 month): User research, competitor analysis, define user stories, create functional specifications.

▪Design & Prototyping (1 month): Wireframes, UI/UX mockups, low-fidelity prototype for user testing.

▪Development (3 months): Implement core features in sprints (e.g., user registration, profile creation, artwork posting, commenting).

▪Testing & Refinement (2 months): Unit, integration, and user testing, bug fixes, feature adjustments based on feedback.

▪Deployment & Maintenance (ongoing): Launch on app stores, monitor performance, address bugs, add new features through updates.

Milestones and Deliverables

- **Non- Agile Web App Development for Artists' Social Media Platform.**
- **Milestones:**

▪Requirements Document finalized (Month 1):

➢Detailed document outlining all functionalities, technical specifications, user personas.

▪Functional Prototype completed (Month 2):

➢Basic interactive prototype demonstrating core features for user testing.

▪Beta version released internally (Month 4):

➢ Feature-complete version for internal testing and stakeholder feedback.

▪Open Beta launched publicly (Month 6):

➢ Public testing to gather wide user feedback and refine features before official launch.

▪App available on major app stores (Month 8):

➢Fully polished and functional app ready for mass adoption.

Milestones and Deliverables

- **Non- Agile Web App Development for Artists' Social Media Platform.**
- **Deliverables:**

▪Requirements Document:

➢Comprehensive guide for development team and stakeholders.

▪Wireframes & UI/UX mockups:

➢Visual representations of app screens and user interface elements.

▪Functional Prototypes:

➢Interactive prototypes for user testing and feedback on core features.

▪Test Reports:

➢Documentation of testing results and identified bugs for resolution.

▪Deployment scripts & Release notes:

➢Automated scripts for app updates and user-friendly notes outlining changes in each version.

▪Launched App:

➢The final web app accessible to users on app stores

Cost Estimation based on Functional Point (FP) Analysis

- Allan J. Albrecht initially developed function Point Analysis in 1979 at IBM and it has been further modified by the International Function Point Users Group (IFPUG).
- FPA is used to make estimate of the software project, including its testing in terms of functionality or function size of the software product.
- However, functional point analysis may be used for the test estimation of the product.
- The functional size of the product is measured in terms of the function point, which is a standard of measurement to measure the software application.
- The basic and primary purpose of the functional point analysis is to measure and provide the software application functional size to the client, customer, and the stakeholder on their request.
- Further, it is used to measure the software project development along with its maintenance, consistently throughout the project irrespective of the tools and the technologies.

Cost Estimation based on Functional Point (FP) Analysis

❑**Following are the Essential points regarding FPs**

1. FPs of an application is found out by counting the number and types of functions used in the applications. Various functions used in an application can be put under five types, as shown in Table:

