Chapter 16

Project Planning and Control

A. Introduction

- The goal of project planning and control is to prevent, or at least minimize the delay of system completion, the overspending, and to ensure that the system will deliver the promised functions.

- **Project planning** is aimed to develop accurate estimates for time, costs and expected benefits and adjust these estimates when needed

- **Project Plan**: primary documentation tool detailing the allocation of resources throughout the SDLC and listing required tasks and phases, time schedule, and personnel. The project plan can be broken down into smaller plans for each of the SDLC phases.

- **Project control** is the ongoing process of monitoring the actual project to ensure that the project plan has been implemented and to detect any problem as soon as possible.

B. Techniques for Estimating

- In order to be able to deliver the system on time and within budget, the systems analyst must perform accurate estimates of **time**, **costs**, and **benefits** based on measurements (number of tasks, number of interfaces, type of data structures, etc.) and use formulas to do the calculations.

- **WHIM,** or **Wh**olly **I**nadequate **M**easurement, refers to estimates performed by guessing (referring to one's intuition) or based on previous experience. These estimates are often inaccurate.

- **Metrics**, or function points, are system elements that can be counted or measured. When metrics are given weighting factors can be used to predict the money and time required building a system. The basic metrics are:
    1. Number of functional primitives
    2. Number of decisions, data stores, data elements, data re[rtitions, data choices, optional data items, and pointers

- **Personnel characteristics** (skills, experience, turnover rate) also affect estimates, along with the number of users, their computer experience, and their expectations.

- **Weighting factors** must be determined for the specific organization by trial and error. There are no standard weighting factors. The analyst must also take into consideration all the unforeseen catastrophes:

$$\textbf{Weighting average} = \frac{(\text{optimistic estimate}) + 4(\text{most likely estimate}) + (\text{pessimistic estimate})}{6}$$

- Estimates must be **updated and refined** as the system building progresses through the different phases. No estimates can be done once for all.

- The systems analyst must ensure that all the **documentation** is kept to explain the changes in the estimates and justify them. High inflation rates must be taken into consideration seriously as they can cause the costs to rise sharply and quickly.

- The estimates must be presented using a **standard format**, such as a table or a matrix. Spreadsheet software and decision support programs are the best tools to analyze the factors and develop the estimates.

- All estimates must be based on **realistic expectations**, not on the management's goal or on external deadlines.

- Analysts tend to underestimate. Some organizations may rely on the findings of an **estimating group,** which consists of former systems analysts who now concentrate solely on estimation.

