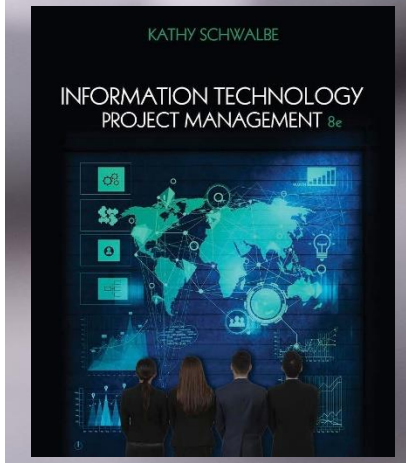
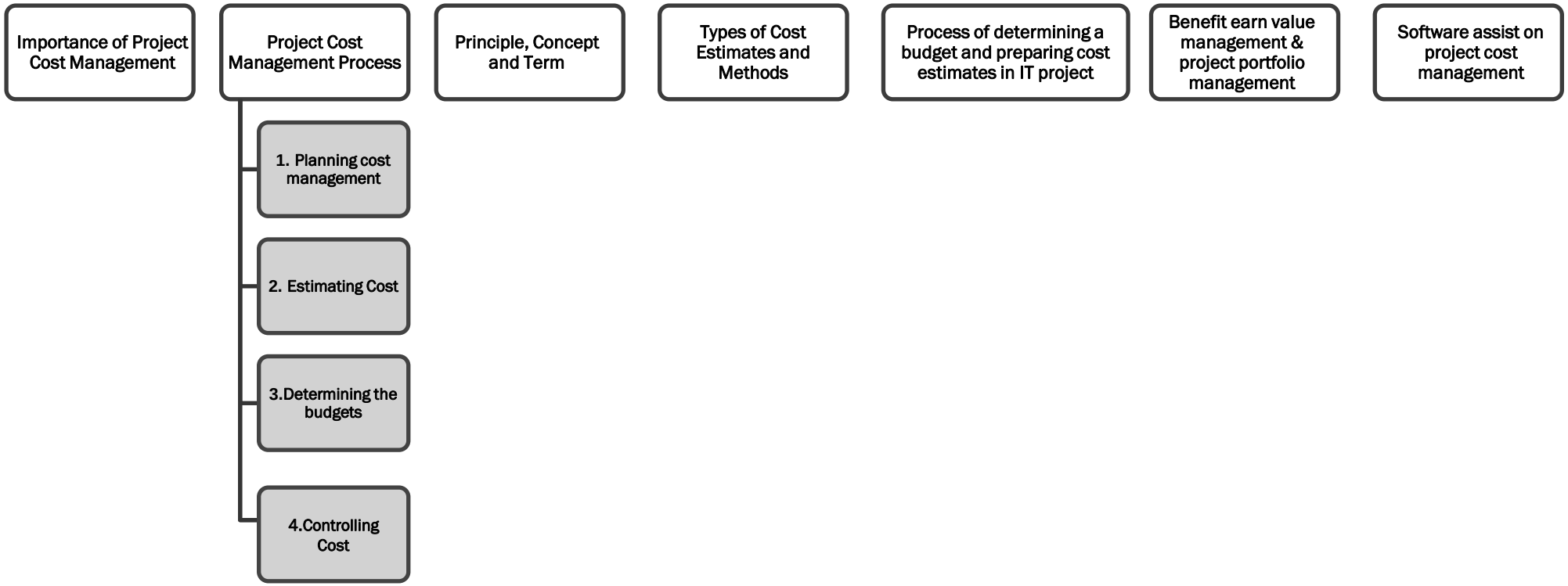
IT PROJECT MANAGEMENT

WEEK 7 : PROJECT COST MANAGEMENT



Note:
Adapted from slide of the textbook: Schwalbe, Kathy. Managing Information Technology Project – Eight Edition. Boston, MA: Thomson Course Technology, 2016.
See the text itself for full citations.

