Managing a Successful Computing Project

Project Cost Estimation and Management

Objectives

- Understand the importance of project cost management
- Reasons for Cost Overruns.
- What is Cost and PCM?
- Basic Principles of Cost Management
- Resource Planning
- Cost Estimation Techniques
- Cost Budgeting
- Cost Control

The Importance of PCM

- IT projects have a poor track record for meeting budget goals.
- Average cost overrun from 1995 CHAOS study was 189% of the original estimates; improved to 145% in the 2001 study.
- The 2003 CHAOS studies showed the average cost **overrun** (the additional percentage or dollar amount by which actual costs exceed estimates) was 43 percent.
- In 1995, cancelled IT projects cost the U.S. over $81 billion
- U.S. lost $55 billion in IT projects in 2002 from cancelled projects and overruns compared to $140 billion in 1994.

Reasons for Cost Overruns

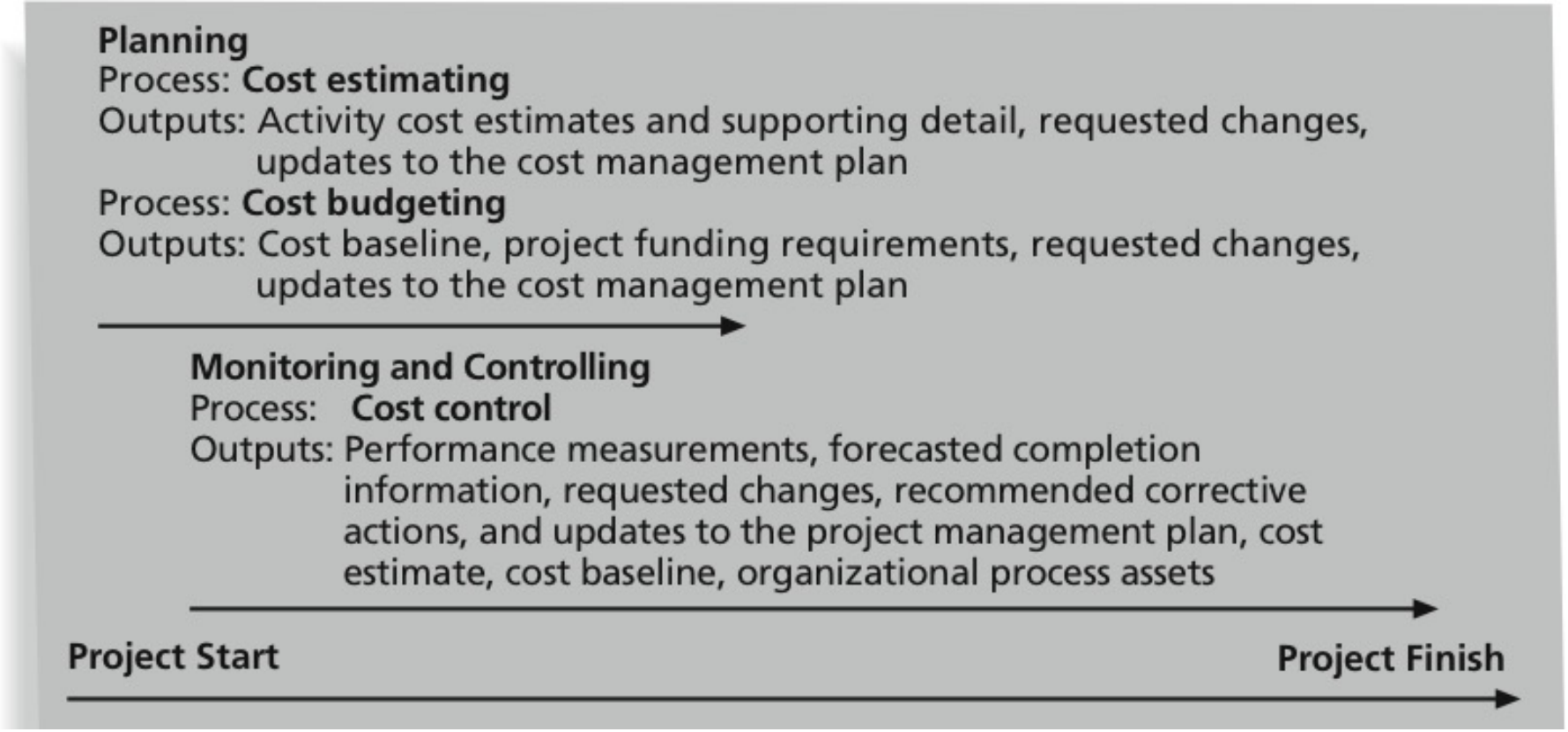
- Not emphasizing the importance of realistic project cost estimates from the outset.
  - ➢ Many of the original cost estimates for IT projects are low to begin with and based on very unclear project requirements.
- Many IT professionals think preparing cost estimates is a job for accountants when in fact it is a very demanding and important skill that project managers need to acquire.
- Many IT projects involve new technology or business processes which involve untested products and inherent risks.