C. Time Estimation

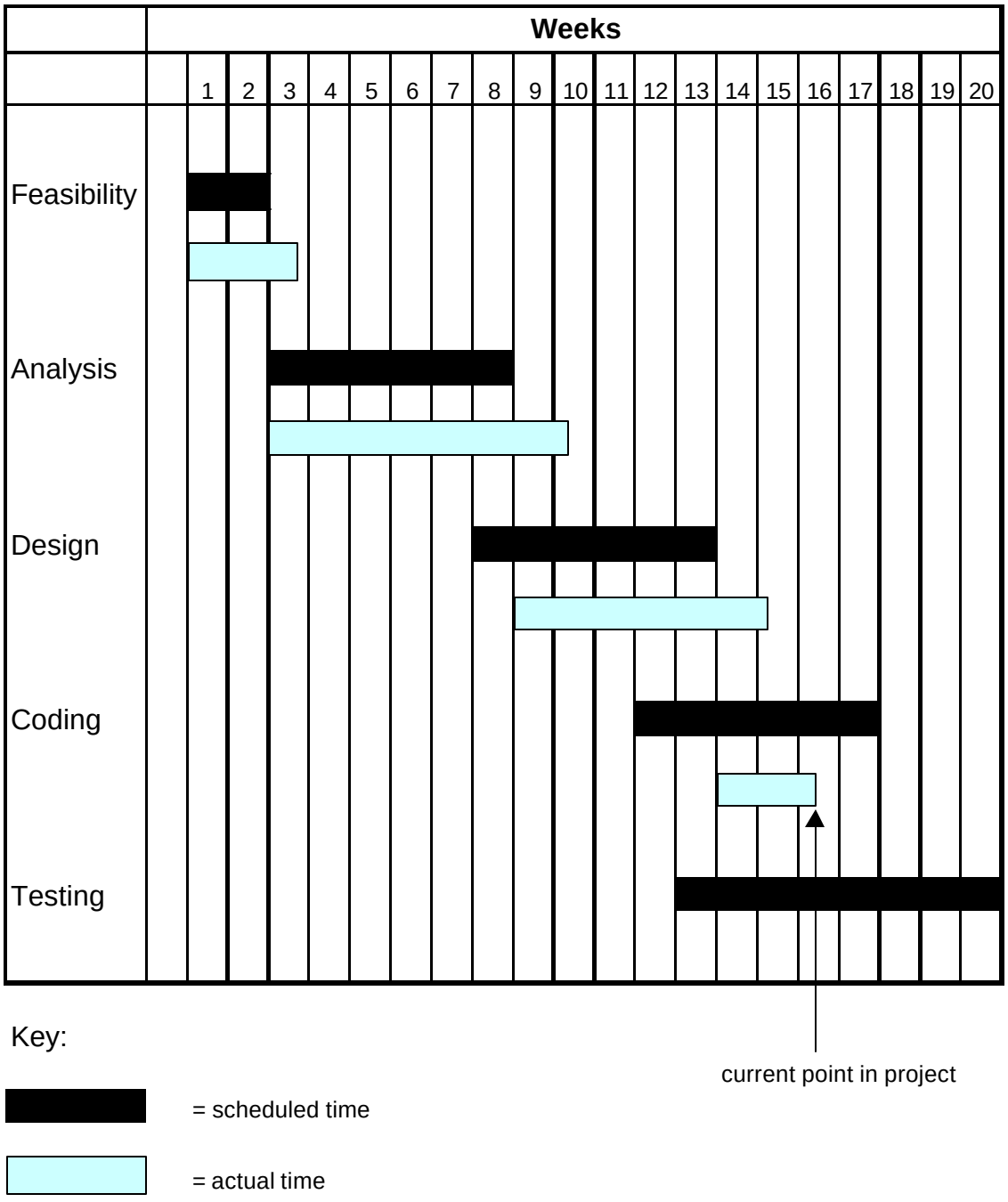
- The analyst must beak the project down into chunks when making affective time estimates. Each chunk is marked with a **milestone**.

- Milestones must be **measurable** or **verifiable** points in time.

- **Gantt Charts** and **PERT Charts** can be used to develop time schedules:

    1. A **Gantt chart** shows exactly how long a given task is scheduled to take, as well as how long it actually takes using bars displayed horizontally with the y-axis representing the activities and the x-axis the time. Unfortunately, it does nor show the precise dependencies between tasks.

    2. A **PERT chart** (**P**erformance **E**valuation and **R**eview **T**echnique) illustrates the dependencies: the project is viewed as a network of activities, of which some must be completed before others can begin