MIND MAP


Importance of Project Cost Management
Project Cost Management Process
1. Planning cost management
2. Estimating Cost
3.Determining the budgets
4.Controlling Cost
Principle, Concept and Term
Types of Cost Estimates and Methods
Process of determining a budget and preparing cost estimates in IT project
Benefit earn value management & project portfolio management
Software assist on project cost management

LEARNING OBJECTIVES

a. Understand the **importance** of **project cost** management
b. Explain basic project cost management **principles**, **concepts**, and **terms**
c. Describe the process of **planning cost management**
d. Discuss different types of **cost estimates** and methods for preparing them
e. Understand the processes of **determining** a **budget** and preparing a cost estimate for an information technology (IT) project
f. Understand the benefits of **earned value management** and project portfolio management to assist in cost control
g. Describe how project management software can assist in project cost management

A: THE IMPORTANCE OF PROJECT COST MANAGEMENT

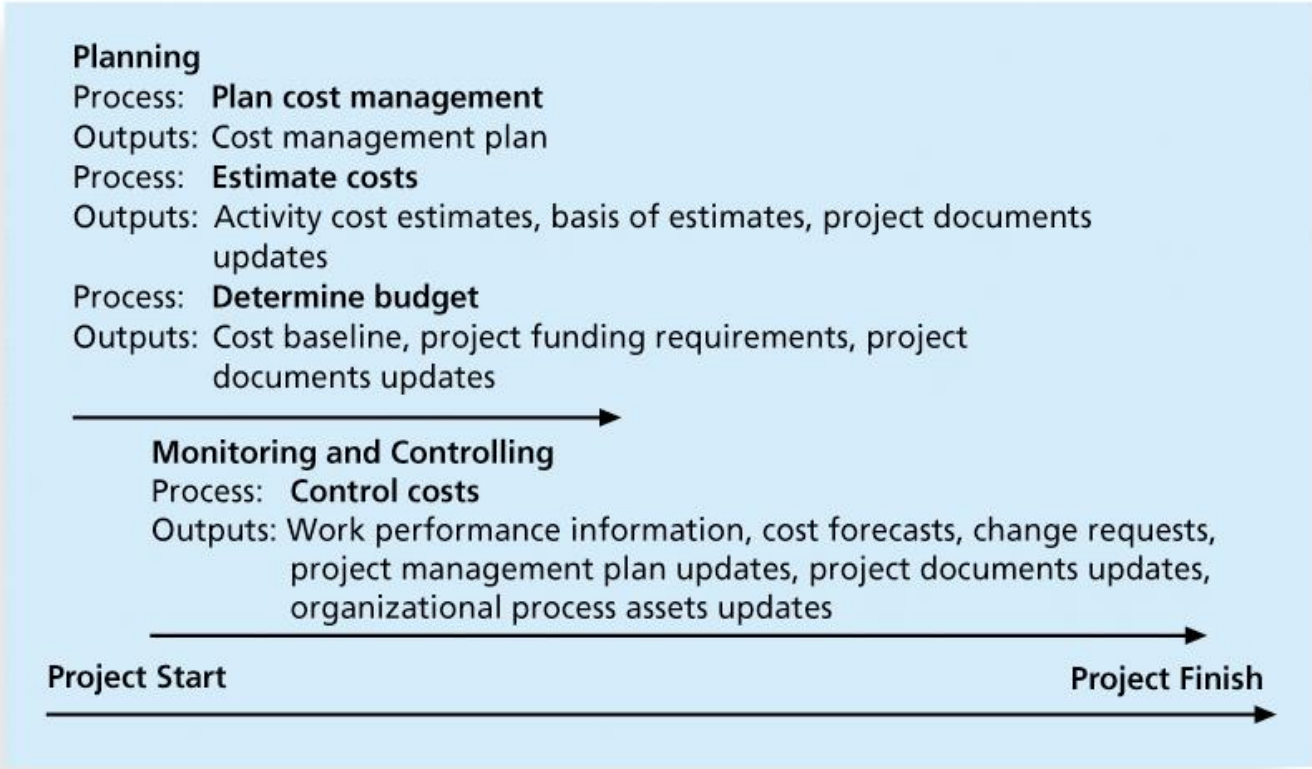
THE IMPORTANCE OF PROJECT COST MANAGEMENT