What is Cost and PCM?

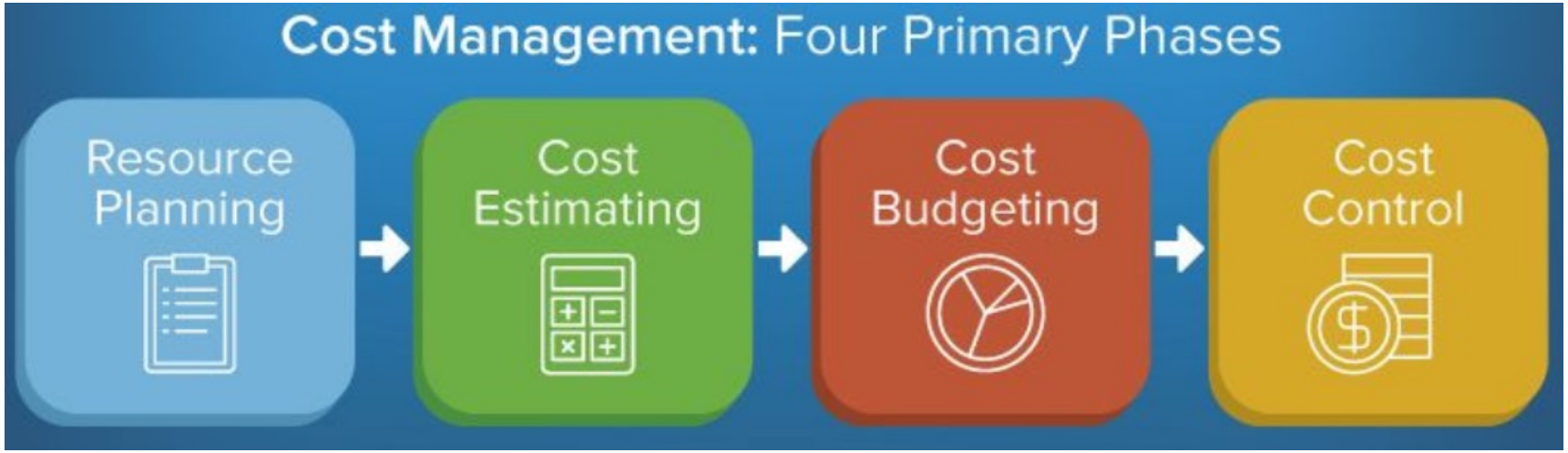
- Cost is a resource sacrificed or foregone to achieve a specific objective or something given up in exchange.
- Costs are usually measured in monetary units like dollars.
- Project Cost Management includes the processes required to ensure that the project is completed within an approved budget.
- Project managers must make sure their projects are well defined, have accurate time and cost estimates and have a realistic budget that they were involved in approving.

What is Cost and PCM?

- Project Cost Management Summary:



Project Cost Management Processes



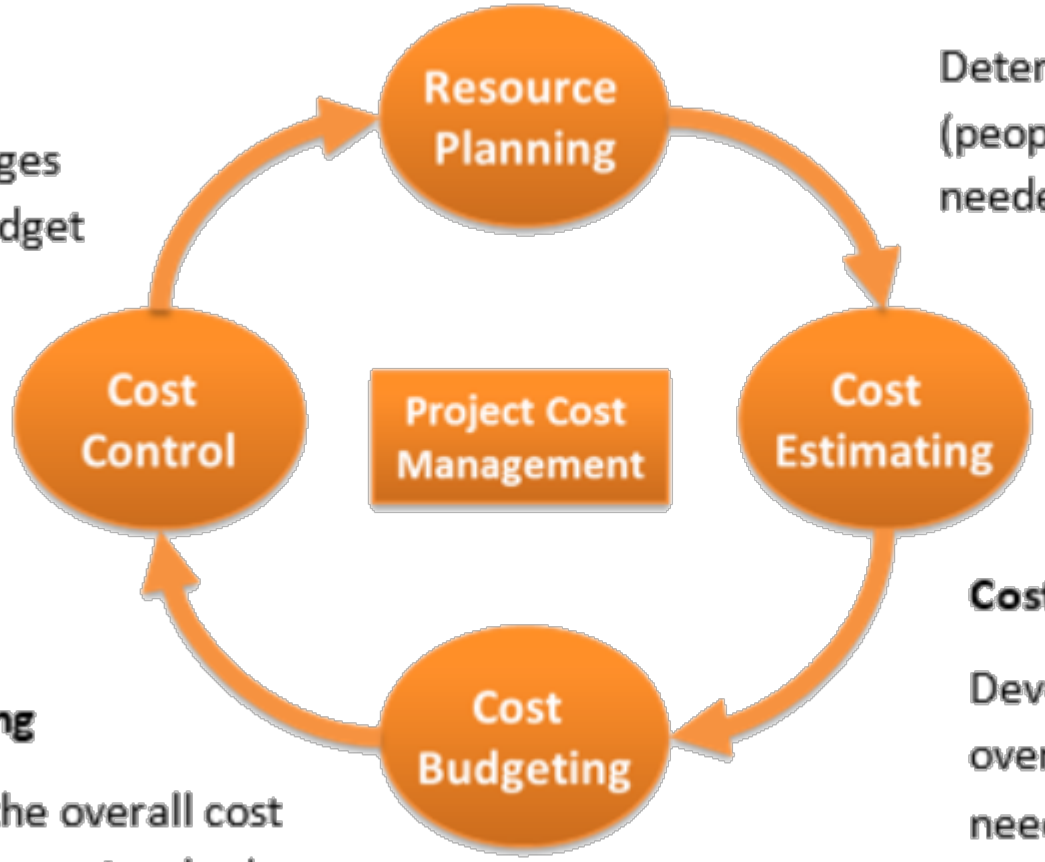
Project Cost Management Processes

Resource Planning

Determine the resources (people, equipment, materials) needed for project completion

Cost Control

Controlling changes to the project budget



Cost Estimating

Develop an approximation of overall cost of resources needed to complete the project

Cost Budgeting

Allocation of the overall cost estimate to the project budget

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.
  - **Profits margin** is the ratio of revenues to profits
    - $2 profit per $100 revenue → 2% profit margin
  - **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.

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**).

Basic Principles of Cost Management

- 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.

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?

Resource Planning

RESOURCE USAGE

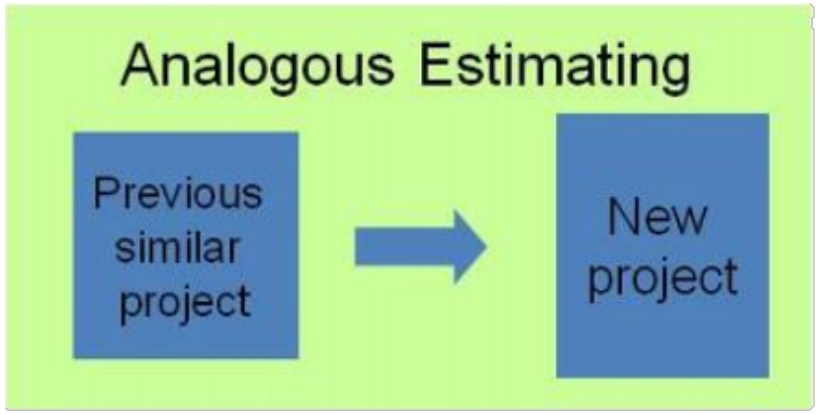
	Resource Name	Work	Details	June 6/1	6/8	6/15	6/22
1	Mary Smith	163.33 hrs	Work	5.33h	22h	30h	20h
2	John Taylor	44.67 hrs	Work	34.67h	10h		
3	Malcolm Green	9.33 hrs	Work	1.33h	6h	2h	
4	Brent Brown	4.67 hrs	Work	2.67h	2h		
5	Scott Grey	24 hrs	Work		8h	8h	8h
6	Karen White	16 hrs	Work		8h	0h	8h
7	Mark Foster	4 hrs	Work			4h	
8	Amy Johnson	42 hrs	Work		2h	36h	4h
9	Bob Seer	26 hrs	Work		2h	8h	16h
10	Larry Nelson	16 hrs	Work			4h	12h
11	Tasha McCoy	56 hrs	Work	8h	32h	16h	
12	Lee Brown	2 hrs	Work		2h		
13	Troy Smith	24 hrs	Work		12h	12h	