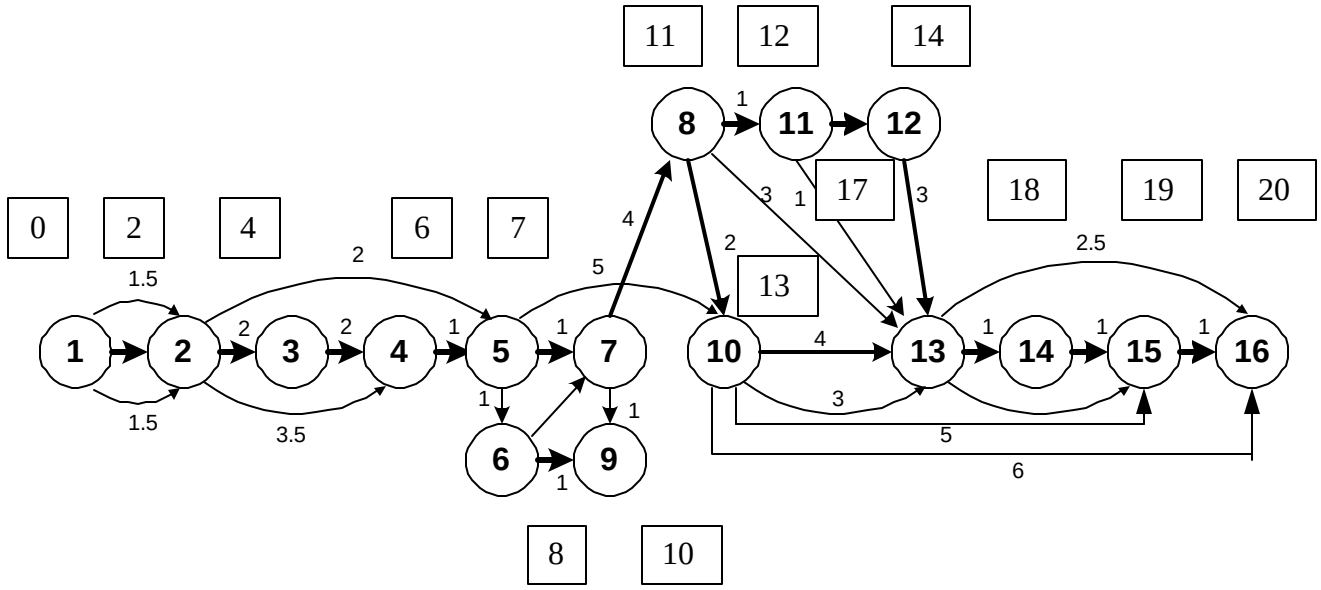
Gantt Chart for WBM Accounts Payable

Events

1 - Start
2 - Feasibility study completed
3 - Current logical model completed
4 - New physical model completed
5 - NPM option chosen
6 - Detailed design plan completed
7 - Problem specification completed
8 - Upper-level modules designed
9 - Detailed coding plan completed
10 - Design specification completed
11 - Detailed test plan completed
12 - Test data prepared
13 - Integration test completed
14 - First acceptance test completed
15 - Cutover
16 - Parallel operations completed

Activities

path	weeks	description	path	weeks	description
1-2	2	Conduct feasibility study	8-10	2	Design lower-level modules
1-2	1.5	Prepare tentative project plan	8-11	1	Prepare detailed plan of testing phase
1-2	1.5	Prepare detailed plan of analysis phase	8-13	3	Code and unit-test upper modules
2-5	2	Complete project plan and estimates	9-10	1	Update project plan and estimates
2-3	2	Model current system	10-13	4	Code and unit-test lower modules
2-4	3.5	Interviewing	10-16	6	Train Users
3-4	2	Model new system	10-13	3	Prepare user documentation
4-5	1	Choose among new physical model options	10-15	5	Prepare system documentation
5-7	1	Complete problem specification	11-13	1	Update project plan and estimates
5-6	1	Prepare detailed plan of design phase	11-12	2	Create test data
5-8	4	Design upper-level modules	12-13	3	Perform incremental testing
5-10	5	Prepare site	13-14	1	Remove defects after integration test
6-7	1	Update project plan and estimates	13-15	1.5	Convert files
7-9	1	Prepare deteiled plan of coding phase	13-16	2.5	Conduct user training
			14-15	1	Optimize system
			15-16	1	Perform parallel operations



PERT Chart for WBM Accounts Payable

In a PERT chart:

- **Circles** represent events or milestones
- **Vectors** represent activities that take place over a period of times
- The number in the squares shows the total number of weeks to reach a specific milestone (**event time**)
- From one event to the other several activities can happen concurrently. The activity that is completed early is said to have **slack time,** which means that it can a little bit behind schedule without affecting the project's schedule.
- The **critical path**, shown by heavier vectors, consists of activities having no slack time, activities that need to be closely monitored.

