7 : Project Cost Management

IT4306− IT Project Management

Level II - Semester 4

Intended Learning Outcomes

- At the end of this lesson, you will be able to;
  - Describe the importance of project cost management

  - Explain basic project cost management principles, concepts, and terms

  - Discuss different types of cost estimates and methods for preparing them

  - Identify the processes involved in cost budgeting

  - Prepare a cost estimate and budget for an information technology project

  - Describe what the cost control is

7.1. The Importance of Project Cost Management

- IT projects have a poor track record for meeting budget goals.

- The 2003 CHAOS studies showed the average cost overrun (the additional percentage or dollar amount by which actual costs exceed estimates) was 43 percent.

- U.S. lost $55 billion in IT projects in 2002 from cancelled projects and overruns compared to $140 billion in 1994.*

*The Standish Group, "Latest Standish Group CHAOS Report Shows Project Success Rates Have Improved by 50%," A Standish Group Research Note (3/25/03).

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, such as dollars.

- **Project cost management** includes the processes required to ensure that the project is completed within an approved budget.

Project Cost Management Processes

- **Estimating costs**: Developing an approximation or estimate of the costs of the resources needed to complete a project.

- **Determining the Budget**: Allocating the overall cost estimate to individual work items to establish a baseline for measuring performance.

- **Controlling Costs**: Controlling changes to the project budget.

7.2. Basic Principles of Cost Management

- Most members of an executive board have a better understanding and are more interested in financial terms than IT terms, so IT project managers must speak their language.

  - **Profits** are revenues minus expenses.
  - **Life cycle costing** considers the total cost of ownership, or development plus support costs, for a project.
  - **Cash flow analysis** determines the estimated annual costs and benefits for a project and the resulting annual cash flow.

Cost of Software Defects*

WHEN DEFECT IS DETECTED	TYPICAL COSTS 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.

*Collard, Ross, *Software Testing and Quality Assurance*, working paper (1997).

Basic Principles of Cost Management

- **Tangible costs** or **benefits** are those costs or benefits that an organization can easily measure in dollars.

- **Intangible costs** or **benefits** are costs or benefits that are difficult to measure in monetary terms.

- **Direct costs** are costs that can be directly related to producing the products and services of the project.

- **Indirect costs** are costs that are not directly related to the products or services of the project, but are indirectly related to performing the project.

- **Sunk cost** is money that has been spent in the past; when deciding what projects to invest in or continue, you should not include sunk costs.

Basic Principles of Cost Management

- **Learning curve theory** states that when many items are produced repetitively, the unit cost of those items decreases in a regular pattern as more units are produced.

- **Reserves** are dollars included in a cost estimate to mitigate cost risk by allowing for future situations that are difficult to predict.

  - **Contingency reserves** allow for future situations that may be partially planned for (sometimes called **known unknowns**) and are included in the project cost baseline.

  - **Management reserves** allow for future situations that are unpredictable (sometimes called **unknown unknowns**).

7.3. Planning Cost Management

A cost management plan

- A cost management plan is a document that describes how the organization will manage cost variances on the project.

- A large percentage of total project costs are often labor costs, so project managers must develop and track estimates for labor.

Maximum Departmental Headcounts by Year

DEPARTMENT	1994	1995	1996	1997	1998	TOTALS
Information Systems	24	31	35	13	13	116
Marketing Systems	3	3	3	3	3	15
Reservations	12	29	33	9	7	90
Contractors	2	3	1	0	0	6
Totals	41	66	72	25	23	227

A large percentage of the costs of many IT projects are human resource costs.

7.4. Estimating Costs

- Project managers must take cost estimates seriously if they want to complete projects within budget constraints.

- It's important to know the types of cost estimates, how to prepare cost estimates, and typical problems associated with IT cost estimates.

Types of Cost Estimates

TYPE OF ESTIMATE	WHEN DONE	WHY DONE	HOW ACCURATE
Rough Order of Magnitude (ROM)	Very early in the project life cycle, often 3–5 years before project completion	Provides estimate of cost for selection decisions	−25% to +75%
Budgetary	Early, 1–2 years out	Puts dollars in the budget plans	−10% to +25%
Definitive	Later in the project, less than 1 year out	Provides details for purchases, estimates actual costs	−5% to +10%

Cost Estimation Tools and Techniques

Basic tools and techniques for cost estimates:

- **Analogous or top-down estimates**: Use the actual cost of a previous, similar project as the basis for estimating the cost of the current project.

- **Bottom-up estimates**: Involve estimating individual work items or activities and summing them to get a project total.

- **Parametric modeling**: Uses project characteristics (parameters) in a mathematical model to estimate project costs.

- **Computerized tools**: Tools, such as spreadsheets and project management software, that can make working with different cost estimates and cost estimation tools easier.

Constructive Cost Model (COCOMO)

- Barry Boehm helped develop the COCOMO models for estimating software development costs.

- Parameters include:
    - **Function points**: Technology-independent assessments of the functions involved in developing a system.
    - **Source Lines of Code (SLOC)**: A human-written line of code that is not a blank line or comment.

- Boehm suggests that only parametric models do not suffer from the limits of human decision-making.

Typical Problems with IT Cost Estimates

- Developing an estimate for a large software project is a complex task that requires a significant amount of effort.

- People who develop estimates often do not have much experience.

- Human beings are biased toward underestimation.

- Management might ask for an estimate, but really desire a bid to win a major contract or get internal funding.

How to Develop a Cost Estimate and Basis of Estimates

- See pages 299 - 304 for a detailed example.

- Before creating an estimate, know what it will be used for, gather as much information about the project as possible, and clarify the ground rules and assumptions for the estimate.