- IT projects have a poor track record for meeting budget goals
- A cost **overrun** is the additional percentage or dollar amount by which actual costs exceed estimates
- A 2011 Harvard Business Review study reported an average cost overrun of 27 percent. The most important finding was the discovery of a large number of gigantic overages or “black swans” (a high-impact event that is rare and unpredictable, but not improbable in retrospect)

- **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

- **Planning cost management** :determining the policies procedures, and documentation that will be used for planning, executing, and controlling project cost.
- **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 base for measuring performance
- **Controlling costs:** controlling changes to the project budget



B: BASIC PRINCIPLES OF COST MANAGEMENT

BASIC PRINCIPLES OF COST MANAGEMENT

- Most members of an executive board better understand and are more interested in financial terms than IT terms, so IT project managers must speak their language
  - **Profits** are revenues minus expenditures
  - **Profit margin** is the ratio of revenues to profits
  - **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

TYPES OF COSTS AND BENEFITS

- **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

MORE 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**

C: PLANNING COST MANAGEMENT

PLANNING COST MANAGEMENT

- The project team uses expert judgment, analytical techniques, and meetings to develop the cost management plan
- Project costs, like project schedules, grow out of the basic documents that initiate a project, like the project charter
- A **cost management plan** includes:
  - Level of accuracy and units of measure
  - Organizational procedure links
  - Control thresholds
  - Rules of performance measurement
  - Reporting formats
  - Process descriptions

D: ESTIMATING COSTS

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

Type of Estimate	When Done	Why Done	Typical Range
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	−50% to +100%
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%

MORE ON COST ESTIMATES

- The number and type of cost estimates **vary by application area**. The Association for the Advancement of Cost Engineering International identifies five types of cost estimates for construction projects: order of magnitude, conceptual, preliminary, definitive, and control
- Estimates are usually **done at various stages of a project** and should become more accurate as time progresses
- A large percentage of total project costs are often **labor costs**
  - Labor costs are often much higher for contractors, so it is important to distinguish between internal and external resources

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

TYPICAL PROBLEMS WITH IT COST ESTIMATES

- Estimates are done too quickly
- People lack estimating experience
- Human beings are biased toward underestimation
- Management desires accuracy

SAMPLE COST ESTIMATE

- See the text for a detailed example of creating a cost estimate for the Surveyor Pro project described in the opening case
- Before creating an estimate, know what it will be used for, gather as much information 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 make changes to and document the estimate

Surveyor Pro Project Cost Estimate Created October 5

	# Units/Hrs.	Cost/Unit/Hr.	Subtotals	WBS Level 2 Totals	% of Total
WBS Items					
1. Project Management				**$306,300**	**20%**
Project manager	960	$100	$96,000		
Project team members	1,920	$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	1,920	$75	$144,000		
Subtotal			$1,267,700		
6. Reserves (20% of total estimate)			$253,540	**$253,540**	**17%**
Total project cost estimate				**$1,521,240**	

*See software development estimate.

SOFTWARE DEVELOPMENT ESTIMATE

Surveyor Pro Software Development Estimate Created October 5

1. Labor Estimate	# Units/Hrs.	Cost/Unit/Hr.	Subtotals	**Calculations**
Contractor labor estimate	3,000	$150	$450,000	3,000 * 150
Project team member estimate	1,920	$75	$144,000	1,920 * 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 language 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 (27 hours/function point)*			4,725	27*175
Cost/labor hour ($120/hour)			$120	Assumed value from budget expert
Total function point estimate			**$567,000**	4,725 * 120

* Based on historical data

E: DETERMINING THE BUDGET

DETERMINING THE BUDGET

- Cost budgeting involves allocating the project cost estimate to individual work items over time
- The WBS is a required input to the cost budgeting process since 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*

	Months												
WBS Items	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1. Project Management													
1.1 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
1.2 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
1.3 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
4. Testing			6,000	8,000	12,000	15,000	15,000	13,000					69,000
5. Training and Support													
5.1 Trainee cost									50,000				50,000
5.2 Travel cost									8,400				8,400
5.3 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	90,027	80,027	53,567	1,521,240

*See the lecture slides for this chapter on the Instructor website for a larger view of this and other figures in this chapter. Numbers are rounded, so some totals appear to be off.