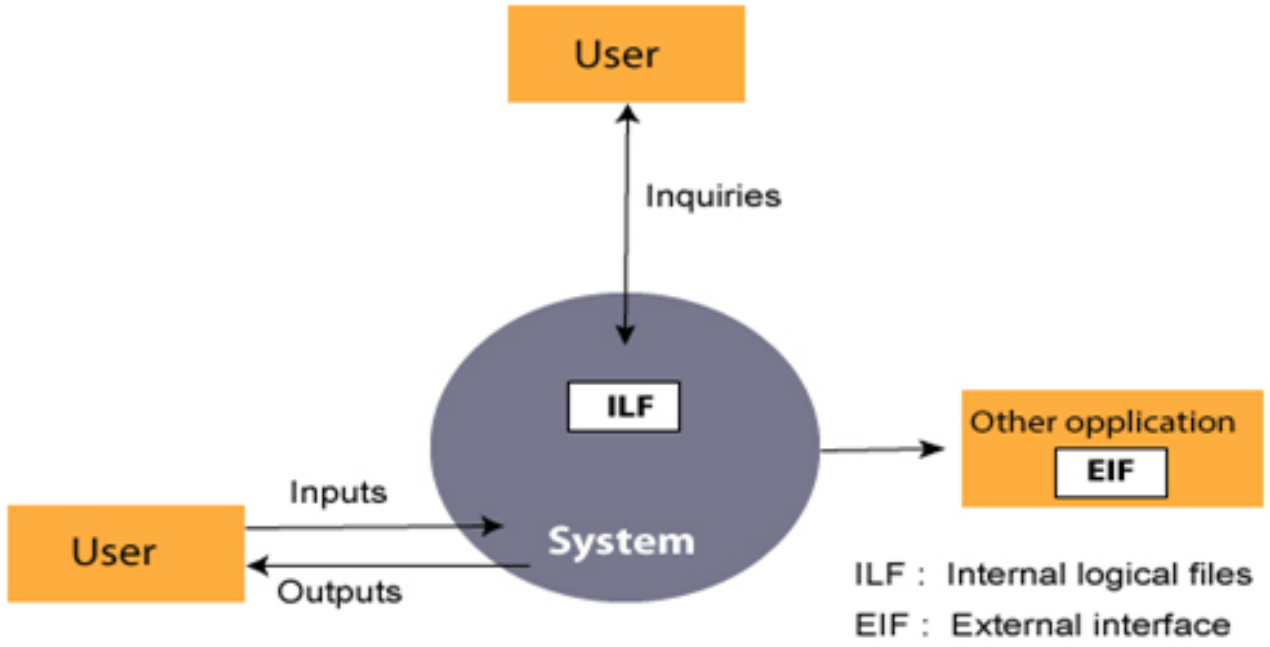
Types of FP Attributes

Measurements Parameters	Examples
1.Number of External Inputs(EI)	Input screen and tables
2. Number of External Output (EO)	Output screens and reports
3. Number of external inquiries (EQ)	Prompts and interrupts.
4. Number of internal files (ILF)	Databases and directories
5. Number of external interfaces (EIF)	Shared databases and shared routines.

Cost Estimation based on Functional Point (FP) Analysis

- **Following are the Essential points regarding FPs**
- All these parameters are then individually assessed for complexity.

The FPA functional units are shown in Fig:



FPAs Functional Units System

Cost Estimation based on Functional Point (FP) Analysis

❑**Following are the Essential points regarding FPs**

2. FP characterizes the complexity of the software system and hence can be used to depict the project time and the manpower requirement.
3. The effort required to develop the project depends on what the software does.
4. FP is programming language independent.
5. FP method is used for data processing systems, business systems like information systems.
6. The five parameters mentioned above are also known as information domain characteristics.

Cost Estimation based on Functional Point (FP) Analysis

❑**Following are the Essential points regarding FPs**

7. All the parameters mentioned above are assigned some weights that have been experimentally determined and are shown in Table.

Computing FPs

Measurement Parameter	Count		Weighing factor			
			Simple	Average	Complex	
1. Number of external inputs (EI)	—	*	3	4	6 =	—
2. Number of external Output (EO)	—	*	4	5	7 =	—
3. Number of external Inquiries (EQ)	—	*	3	4	6 =	—
4. Number of internal Files (ILF)	—	*	7	10	15 =	—
5. Number of external interfaces(EIF)	—	*	5	7	10 =	—
Count-total →						

Cost Estimation based on Functional Point (FP) Analysis

❑**Following are the Essential points regarding FPs**

❑Here that weighing factor will be simple, average, or complex for a measurement parameter type. The

❑Function Point (FP) is thus calculated with the following formula.

FP = Count-total * [0.65 + 0.01 * $\sum(f_i)$]

= Count-total * CAF

where Count-total is obtained from the above Table.

CAF = [0.65 + 0.01 *$\sum(f_i)$]

and **$\sum(f_i)$** is the sum of all 14 questionnaires and show the complexity adjustment value/ factor-CAF (where i ranges from 1 to 14). Usually, a student is provided with the value of $\sum(f_i)$

Also note that **$\sum(f_i)$** ranges from 0 to 70, i.e.,

0 <= $\sum(f_i)$ <=70

and CAF ranges from 0.65 to 1.35 because

a. When **$\sum(f_i)$** = 0 then CAF = 0.65

b. When **$\sum(f_i)$** = 70 then CAF = 0.65 + (0.01 * 70) = 0.65 + 0.7 = 1.35

Cost Estimation based on Functional Point (FP) Analysis

❑**Following are the Essential points regarding FPs**

❑Based on the FP measure of software many other metrics can be computed:

a. Errors/FP

b. $/FP.

c. Defects/FP

d. Pages of documentation/FP

e. Errors/PM.

f. Productivity = FP/PM (effort is measured in person-months).

g. $/Page of Documentation.

