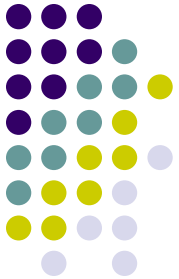
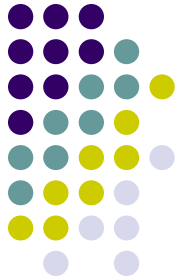


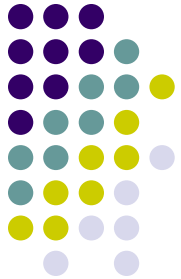
Chapter 5
Project Cost Management

5.1.What is Cost and Project Cost Management?



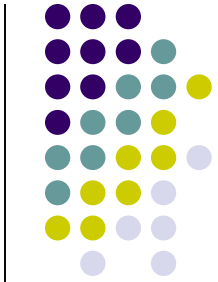
- Cost is a resource sacrificed or foregone to achieve a specific objective or something given up in exchange
- Costs are usually measured in monetary units like dollars
- Project cost management includes the processes required to ensure that the project is completed within an approved budget

* Project Cost Management Processes



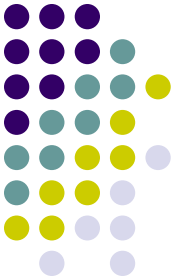
- Resource planning: determining what resources and quantities of them should be used
- Cost estimating: developing an estimate of the costs and resources needed to complete a project
- Cost budgeting: allocating the overall cost estimate to individual work items to establish a baseline for measuring performance
- Cost control: controlling changes to the project budget

5.2. Basic Principles of Cost Management



- Most CEOs and boards know a lot more about finance than IT, so IT project managers must speak their language
  - Profits are revenues minus expenses
  - Life cycle costing is estimating the cost of a project plus the maintenance costs of the products it produces
  - Cash flow analysis is determining the estimated annual costs and benefits for a project
  - Benefits and costs can be tangible or intangible, direct or indirect
  - Sunk cost should not be a criteria in project selection

Table 5-1. Cost of Software Defects



When Defect is Detected	Typical Cost of Correction
User Requirements	$100-$1,000
Coding/Unit Testing	$1,000 or more
System Testing	$7,000 - $8,000
Acceptance Testing	$1,000 - $100,000
After Implementation	Up to millions of dollars

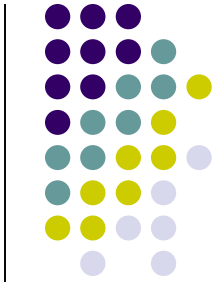
* It is important to spend money up-front on IT projects to avoid spending a lot more later.

5.3. Resource Planning

- The nature of the project and the organization will affect resource planning
- Some questions to consider:
  - How difficult will it be to do specific tasks on the project?
  - Is there anything unique in this project's scope statement that will affect resources?
  - What is the organization's history in doing similar tasks?
  - Does the organization have or can they acquire the people, equipment, and materials that are capable and available for performing the work?

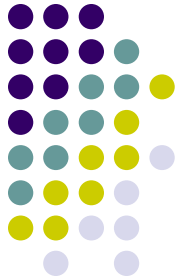
    * *A large percentage of the costs of many of IT projects are human resources costs*

5.4. Cost Estimating



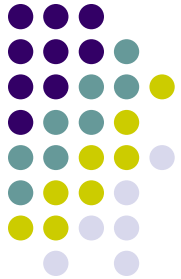
- An important output of project cost management is a cost estimate
- There are several types of cost estimates and tools and techniques to help create them
- It is also important to develop a cost management plan that describes how cost variances will be managed on the project

a) Cost Estimation Tools and Techniques



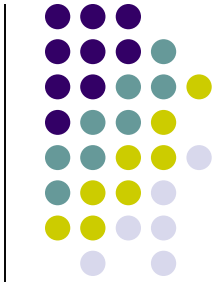
- 3 basic tools and techniques for cost estimates:
  - analogous or top-down: use the actual cost of a previous, similar project as the basis for the new estimate
  - bottom-up: estimate individual work items and sum them to get a total estimate
  - parametric: use project characteristics in a mathematical model to estimate costs

* Constructive Cost Model (COCOMO)



- Barry Boehm helped develop the COCOMO models for estimating software development costs
- Parameters include source lines of code or function points

b) Types of Project Costs

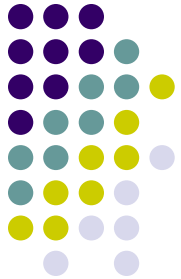


- A project estimate can be sub-divided into a number of different costs as the following:

  1) Direct costs: are the costs that can be specifically identified with an activity or project.

  - *Direct management costs* refer to the project office running costs. Salaries for the project manager, project engineer, planner, accountant, secretary and QA.
  - *Direct labor costs* refer to the people working on an activity (computer programmers,…).
  - *Direct material costs*

b) Types of Project Costs

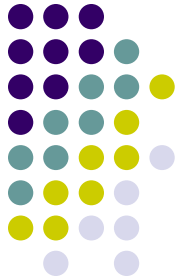


- *Direct equipment costs* refer to the machinery, plant and tools.
- *Direct expenses* include bought-in services that are specific to the project, for example, plant hire, surveyor, designer, and sub-contractor fee.