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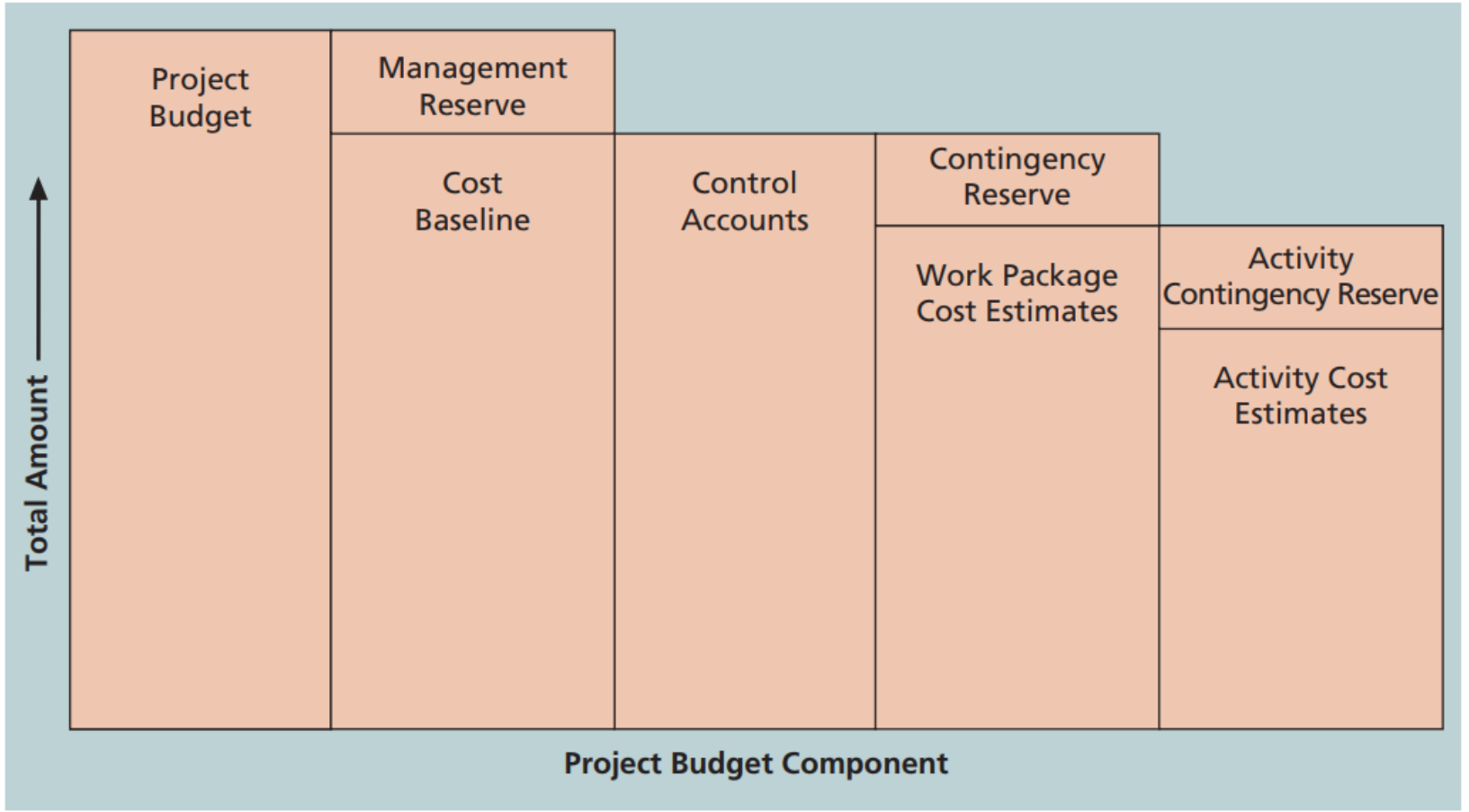
PROJECT BUDGET COMPONENT