Cost Estimation based on Functional Point (FP) Analysis

❑**Following are the Essential points regarding FPs**

8. LOCs of an application can be estimated from FPs. That is, they are interconvertible. **This process is known as backfiring**. For example, 1 FP is equal to about 100 lines of COBOL code.
9. FP metrics is used mostly for measuring the size of Management Information System (MIS) software.
10. But the function points obtained above are unadjusted function points (UFPs). These (UFPs) of a subsystem are further adjusted by considering some more General System Characteristics (GSCs). It is a set of 14 GSCs that need to be considered. The procedure for adjusting UFPs is as follows:
    a. Degree of Influence (DI) for each of these 14 GSCs is assessed on a scale of 0 to 5. If a particular GSC has no influence, then its weight is taken as 0 and if it has a strong influence then its weight is 5.
    b. The score of all 14 GSCs is totaled to determine Total Degree of Influence (TDI).
    c. Then Value Adjustment Factor (VAF) is computed from TDI by using the formula: **VAF = (TDI * 0.01) + 0.65**

Cost Estimation based on Functional Point (FP) Analysis

❑**Following are the Essential points regarding FPs**

- Remember that the value of VAF lies within 0.65 to 1.35 because
- When TDI = 0, VAF = 0.65
- When TDI = 70, VAF = 1.35
- VAF is then multiplied with the UFP to get the final FP count: **FP = VAF * UFP**

Cost Estimation based on Functional Point (FP) Analysis

❑**Example:** Compute the function point, productivity, documentation, cost per function for the following data:

1. Number of user inputs = 24
2. Number of user outputs = 46
3. Number of inquiries = 8
4. Number of files = 4
5. Number of external interfaces = 2
6. Effort = 36.9 p-m
7. Technical documents = 265 pages
8. User documents = 122 pages
9. Cost = $7744/ month

Various processing complexity factors are: 4, 1, 0, 3, 3, 5, 4, 4, 3, 3, 2, 2, 4, 5.

Cost Estimation based on Functional Point (FP) Analysis

❑**Solution:**

Measurement Parameter	Count		Weighing factor
1. Number of external inputs (EI)	24	*	4 = 96
2. Number of external outputs (EO)	46	*	4 = 184
3. Number of external inquiries (EQ)	8	*	6 = 48
4. Number of internal files (ILF)	4	*	10 = 40
5. Number of external interfaces (EIF) Count-total →	2	*	5 = 10 378

Cost Estimation based on Functional Point (FP) Analysis

❑**Solution:**

So sum of all f_i (i ← 1 to 14) = 4 + 1 + 0 + 3 + 5 + 4 + 4 + 3 + 3 + 2 + 2 + 4 + 5 = 43

FP = Count-total * [0.65 + 0.01 *∑(f_i)]

= 378 * [0.65 + 0.01 * 43]

= 378 * [0.65 + 0.43]

= 378 * 1.08 = 408

$$\text{Productivity} = \frac{\text{FP}}{\text{Effort}} = \frac{408}{36.9} = 11.1$$

Total pages of documentation = technical document + user document

= 265 + 122 = 387pages

Documentation = Pages of documentation/FP

= 387/408 = 0.94

$$\text{Cost per function} = \frac{\text{cost}}{\text{productivity}} = \frac{7744}{11.1} = \$700$$

Project Scheduling using CPM and PERT

- **Project-task scheduling is a significant project planning activity.**
- It comprises deciding which functions would be taken up when.
- To schedule the project plan, a software project manager wants to do the following:

1. Identify all the functions required to complete the project.
2. Break down large functions into small activities.
3. Determine the dependency among various activities.
4. Establish the most likely size for the time duration required to complete the activities.
5. Allocate resources to activities.
6. Plan the beginning and ending dates for different activities.
7. Determine the critical path. A critical way is the group of activities that decide the duration of the project.

Project Scheduling using CPM and PERT

- The first method in scheduling a software plan involves identifying all the functions required to complete the project.
- A good judgment of the intricacies of the project and the development process helps the supervisor to identify the critical role of the project effectively.
- Next, the large functions are broken down into a valid set of small activities which would be assigned to various engineers.
- The work breakdown structure formalism supports the manager to breakdown the function systematically after the project manager has broken down the purpose and constructs the work breakdown structure; he has to find the dependency among the activities.
- Dependency among the various activities determines the order in which the various events would be carried out.
- If an activity A necessary the results of another activity B, then activity A must be scheduled after activity B. In general, the function dependencies describe a partial ordering among functions, i.e., each service may precede a subset of other functions, but some functions might not have any precedence ordering describe between them (called concurrent function).
- The dependency among the activities is defined in the pattern of an activity network.