2) Indirect costs (also called overhead) are the costs which cannot be directly booked to an activity or project, but are required to keep the company operational.

- *Indirect management costs* refer to senior managers, the estimating department, sales and marketing, general office staff, secretarial, administration and the personnel department.

b) Types of Project Costs

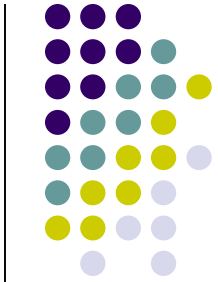


- *Indirect labor costs* refer to reception, maintenance, security and cleaners.
- *Indirect material costs* include stationary, cleaning materials and maintenance parts.
- *Indirect equipment* includes, computers, photocopiers and fax machines.
- *Indirect expenses* include training, insurance.

3) Time Related Costs

- Rent increases with time
- Running costs-water, electricity and gas would increase with time.

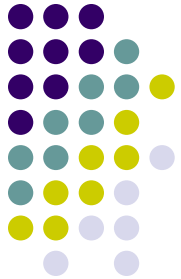
b) Types of Project Costs



- If the project's duration is reduced, employee labor rate will increase if the workers have to work overtime.
- Contract labor on a fixed rate is not affected by time, but their productivity may reduce if they work long hours.
- Fixed price contracts may not be affected by time.

4) Labor costs: The labor costs considered here are for the project workforce and thus a direct cost. Here the costs have been subdivided into four main heading:

b) Types of Project Costs



- Salary
- Associated labor costs
  - Medical insurance
  - Training courses
  - Protective clothing
  - Car allowance
  - Housing allowance
  - Subsistence allowance
  - Pension
  - Tool allowance
  - Private jobs
  - Productivity bonus
- Contribution to overheads: 30% of salary
- Contribution to company profit: 25% of salary

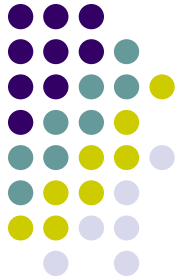
b) Types of Project Costs

$$\text{Labor rate} = \frac{\text{Total monthly costs}}{\text{Total number of normal working hours per month}}$$

- Example:
- Salary: **$2000**
- Associated labor costs: **$740**
- Contribution to overheads: 30% of salary is **$600**
- Contribution to company profit: 25% of salary is **$500**

$\Rightarrow$ Labor rate = (2000+740+600+500)/(21-5)*8 = **$30/h**

b) Types of Project Costs



5) Project office costs: The project office costs or project management fee are often separated out and may form a separate contract within the total project. The project office costs not only include the management fee, but also many other associated costs. Many of costs vary as the project passes through the project phases.

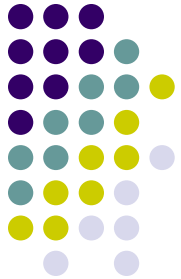
b) Types of Project Costs

Cost Breakdown Structure		Cost
Project Team's Salary	Project Manager	
	Project Engineer	
	Project Planner	
	Project Accountant	
	Procurement Manager	
	Quality Manager	
	Configuration Manager	
	Project Estimator	
	Project Secretary	
Project Office Costs	Rent, water, electricity	
	Office equipment	
	Stationery	
	Telephone, internet	
Travel	Car pool	
	Air flights	
	Accommodations, meals	
Security	Reception, guards	
Training	Project management, quality, TQM, Computer skills	
Marketing	Entertaining client	
TOTAL		

TQM: Total quality management

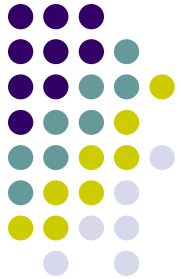
6) Transport costs

5.5. Cost Budgeting



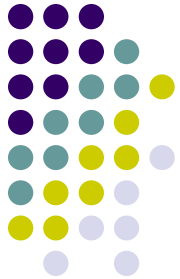
- Cost budgeting involves allocating the project cost estimate to individual work items and providing a cost baseline
- The work items are based on the work breakdown structure for the project.

5.6. Cost Control



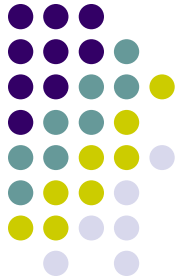
- Project cost control includes
  - Monitoring cost performance to detect and understand variances from plan
  - Ensuring that all appropriate changes are recorded accurately in the cost baseline
  - Preventing incorrect, inappropriate, or unauthorized changes from being included in the cost baseline
  - Informing project stakeholders of authorized changes to the project that will affect costs
  - Acting to bring expected costs within acceptable limits.
- Earned value management is an important tool for cost control

a) Earned Value Management (EVM)