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F: CONTROLLING COSTS

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

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
- You must enter actual information periodically to use EVM
- More and more organizations around the world are using EVM to help control project costs

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
- **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
- EV is based on the original planned costs for the project or activity and the rate at which the team is completing work on the project or activity to date

RATE OF PERFORMANCE

- **Rate of performance (RP)** is the ratio of actual work completed to the percentage of work planned to have been completed at any given time during the life of the project or activity
- Brenda Taylor, Senior Project Manager in South Africa, suggests this term and approach for estimating earned value
- For example, suppose the server installation was halfway completed by the end of week 1. The rate of performance would be 50% because by the end of week 1, the planned schedule reflects that the task should be 100 percent complete and only 50 percent of that work has been completed

EARNED VALUE FORMULAS

Term	Formula
Earned value (EV)	EV = PV of all completed work
Cost variance (CV)	CV = EV − AC
Schedule variance (SV)	SV = EV − PV
Cost performance index (CPI)	CPI = EV/AC
Schedule performance index (SPI)	SPI = EV/PV
Estimate at completion (EAC)	EAC = BAC/CPI
Estimated to Complete (ETC)	ETC = EAC − AC

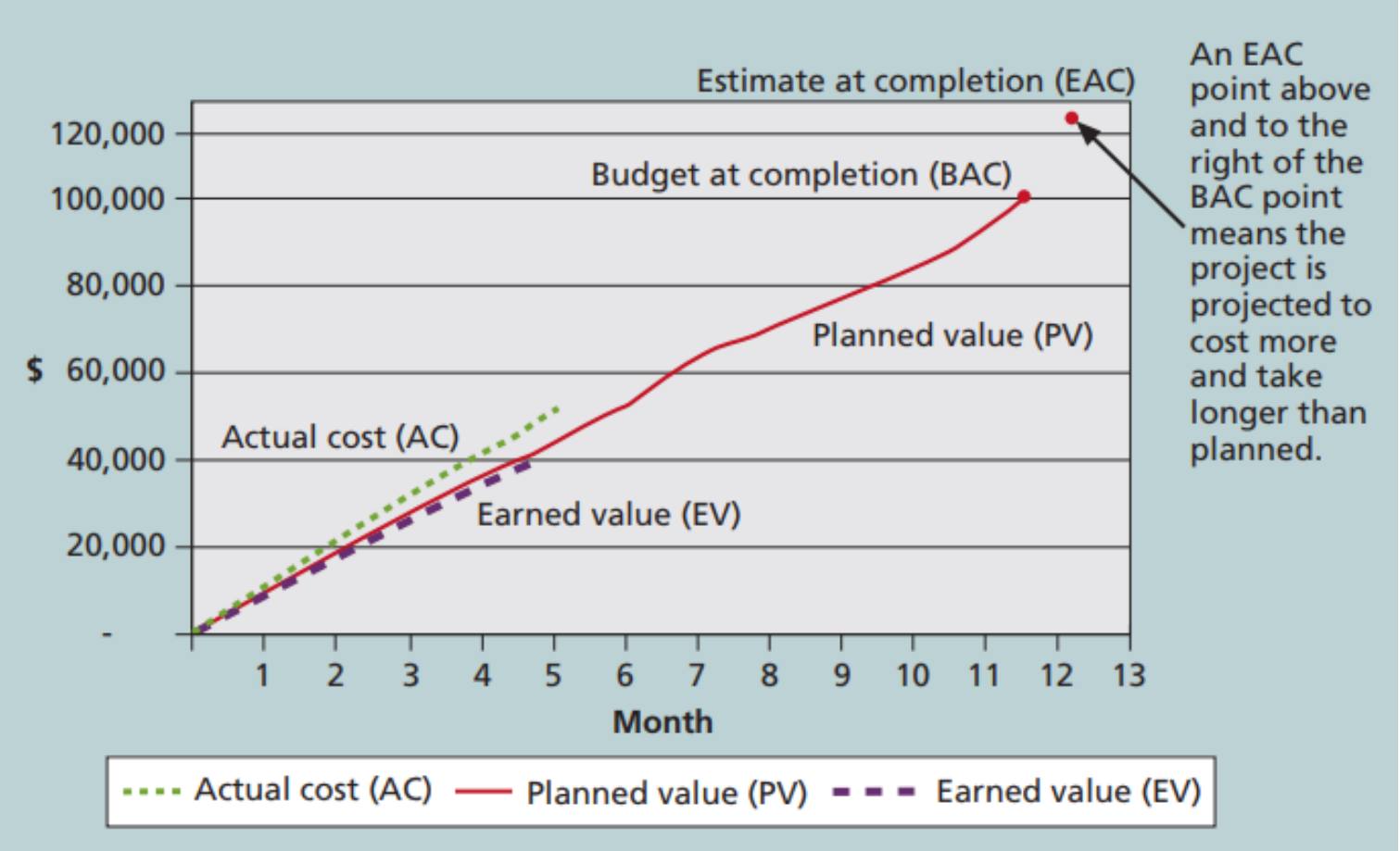
EARNED VALUE CALCULATIONS FOR ONE ACTIVITY AFTER WEEK ONE

Activity	Week 1
Earned value (EV)	5,000
Planned value (PV)	10,000
Actual cost (AC)	15,000
Cost variance (CV)	−10,000
Schedule variance (SV)	−5,000
Cost performance index (CPI)	33%
Schedule performance index (SPI)	50%