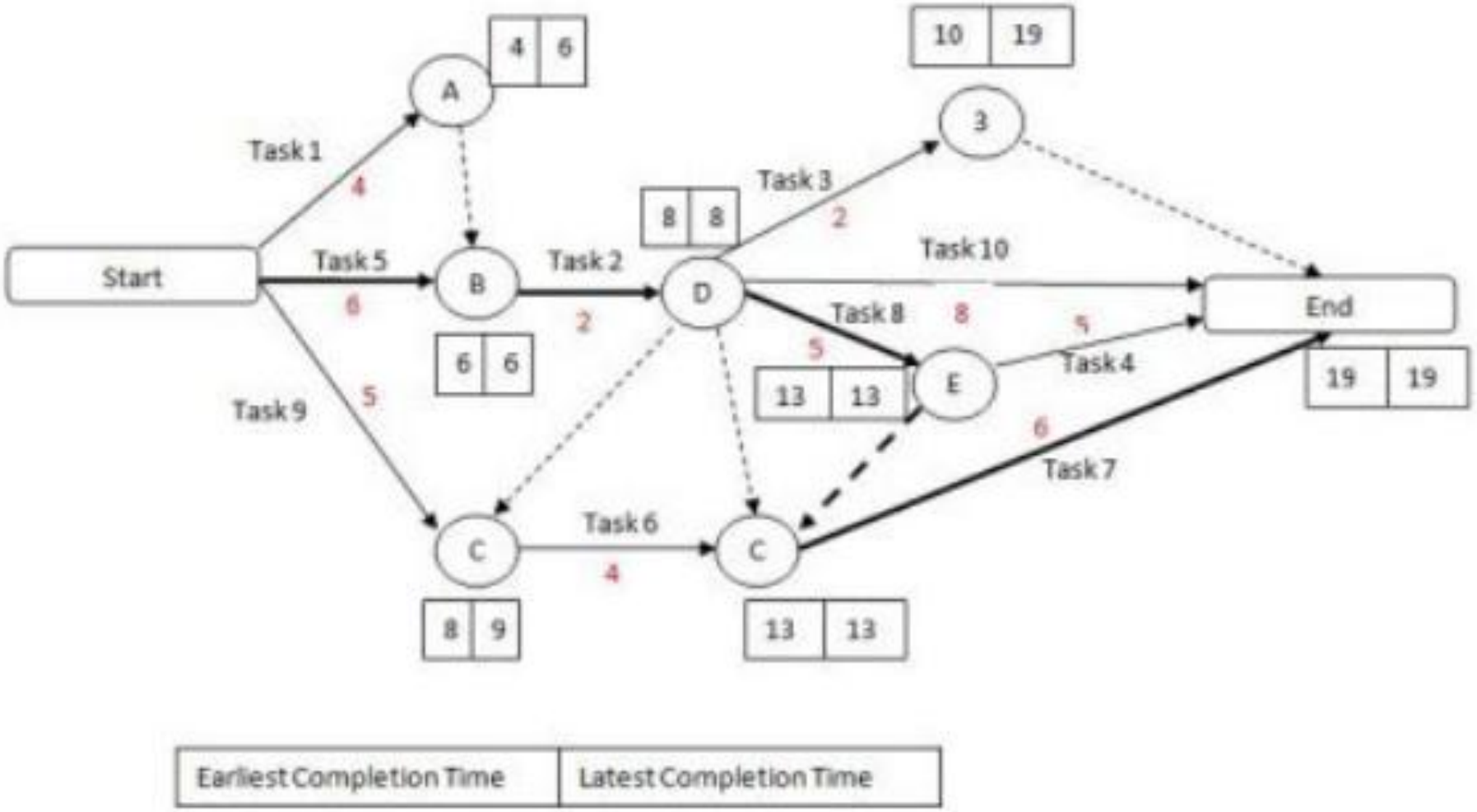
Project Scheduling using CPM and PERT

- Once the activity network representation has been processed out, resources are allocated to every activity.
- Resource allocation is usually done using a Gantt chart.
- After resource allocation is completed, a PERT chart representation is developed.
- The PERT chart representation is useful for program monitoring and control.
- For task scheduling, the project plan needs to decompose the project functions into a set of activities.
- The time frame when every activity is to be performed is to be determined.
- The end of every action is called a milestone.
- The project manager tracks the function of a project by audit the timely completion of the milestones.
- If he examines that the milestones start getting delayed, then he has to handle the activities carefully so that the complete deadline can still be met.