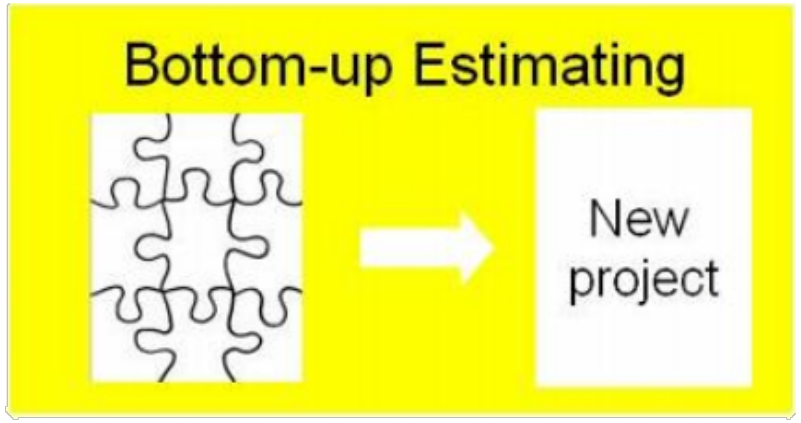
Cost Estimating

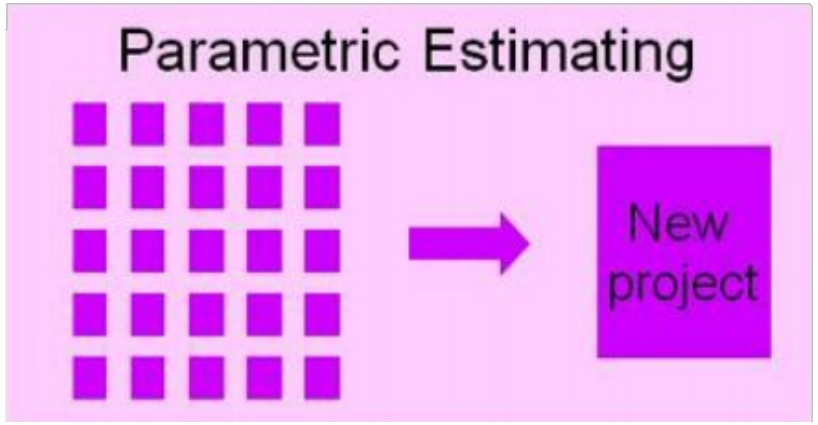
- An important output of project cost management is a cost estimate.
- After developing a good resource requirements list, PMs and their teams must develop several estimates of the costs for these resources.
- Project managers must take cost estimates seriously if they want to complete projects within budget constraints.

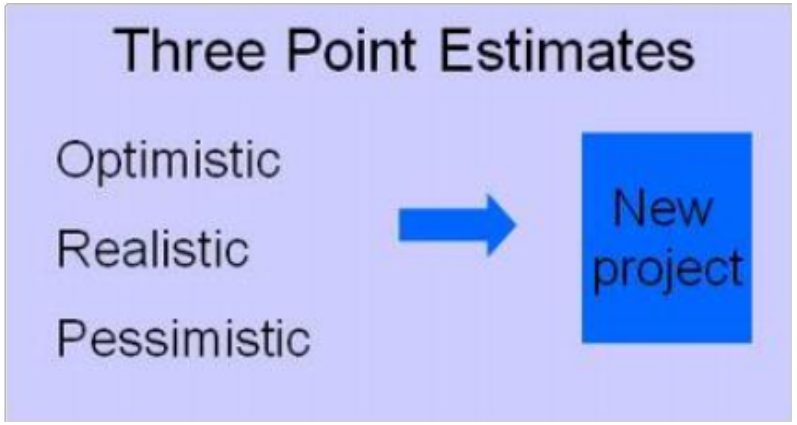
Cost Estimation Techniques

- There are 4 basic techniques for cost estimates.