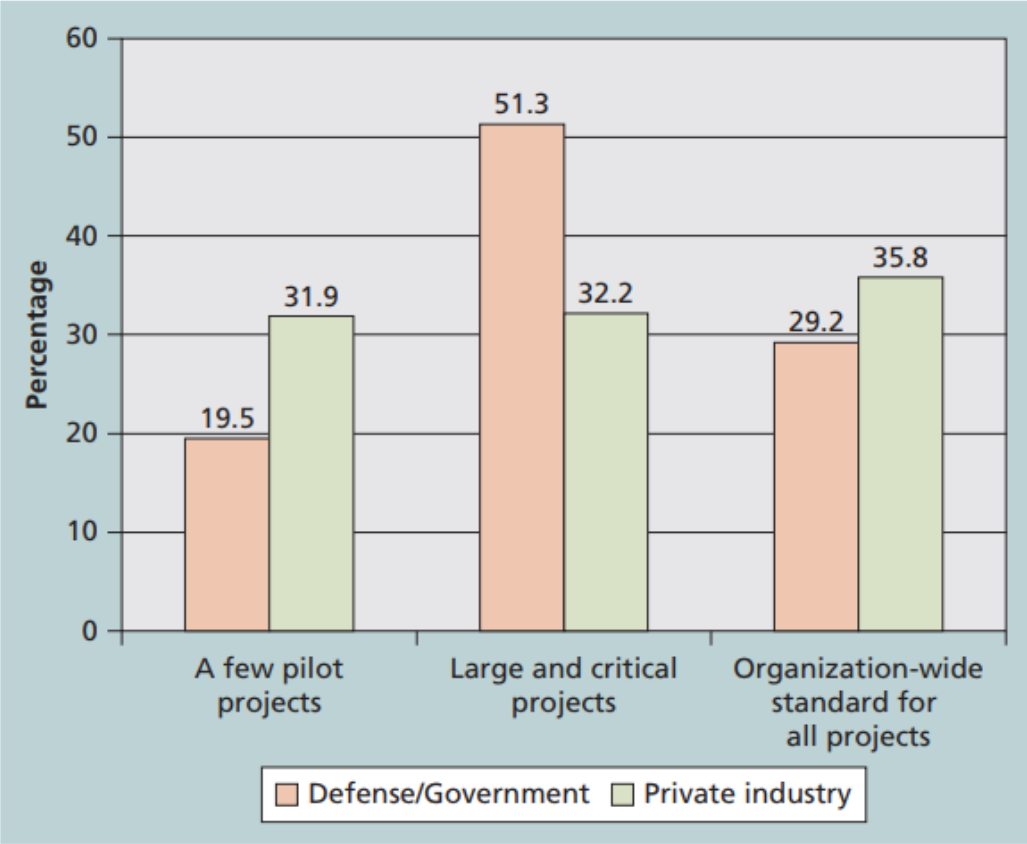
RULES OF THUMB FOR EARNED VALUE NUMBERS

- Negative numbers for cost and schedule variance indicate problems in those areas
- CPI and SPI less than 100% indicate problems
- Problems mean the project is costing more than planned (over budget) or taking longer than planned (behind schedule)
- The CPI can be used to calculate the **estimate at completion** (EAC)—an estimate of what it will cost to complete the project based on performance to date. The **budget at completion** (BAC) is the original total budget for the project

EARNED VALUE CHART FOR PROJECT AFTER FIVE MONTHS



GLOBAL ISSUES



Source: Lingguang Song, "Earned Value Management: A Global and Cross-Industry Perspective on Current EVM Practice," PMI (2011), p. 36.

- EVM is used worldwide, and it is particularly popular in the Middle East, South Asia, Canada, and Europe
- Most countries require EVM for large defense or government projects, as shown in Figure 7-6
- EVM is also used in such private-industry sectors as IT, construction, energy, and manufacturing.
- However, most private companies have not yet applied EVM to their projects because management does not require it, feeling it is too complex and not cost effective

PROJECT PORTFOLIO MANAGEMENT

- Many organizations collect and control an entire suite of projects or investments as one set of interrelated activities in a portfolio
- Five levels for project portfolio management
  1. Put all your projects in one database
  2. Prioritize the projects in your database
  3. Divide your projects into two or three budgets based on type of investment
  4. Automate the repository
  5. Apply modern portfolio theory, including risk-return tools that map project risk on a curve

BENEFITS OF PORTFOLIO MANAGEMENT

- Schlumberger saved $3 million in one year by organizing 120 information technology projects into a portfolio
- Reduced redundant projects and coordinated those with overlap