Project Scheduling using CPM and PERT

- **Critical path is the sequential activities from start to the end of a project**.
- Although many projects have only one critical path, some projects may have more than one critical paths depending on the flow logic used in the project.
- If there is a delay in any of the activities under the critical path, there will be a delay of the project deliverables.
- Most of the times, if such delay is occurred, project acceleration or re-sequencing is done in order to achieve the deadlines.
- Critical path method is based on mathematical calculations and it is used for scheduling project activities.
- This method was first introduced in 1950s as a joint venture between Remington Rand Corporation and DuPont Corporation.
- In the critical path method, the critical activities of a program or a project are identified.
- These are the activities that have a direct impact on the completion date of the project.

Project Scheduling using CPM and PERT



Project Scheduling using CPM and PERT

❑Key Steps in Critical Path Method

1. Step 1: Activity specification
2. Step 2: Activity sequence establishment
3. Step 3: Network diagram
4. Step 4: Estimates for each activity
5. Step 5: Identification of the critical path
6. Step 6: Critical path diagram to show project progresses

Project Scheduling using CPM and PERT

❑Step 1: Activity specification

- You can use the Work Breakdown Structure (WBS) to identify the activities involved in the project. This is the main input for the critical path method.
- In activity specification, only the higher-level activities are selected for critical path method.
- When detailed activities are used, the critical path method may become too complex to manage and maintain.

Project Scheduling using CPM and PERT

❑**Step 2: Activity sequence establishment:** In this step, the correct activity sequence is established. For that, you need to ask three questions for each task of your list.

- Which tasks should take place before this task happens.
- Which tasks should be completed at the same time as this task.
- Which tasks should happen immediately after this task.

❑Step 3: Network diagram

- Once the activity sequence is correctly identified, the network diagram can be drawn (refer to the sample diagram above).
- Although the early diagrams were drawn on paper, there are a number of computer softwares, such as Primavera, for this purpose nowadays.

Project Scheduling using CPM and PERT

❑Step 4: Estimates for each activity

- This could be a direct input from the WBS based estimation sheet.
- Most of the companies use 3-point estimation method or COCOMO based (function points based) estimation methods for tasks estimation.

Project Scheduling using CPM and PERT

❑**Step 5: Identification of the critical path:** For this, you need to determine four parameters of each activity of the network.

- Earliest start time (ES) - The earliest time an activity can start once the previous dependent activities are over.
- Earliest finish time (EF) - ES + activity duration.
- Latest finish time (LF) - The latest time an activity can finish without delaying the project.
- Latest start time (LS) - LF - activity duration.

❑The float time for an activity is the time between the earliest (ES) and the latest (LS) start time or between the earliest (EF) and latest (LF) finish times.

Project Scheduling using CPM and PERT

❑Step 6: Critical path diagram to show project progresses

- Critical path diagram is a live artefact, thus, this diagram should be updated with actual values once the task is completed.
- This gives more realistic figure for the deadline and the project management can know whether they are on track regarding the deliverables.

Project Scheduling using CPM and PERT

❑Advantages of Critical Path Method

1. Offers a visual representation of the project activities.
2. Presents the time to complete the tasks and the overall project.
3. Tracking of critical activities.

Project Scheduling using CPM and PERT

❑**Project Evaluation and Review Technique (PERT)** is a procedure through which activities of a project are represented in its appropriate sequence and timing.

❑It is a scheduling technique used to schedule, organize and integrate tasks within a project.

❑PERT is basically a mechanism for management planning and control which provides blueprint for a particular project.

❑All of the primary elements or events of a project have been finally identified by the PERT.

❑In this technique, a PERT Chart is made which represent a schedule for all the specified tasks in the project.

❑The reporting levels of the tasks or events in the PERT Charts is somewhat same as defined in the work breakdown structure (WBS).