- If possible, estimate costs by major WBS categories.

- Create a cost model to make it easy to change and document the estimate.

Sample Cost Estimate

Surveyor Pro Project Cost Estimate

Surveyor Pro Project Cost Estimate Created October 5, 2006

	# Units/Hrs.	Cost/Unit/Hr.	Subtotals	WBS Level 1 Totals	% of Total
WBS Items					
1. Project Management				$306,300	20%
Project manager	960	$100	$96,000		
Project team members	1920	$75	$144,000		
Contractors (10% of software development and testing)			$66,300		
2. Hardware				$76,000	5%
2.1 Handheld devices	100	$600	$60,000		
2.2 Servers	4	$4,000	$16,000		
3. Software				$614,000	40%
3.1 Licensed software	100	$200	$20,000		
3.2 Software development*			$594,000		
4. Testing (10% of total hardware and software costs)			$69,000	$69,000	5%
5. Training and Support				$202,400	13%
Trainee cost	100	$500	$50,000		
Travel cost	12	$700	$8,400		
Project team members	1920	$75	$144,000		
6. Reserves (20% of total estimate)			$253,540	$253,540	17%
Total project cost estimate				$1,521,240	

* See software development estimate

Surveyor Pro Software Development Estimate

Surveyor Pro Software Development Estimate Created October 5, 2006

1. Labor Estimate	# Units/Hrs.	Cost/Unit/Hr.	Subtotals	Calculations
Contractor labor estimate	3000	$150	$450,000	3000*150
Project team member estimate	1920	$75	$144,000	1920*75
Total labor estimate			**$594,000**	Sum above two values
2. Function point estimate **	Quantity	Conversion Factor	Function Points	Calculations
External inputs	10	4	40	10*4
External interface files	3	7	21	3*7
External outputs	4	5	20	4*5
External queries	6	4	24	6*4
Logical internal tables	7	10	70	7*10
Total function points			**175**	Sum above function point values
Java 2 languange equivalency value			46	Assumed value from reference
Source lines of code (SLOC) estimate			8,050	175*46
Productivity*KSLOC^Penalty (in months)			29.28	3.13*8.05^1.072 (see reference)
Total labor hours (160 hours/month)			4,684.65	29.28*160
Cost/labor hour ($120/hour)			$120	Assumed value from budget expert
Total function point estimate			**$562,158**	4684.65*120

**Approach based on paper by William Roetzheim, "Estimating Software Costs," Cost Xpert Group, Inc. (2003) using the COCOMO II default linear productivity factor (3.13) and penalty factor (1.072).

7.5. Determining the Budget

- Cost budgeting involves allocating the project cost estimate to individual work items over time.

- The WBS is a required input for the cost budgeting process because it defines the work items.

- Important goal is to produce a **cost baseline**:

- – A time-phased budget that project managers use to measure and monitor cost performance.

Surveyor Pro Project Cost Baseline

Surveyor Pro Project Cost Baseline Created October 10, 2006*

WBS Items	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1. Project Management													
Project manager	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	96,000
Project team members	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	144,000
Contractors		6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	66,300
2. Hardware													
2.1 Handheld devices				30,000	30,000								60,000
2.2 Servers				8,000	8,000								16,000
3. Software													
3.1 Licensed software				10,000	10,000								20,000
3.2 Software development		60,000	60,000	80,000	127,000	127,000	90,000	50,000		594,000			594,000
4. Testing			6,000	8,000	12,000	15,000	15,000	13,000		69,000			69,000
5. Training and Support													
Trainee cost									50,000				50,000
Travel cost									8,400				8,400
Project team members							24,000	24,000	24,000	24,000	24,000	24,000	144,000
6. Reserves				10,000	10,000	30,000	30,000	60,000	40,000	40,000	30,000	3,540	253,540
Totals	20,000	86,027	92,027	172,027	223,027	198,027	185,027	173,027	148,427	753,027	80,027	53,567	1,521,240

*See the lecture slides for this chapter on the companion Web site for a larger view of this and other figures in this chapter.

7.6. Controlling Costs

- Project cost control includes:

    - Monitoring cost performance.

    - Ensuring that only appropriate project changes are included in a revised cost baseline.

    - Informing project stakeholders of authorized changes to the project that will affect costs.

- Many organizations around the globe have problems with cost control.

Media Snapshot

- Group Ltd. led to an estimated cost overrun of $11.5 million.*
- India: As many as 274 projects currently under implementation in the Central sector are suffering serious cost and time overruns.**
- Pakistan: Pakistan has sustained a cost overrun of Rs 1.798 billion (over
- $30 million U.S. dollars) in the execution of the 66.5 megawatt Jagran Hydropower Project in the Neelum Valley.***
- United States: Northern California lawmakers were outraged over Governor Arnold Schwarzenegger's announcement that commuters should have to pay construction costs on Bay Area bridges. Maybe it takes the Terminator to help control costs!****

*Songini, Marc L., "Australian Firm Wrestles With ERP Delays," ComputerWorld (July 12, 2004).

**Srinivasan, G., "274 Central sector projects suffer cost, time overruns," The Hindu Business Line (May 4, 2004).

***Mustafa, Khalid, "Rs 1.8 billion cost overrun in Jagran hydropower project," Daily Times (November 19, 2002).

****Gannett Company, "Governor Refuses to Pay for Bay Bridge Cost Overruns," News10 (August 17, 2004).

Summary

- Project cost management is traditionally a weak area in IT projects, and project managers must work to improve their ability to deliver projects within approved budgets.

- Main processes include:

  - Estimating cost
  - Determining the budget
  - Controlling Costs