- IT projects can be huge investments, so it makes sense to view them as portfolios and track their progress as a whole

G: USING SOFTWARE TO ASSIST IN COST MANAGEMENT

USING SOFTWARE TO ASSIST IN COST MANAGEMENT

- Spreadsheets are a common tool for resource planning, cost estimating, cost budgeting, and cost control
- Many companies use more sophisticated and centralized financial applications software for cost information
- Project management software has many cost-related features, especially enterprise PM software
- Portfolio management software can help reduce costs

RECENT STUDIES ON PPM SOFTWARE

- 2014 Gartner report says the market continues to grow, with annual sales over $1.65 billion in 2014 report. The pace of change is driving the demand for enterprise software to help manage projects
- Forrester estimates ROIs of 250 percent from PPM tools
- Pfizer and Ford use PPM software to improve transparency of the many projects they manage

CONSIDERATIONS FOR AGILE/ADAPTIVE ENVIRONMENTS

- Projects with **high degrees of uncertainty** or those where the scope is not yet fully defined **may not benefit** from detailed cost calculations due to frequent changes.
- Instead, lightweight estimation methods can be used to generate a fast, high-level forecast of project labor costs, which can then be easily adjusted as changes arise.
- Detailed estimates are reserved for short-term planning horizons in a just-in-time fashion.
- In cases where high-variability projects are also subject to strict budgets, the scope and schedule are more often adjusted to stay within cost constraints.

CHAPTER SUMMARY

- Project cost management is a traditionally weak area of IT projects, and project managers must work to improve their ability to deliver projects within approved budgets
- Main processes include
  - Plan cost management
  - Estimate costs
  - Determine the budget
  - Control costs