Project Scheduling using CPM and PERT

- The PERT chart is used to schedule, organize and co-ordinate tasks within the project.
- The objective of PERT chart is to determine the critical path, which comprises critical activities that should be completed on schedule.
- This chart is prepared with the help of information generated in project planning activities such as estimation of effort, selection of suitable process model for software development and decomposition of tasks into subtasks.

❑Characteristics of PERT:

1. It serves as a base for obtaining the important facts for implementing the decision-making.
2. It forms the basis for all the planning activities.
3. PERT helps management in deciding the best possible resource utilization method.
4. PERT take advantage by using time network analysis technique.
5. PERT presents the structure for reporting information.
6. It helps the management in identifying the essential elements for the completion of the project within time.
7. It specifies the activities that from the critical path.
8. It describes the probability of completion of project before the specified date.
9. It describes the dependencies of one or more tasks on each other.
10. It represents the project in graphical plan form.

❑Advantages of PERT:

1. It has the following advantages :
2. Estimation of completion time of project is given by the PERT.
3. It supports the identification of the activities with slack time.
4. The start and dates of the activities of a specific project is determined.
5. It helps project manager in identifying the critical path activities.
6. PERT makes well organized diagram for the representation of large amount of data.

❑Disadvantages of PERT:

1. It has the following disadvantages :
2. The complexity of PERT is more which leads to the problem in implementation.
3. The estimation of activity time are subjective in PERT which is a major disadvantage.
4. Maintenance of PERT is also expensive and complex.
5. The actual distribution of may be different from the PERT beta distribution which causes wrong assumptions.
6. It under estimates the expected project completion time as there is chances that other paths can become the critical path if their related activities are deferred.

Managing Team Dynamics and Communication

❑What is “Team Dynamics”?

❑Team dynamics is a term that describes the behavioral relationships between the members of a team.

❑The the dynamic between them includes the way they interact, communicate and work together.

❑The success of a team, is greatly influence on the team’s dynamics.

❑In the context of a software development team, the things to pay attention to are the way the team divides programming work, how the team codes together, or how the team decides on the technology used and the purpose of the software.

Managing Team Dynamics and Communication

❑**What values are important for good team dynamics?**

❑There are three competencies that is of importance and must be present within the team:

1. **Alignment**
2. **Transparency**
3. **Accountability**

Managing Team Dynamics and Communication

❑What values are important for good team dynamics?

❑Alignment

a. Every member of the team must understand the goals and direction of the software development project.

b. They must know the requirements for the project and understand that there are priorities to be met for the project.

c. Each member must not vie off the goal to much and not introduce unnecessary features.

Managing Team Dynamics and Communication

❑What values are important for good team dynamics?

❑Transparency

a. If there are any issues during development, they must be faced and brought up.

b. Other members also should be supportive and help face these issues.

c. It is important for each member to be forward with what they are doing and any problems they face.

Managing Team Dynamics and Communication

❑What values are important for good team dynamics?

❑Accountability

a. Each member must be aware of their responsibilities and understand the importance of following through with their tasks.

b. If there needs to be a feature done by tomorrow, the programmer responsible should get it done by then.

Managing Team Dynamics and Communication

❑**How to have good team dynamics in a Software Development Team?**

❑Here are some tips so your team can have good team dynamics:

1. **Good Communication**
2. **Put Plans in Writing**
3. **Have a good leader**

Managing Team Dynamics and Communication

❑How to have good team dynamics in a Software Development Team?

❑Good Communication

a. “Communication is key to success” as the saying goes.

b. So for a Software Development team to work well, good communication is needed.

c. Division of features should be clear.

d. Every member should know what the other members are working on.

e. If there are any issues during development it should be brought up.

Managing Team Dynamics and Communication

- **How to have good team dynamics in a Software Development Team?**
- **Put Plans in Writing**
- Every software development team, should have a way of mapping out their plans somewhere.
- For example a Scrum Board, on the board, write down the features that need to be developed, and mark the ones that are being worked on or done.
- That way everyone knows what is going on and what the goal of the project is.

Managing Team Dynamics and Communication

- **How to have good team dynamics in a Software Development Team?**
- **Have a good leader**
- For a team to function well, a team must have a leader.
- A leader to divide responsibilities and also follow up on progress. And overall manage the team.

Note for Students

- This power point presentation is for lecture, therefore it is suggested that also utilize the text books and lecture notes.