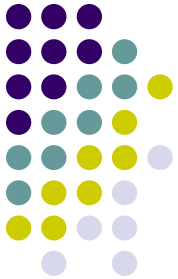
- EVM is a project performance measurement technique that integrates scope, time, and cost data
- Given a baseline (original plan plus approved changes), you can determine how well the project is meeting its goals

b) Earned Value Management Terms



- The **planned value (PV)**, formerly called the budgeted cost of work scheduled (BCWS), also called the budget, is that portion of the approved total cost estimate planned to be spent on an activity during a given period
- The **actual cost (AC)**, formerly called actual cost of work performed (ACWP), is the total of direct and indirect costs incurred in accomplishing work on an activity during a given period
- The **earned value (EV)**, formerly called the budgeted cost of work performed (BCWP), is an estimate of the value of the physical work actually completed

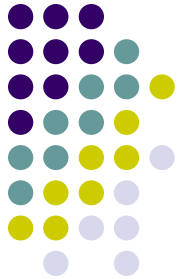
c) Earned Value Formulas



Term	Formula
Earned value	EV = PV to date **x** percent complete
Cost variance	CV = EV **-** AC
Schedule variance	SV = EV **-** PV
Cost performance index	CPI = EV/AC
Schedule performance index	SPI = EV/PV
Estimate at completion (EAC)	EAC = BAC/CPI
Estimated time to complete	Original time estimate/SPI

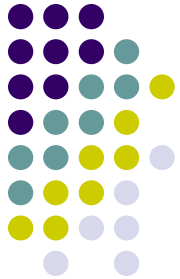
*** *BAC: Budget at completion*, the original total budget for the project**

* Rules of Thumb for Earned Value Numbers



- Negative numbers for cost and schedule variance indicate problems in those areas. The project is costing more than planned or taking longer than planned
- Positive number mean that performing the work cost less than planned or took less time than planned to perform the work

* Rules of Thumb for Earned Value Numbers



- CPI and SPI less than 100% indicate problems

  - CPI < 1 or CPI < 100%, the project is over budget

  - SPI < 1 or SPI < 100%, the project is behind schedule

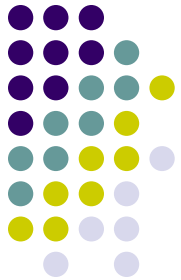
  - CPI = 1 or CPI = 100%, the planned and actual costs are equal, or the costs are exactly as budgeted

  - SPI = 1 or SPI = 100%, the project is on schedule

  - CPI > 1 or CPI > 100%, the project is under budget

  - SPI > 1 or SPI > 100%, the project is ahead of schedule

Ex_1: Earned Value Calculation for One Activity After Week 1



- EV = $10,000 x 75% = $7,500
- CV = EV-AC = 7,500 – 15,000= -7,500

  ⇒ Project is costing more than planned
- SV = EV-PV = 7,500 – 10,000 = -2,500

  ⇒ Project is taking longer than planned
- CPI = EV/AC = 7,500/15,000 = 0.5= 50%

  ⇒ Project is over budget
- SPI = EV/PV = 7,500/10,000 = 0.75 = 75%

⇒ Project is behind schedule

Ex_2:

a) - SPI = EV/PV= 20,000/23,000 = 0.8695 ≈ 0.87= 87%

⇒ Project is behind schedule

- CPI = EV/AC = 20,000/25,000 = 0.8 = 80%

⇒ Project is over budget

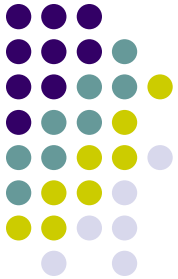
b) EAC=BAC/CPI=(120,000x25,000)/20,000 = $150,000

⇒ The project performing is worse than planned

c) Estimated time to complete = Original time estimate/SPI = (12 x 23,000)/20,000=13.8 months

⇒ It will take 13.8 months or 1 year, 1 month and 25 days to finish this project

Ex_3: Earned Value Calculations for One-Year Project After five Months



- EV_5 = 8,000+12,000+8,000+10,000+6,000 = 44,000
- AC_5= 4,000+11,000+11,000+12,000+15,000 = 53,000
- PV_5= 4,000+10,000+10,000+10,000+12,000 = 46,000
- CV_5= EV_5-AC_5=44,000-53,000 = -9,000

$\Rightarrow$ Project is costing more than planned

- SV_5= EV_5-PV_5 = 44,000-46,000 = -2,000

$\Rightarrow$ Project is taking longer than planned

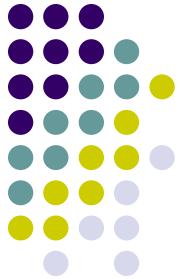
- CPI_5= EV_5/AC_5= 44,000/53,000 = 0.8301 $\approx$ 0.83=83%

$\Rightarrow$ Project is over budget

- SPI_5= EV_5/PV_5= 44,000/46,000 = 0.9565 $\approx$ 0.96 =96%

$\Rightarrow$ Project is behind schedule

Ex3: Earned Value Calculations for One-Year Project After five Months



- EAC = BAC/CPI_5 =(100,000 x 53,000)/44,000
  = 120,454.54 ≈ $120,455
- Estimated time to complete = Original time estimate/SPI_5 = (12 x 46,000)/44,000
  ≈ 12.55 months