Advantages of the PERT chart over the Gantt chart are:

1. The systems analyst can assign tasks to members using activity times
2. The chart can be easily modified to reflect the changes
3. The chart can be used in simulations, which allows the analyst to shorten the critical path
4. The systems analyst can focus on the critical areas of the schedule.

D. Cost Estimation

Developmental costs expended while creating the system consist of:

- Salaries
- Computer hardware
- Software development tools
- Production software
- Supplies
- Site preparation
- User training and documentation
- Parallel operation

Operating costs expended on the daily basis thorough the whole life of the system consist of:

- Salaries
- Software and hardware
- Repair and maintenance
- Supplies
- Utilities (rent, insurance)

Cost estimation must take into consideration the different types of costs: fixed and variable costs, tangible and intangible costs.
Intangible costs, such as costs arisen from the loss of time or loss of opportunities, are difficult to quantify

E. Benefits estimation

Tangible benefits are tied directly to the installation of the new system and can be evaluated in dollar amount. They consist of:

- More efficient use of data processing personnel
- Reduced supply costs
- Provision of services not available before
- More efficient reporting methods resulting in ability to take advantage of better price
- Ability to operate with smaller inventory on hand

Intangible benefits are those not easily converted in dollar amount. They consist of

- Improved employee morale
- Improved collection of account receivables
- Fewer inventory shortage
- Closer control and monitoring of investments
- Better customer service resulting in higher sales
- Improved system security

F. Cost-benefits Analysis

Cost-benefit analysis helps to find the optimum system, the one that delivers the most benefits for the amount of money spent. Several methods can be used:

- **Payback Analysis**

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Costs	$20,000	---	---	---	---	---
Operating Costs	---	$5,000	$5,200	$6,000	$6,000	$8,500
Total Lifetime Costs	$20,000	$25,000	$30,200	$36,200	$42,200	$50,700
Benefits	---	$8,000	$10,000	$12,000	$15,000	$20,000
Total Lifetime benefits	---	$8,000	$18,000	$30,000	$45,000	$65,000

- **Return on Investment Analysis**

$$\text{Return on investment} = \frac{\text{lifetime benefits} - \text{lifetime costs}}{\text{lifetime costs}}$$

- **Net Present Value Analysis**

$$\text{Present value} = \text{amount} \times \frac{1}{(1+\text{rate})^{n}}$$

Development Costs, year 0		$20,000
Operating Costs, year 1	$5000*1/(1.14)^1	$4,386
Operating Costs, year 2	$5200*1/(1.14)^2	$4,000
Operating Costs, year 3	$6000*1/(1.14)^3	$4,049
Operating Costs, year 4	$6000*1/(1.14)^4	$3,552
Operating Costs, year 5	$8000*1/(1.14)^5	$4,416
Total Costs at present value		**$40403**

Benefits, year 0		$0
Benefits, year 1	$8000*1/(1.14)^1	$7,016
Benefits, year 2	$10000*1/(1.14)^2	$7,690
Benefits, year 3	$12000*1/(1.14)^3	$8,100
Benefits, year 4	$15000*1/(1.14)^4	$8,880
Benefits, year 5	$20000*1/(1.14)^5	$10,380
Total benefits at present value		**$42066**

Net present value= benefits - costs = $1663

Cost benefit Analysis: Calculation of Net Present Value

G. Project Control

Tracking costs: The cost index shows whether the project is gone over budget or not:

$$\text{cost index} = \frac{\text{Actual costs}}{\text{Projected costs}} \qquad >1 \rightarrow \text{Over budget}$$

Slippage is the process of falling behind schedule or going over budget. To correct slippage, you can:

- Add more resources (tools, overtime, and personnel). Adding more people works only when the task is partitionable. Also more people, more communication problem.
- Allow more time by extending the deadline
- Trim the task by postponing the completion of some of the functions of the system or eliminating them.

When slippage occurs, make sure you take appropriate measures to correct it: allocate enough additional time and resources or trim the task enough to ensure that there will not be more slippage later on.

Final project review: After the system is installed and running, a final project review must be conducted to evaluate both the quality of the new system and the efficiency of the techniques used to construct it.