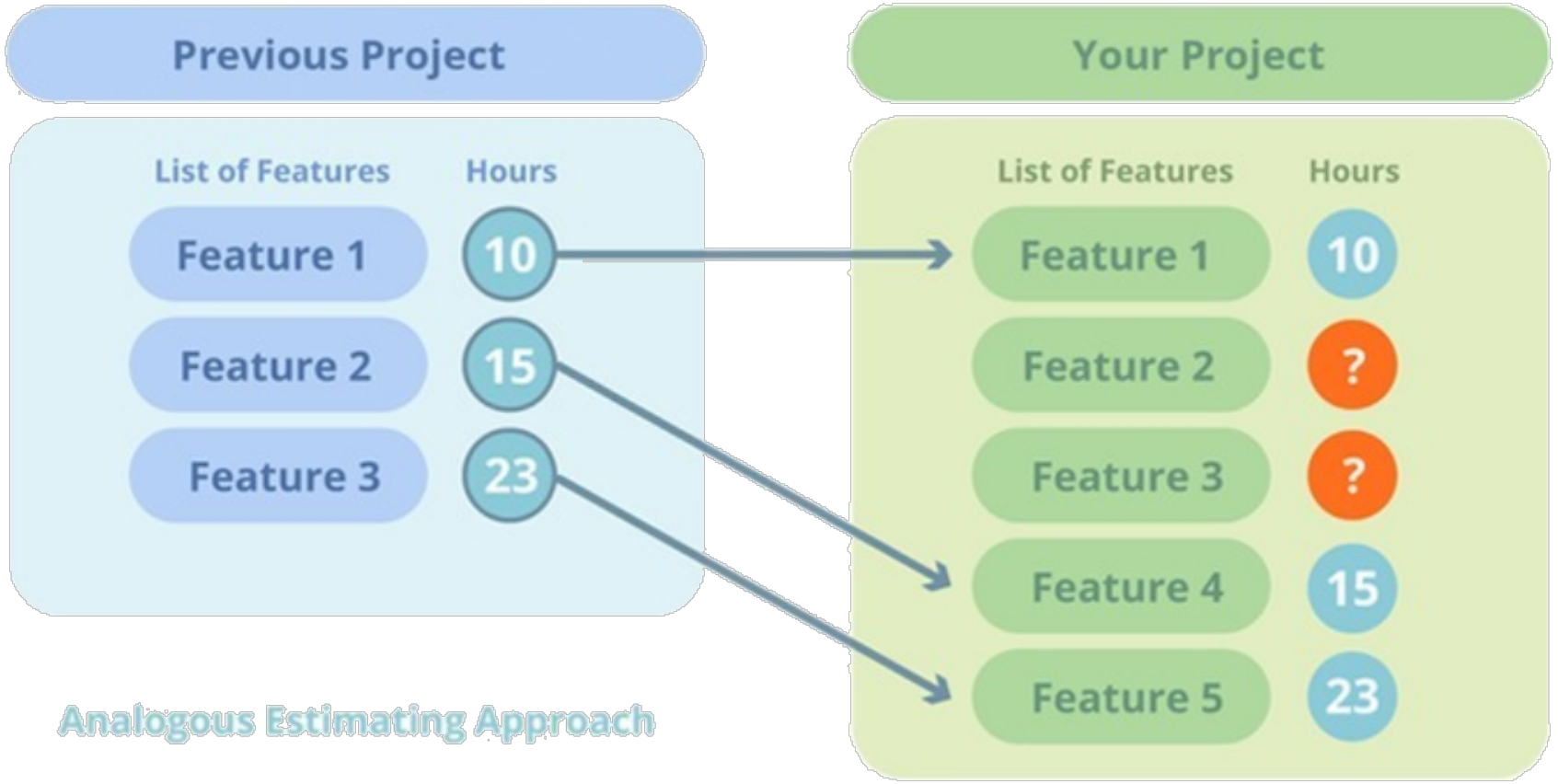


Cost Estimation Techniques

- **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.
  - How similar the current and previous project are determines the accuracy of the estimate.
  - Using a different language or hardware can skew the estimate.

Cost Estimation Techniques

- **Analogous** or **top-down estimates**:

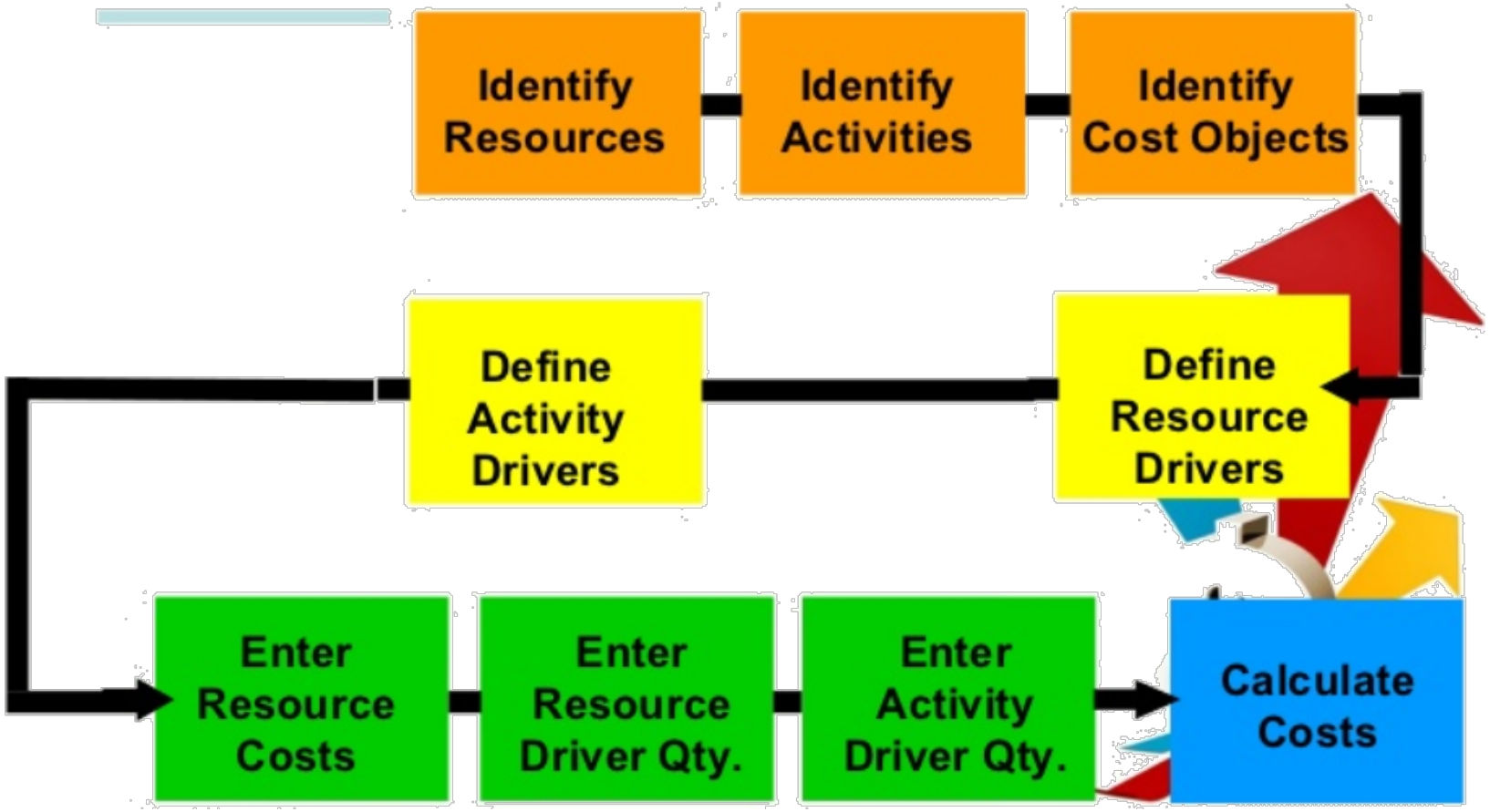


Cost Estimation Techniques

- **Bottom-up estimates** or **Activity Based Costing** : involve estimating individual work items or activities and summing them to get a project total.
  - The smaller the work items, the better the estimate but these estimates are usually time intensive and expensive to develop.

Cost Estimation Techniques

- **Bottom-up estimates** or **Activity Based Costing**:

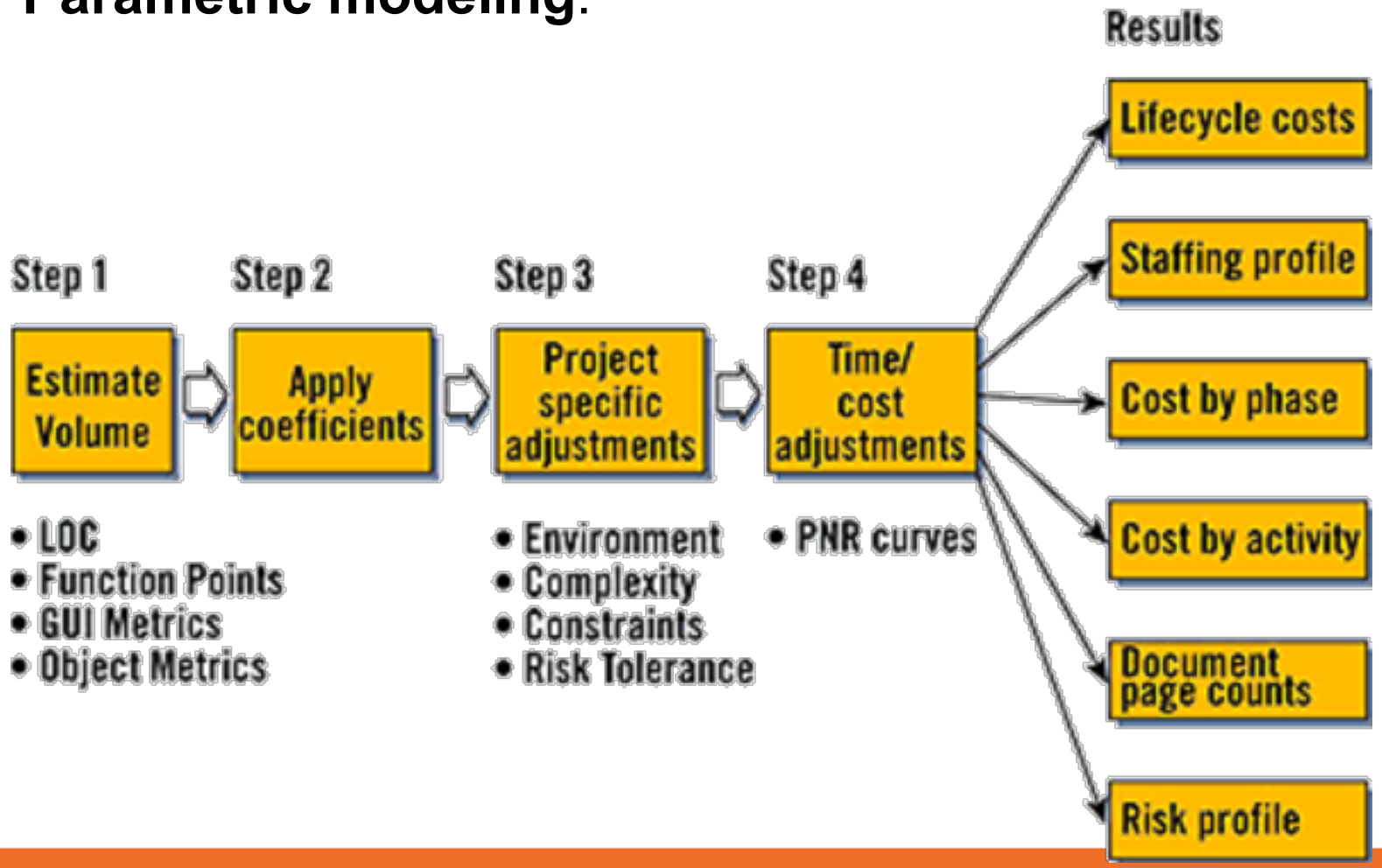


Cost Estimation Techniques

- **Parametric modeling**: uses project characteristics (parameters) in a mathematical model to estimate project costs..
  - For example, a model might provide an estimate of $50 per line of code for a s/w development project based on the programming language, level of expertise of the programmers, size and complexity of the data involved, etc
  - Some models may be simpler such as a $10,000 ballpark estimate per workstation in a large office automation project based on history of similar projects during the same time period.

Cost Estimation Techniques

- **Parametric modeling**:

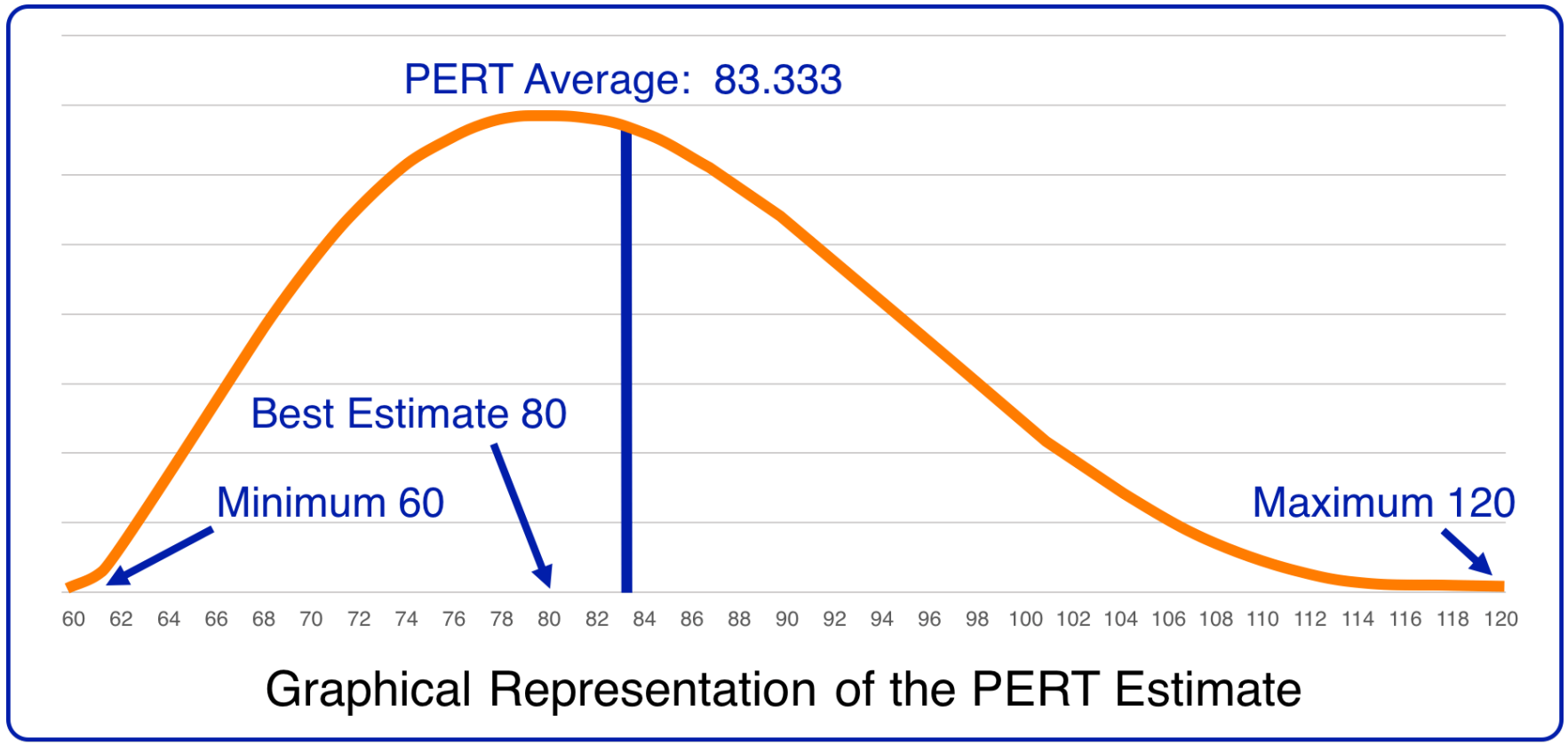


Cost Estimation Techniques

- **Three Point Estimates**: 3-Points is a technique that involves people that are professional in the task we are estimating by this technique. In three-point estimation, three figures are produced initially for every distribution that is required, based on prior experience or best-guesses:
  - The first is a most likely (M)/best guess (BG) which is the average amount of work the task might take if the team member performed it 100 times.
  - The second estimate is the pessimistic (P) estimate which is the amount of work the task might take if the negative factors they identified do occur.
  - The third estimate is the optimistic (O) estimate which is the amount of work the task might take if the positive risks they identified do occur.

Cost Estimation Techniques

- **Three Point Estimates**: also called Program Evaluation and Review Technique (PERT)



Graphical Representation of the PERT Estimate

Typical Problems with IT Cost Estimates

- Developing an estimate for a large software project is a complex task requiring a significant amount of effort. Remember that estimates are done at various stages of the project.
- Many people doing estimates have little experience doing them. Try to provide training and mentoring.
- People have a bias toward underestimation. Review estimates and ask important questions to make sure estimates are not biased.
- Management wants a number for a bid, not a real estimate. Project managers must negotiate with project sponsors to create realistic cost estimates.

Cost Budgeting

- Cost budgeting involves allocating the project cost estimate to individual work items and providing a cost baseline.
- The WBS is a required input to the cost budgeting process since it defines the work items.
- An important goal is to produce a **cost baseline**
  - A time-phased budget that project managers use to measure and monitor cost performance.
  - Estimating costs for each major project activity over time provides management with a foundation for project cost control.
  - Cost budgeting also provides info for project funding requirements – at what point(s) in time will the money be needed.

Cost Budgeting

- For example, in the Business Systems Replacement project, there was a total purchased cost estimate for FY97 of $600,000 and another $1.2 million for Information Services and Technology. These amounts were allocated to appropriate budgets:

Surveyor Pro Project Cost Baseline Created October 10, 2008*

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
4. Testing			6,000	8,000	12,000	15,000	15,000	13,000					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	90,027	80,027	53,567	1,521,240

Cost Control

- 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.

Cost Control

- Performance review meetings can be a powerful tool to help control project costs.
  - ➢ Knowing you have to report on your progress is an incentive for people to perform better.
- Performance measurement is another important tool for cost control.
  - ➢ There are many general accounting approaches for measuring cost performance but **earned value management** is a tool unique to project management

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:
  - Was a WBS item completed or approximately how much of the work was completed
  - Actual start and end dates
  - Actual cost
- More and more organizations around the world are using EVM to help control project costs.

Summarize

That's all for today!

Any questions?

Thank you!