ICT Project Management

Software Project Planning
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Overview

- 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
Step Wise – An Overview

0 Select project

1 Identify project scope and objectives

2 Identify project infrastructure

3 Analyse project characteristics

to next slide
Step Wise – An Overview (cont’d)

4. Identify the products and activities

5. Estimate efforts for activity

6. Identify activity risks

For each activity

Review

Lower level detail

from previous slide

from next slide

to next slide
Step Wise – An Overview (cont’d)

10. Lower level planning

9. Execute plan

8. Review/publicize plan

7. Allocate resources

To previous slides

From previous slide
Step Wise – An Overview (cont’d)

- 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 Wise - An Overview (cont’d)

- Step 5: Estimate effort for each activity
- Step 6: Identify activity risks
- Step 7: Allocate resources
- Step 8: Review/publicize plan
- Step 9: Execute plan
- Step 10: Execute lower levels of planning
Step 1: Identify Project Scope and Objectives

- Step 1.1 Identify objectives and practical measures of the effectiveness in meeting those objectives
- Step 1.2 Establish a project authority
  - To ensure the unity of purpose among all persons concerned
Step 1: Identify Project Scope Objectives (cont’d)

- Step 1.3 Identify all stakeholders in the project and their interests
- Step 1.4 Modify objectives in the light of stakeholder analysis
- Step 1.5 Establish methods of communication between all parties
Step 2: Identify Project Infrastructure

■ Step 2.1 Identify relationship between the project and strategic planning
  ■ To determine the order of related projects (in the organization) being carried out
  ■ To establish a framework within which the system fits
  ■ To ensure the hardware and software standards are followed
Step 2: Identify Project Infrastructure (cont’d)

- Step 2.2 Identify installation standards and procedures
  - more appropriate name: “Identify standards and procedures related to the software project”

- Step 2.3 Identify project team organization
Step 3: Analyse Project Characteristics

- Step 3.1 Distinguish the project as either objective-driven or product-driven
- Step 3.2 Analyse other project characteristics (including quality-based ones)
- Step 3.3 Identify high level project risks
- Step 3.4 Take into account user requirements concerning implementation
Step 3: Analyse Project Characteristics (cont’d)

- Step 3.5 Select general lifecycle approach in the light of the above

- Step 3.6 Review overall resource estimates

  Up to this stage,
  - the major risks of the project are identified
  - the overall approach of the project is decided

  So, it is a good place to re-estimate the required effort and other resources for the project
Step 4: Identify Project Products and Activities

- Step 4.1 Identify and describe project products
  - Identify all the products related to the project
  - Account for the required activities

- Step 4.2 Document generic product flows
  - To document the relative order of the products

- Step 4.3 Recognize product instances
Step 4: Identify Project Products and Activities (cont’d)

- Step 4.4 Produce an ideal activity network
  - Activity network shows the tasks that have to be carried out as well as their sequence of execution for the creation of a product from another

- Step 4.5 Modify the ideal to take into account need for stages and checkpoints
  - To check compatibility of products of previous activities
Step 5: Estimate Effort for Each Activity

- Step 5.1 Carry out bottom-up estimates
  - Need to estimate staff effort, time for each activity, and other resources

- Step 5.2 Revise plan to create controllable activities
  - Need to break a task into a series of manageable sub-tasks
Step 6: Identify Activity Risks

- Step 6.1 Identify and quantify the risks of each activity
- Step 6.2 Plan risk reduction and contingency measures where appropriate
- Step 6.3 Adjust overall plans and estimates to take account of risks
Step 7: Allocate Resources (Staffing)

- Step 7.1 Identify and allocate resources
  - type of staff needed for each activity
  - staff availabilities are identified
  - staff are provisionally allocated to task

- Step 7.2 Revise plans and estimates to take into account resource constraints
  - staffing constraints
  - staffing issues
Step 8: Review/publicize Plan

- Step 8.1 Review quality aspects of the project plan
  - To ensure each activity is completed with a quality product
  - Each activity should have ‘exit requirements’.
  - This ensures the quality of the product on each activity.
Step 8: Review/publicize Plan (cont’d)

- Step 8.2 Document plans and obtain agreement
  - all parties understand and agree to the commitments in the plan
Aside – When to plan

- Planning is an on-going process of refinement
- Planning at different stages of the project has different emphases and purposes
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
Project Vs Activity (cont’d)

- 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
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
Activity Planning (cont’d)

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
Other Objectives of Activity Planning

- Feasibility assessment
- Resource allocation
- Detailed costing
- Motivation
- Co-ordination
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
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 Towards Identifying Activity

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

SCI
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.
Exercise

1. In groups of 6-8 students, identify a hypothetical software project for a certain organisation (you may give a brief description of the project in terms of scope).

2. List down in a hierarchical manner the various tasks/activities that need to be undertaken in this project.
Activity-based Approach (cont’d)

Work Breakdown Structure (an extract)

Software project

- Requirements Analysis
- System Design
- Coding
- Testing

  - Data Design
  - Process Design
Activity-based Approach (cont’d)

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
Activity-based Approach (cont’d)

- Disadvantage
  - Very likely to miss some activities if an unstructured activity list is used
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’
Product-based Approach (cont’d)

- Advantages
  - Less likely to miss a product unexpectedly from a PBS
Product-based Approach – An example

A Product Breakdown Structure (an extract)
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
Hybrid Approach (cont’d)

Software Project

System Installation
- Analyse requirements
- Detailed design
- Integrate system
- Test system
- Deliver system

Software component
- Review requirements
- Outline design
- Detailed design
- Code software
- Test software

User manual
- Analyse requirements
- Design manual
- Document manual
- Capture screens
- Print Manual

User Training
- Design course
- Write materials
- Print course materials
- Training
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
Critical 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
Critical Path Method (cont’d)

- Capture the activities and their inter-relationships using a graph
  - Lines are used to represent the activities
  - Nodes are used to represent the start and stop of activities
Critical Path Method (cont’d)

- 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
Critical Path Method (cont’d)

- 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

<table>
<thead>
<tr>
<th>Id.</th>
<th>Activity Name</th>
<th>Duration (weeks)</th>
<th>Precedents</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Hardware selection</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>Software design</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>Hardware Installation</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>D</td>
<td>Coding</td>
<td>4</td>
<td>B</td>
</tr>
<tr>
<td>E</td>
<td>Data Preparation</td>
<td>5</td>
<td>B</td>
</tr>
<tr>
<td>F</td>
<td>User Documentation</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>G</td>
<td>User Training</td>
<td>5</td>
<td>E,F</td>
</tr>
<tr>
<td>H</td>
<td>System Installation</td>
<td>3</td>
<td>C,D</td>
</tr>
</tbody>
</table>
Example to construct a CPM (cont’d)

Event Number

Earliest start date

Latest start date

Slack
Example to construct a CPM (cont’d)

A=7
B=4
C=6
D=4
E=5
F=9
G=5
H=3

SCI
Activity Float

- Time allowed for an activity to delay
- 3 different types:
  - Total float (without affecting the completion of the project)
    \[= \text{latest start date} - \text{earliest start date}\]
  - Free float (without affecting the next activity)
    \[= \text{earliest start date of next activity} - \text{latest end date of previous activity}\]
  - 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
Tutorial

- Outline the structure of
  1. Feasibility study report
  2. Project plan

You may give a brief description of each part.
### Tutorial

Draw a detailed network diagram for the project described below and use it to determine the critical and the shortest project duration.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>4</td>
</tr>
<tr>
<td>2-3</td>
<td>3</td>
</tr>
<tr>
<td>1-5</td>
<td>6</td>
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References
