

Cost estimation and budgeting

Chapter 8

Cost Management

- ▶ *Cost management* has been defined to encompass data collection, cost accounting, and cost control.
 - ▶ *Cost accounting* and *cost control* serve as the chief mechanisms for identifying and maintaining control over project costs.
 - ▶ *Cost estimation* processes create a reasonable budget baseline for the project.
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Common Sources of Project Cost

- Labor
 - Materials
 - Subcontractors
 - Equipment & facilities
 - Travel
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Types of Costs

- ❖ Direct Vs. Indirect
 - ❖ Recurring Vs. Nonrecurring
 - ❖ Fixed Vs. Variable
 - ❖ Normal Vs. Expedited
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Cost Classifications

TABLE 8.2 Cost Classifications

Costs	Type		Frequency		Adjustment		Schedule	
	Direct	Indirect	Recurring	Nonrecurring	Fixed	Variable	Normal	Expedited
Direct Labor	X		X		X		X	
Building Lease		X	X		X		X	
Expediting Costs	X			X		X		X
Material	X		X			X	X	

Cost Estimation

- Ballpark (order of magnitude) $\pm 30\%$
 - Comparative $\pm 15\%$
 - Feasibility $\pm 10\%$
 - Definitive $\pm 5\%$
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Learning Curves

Each doubling of output results in a reduction in time to perform the last iteration.

$$Y_x = aX^b$$

Where :

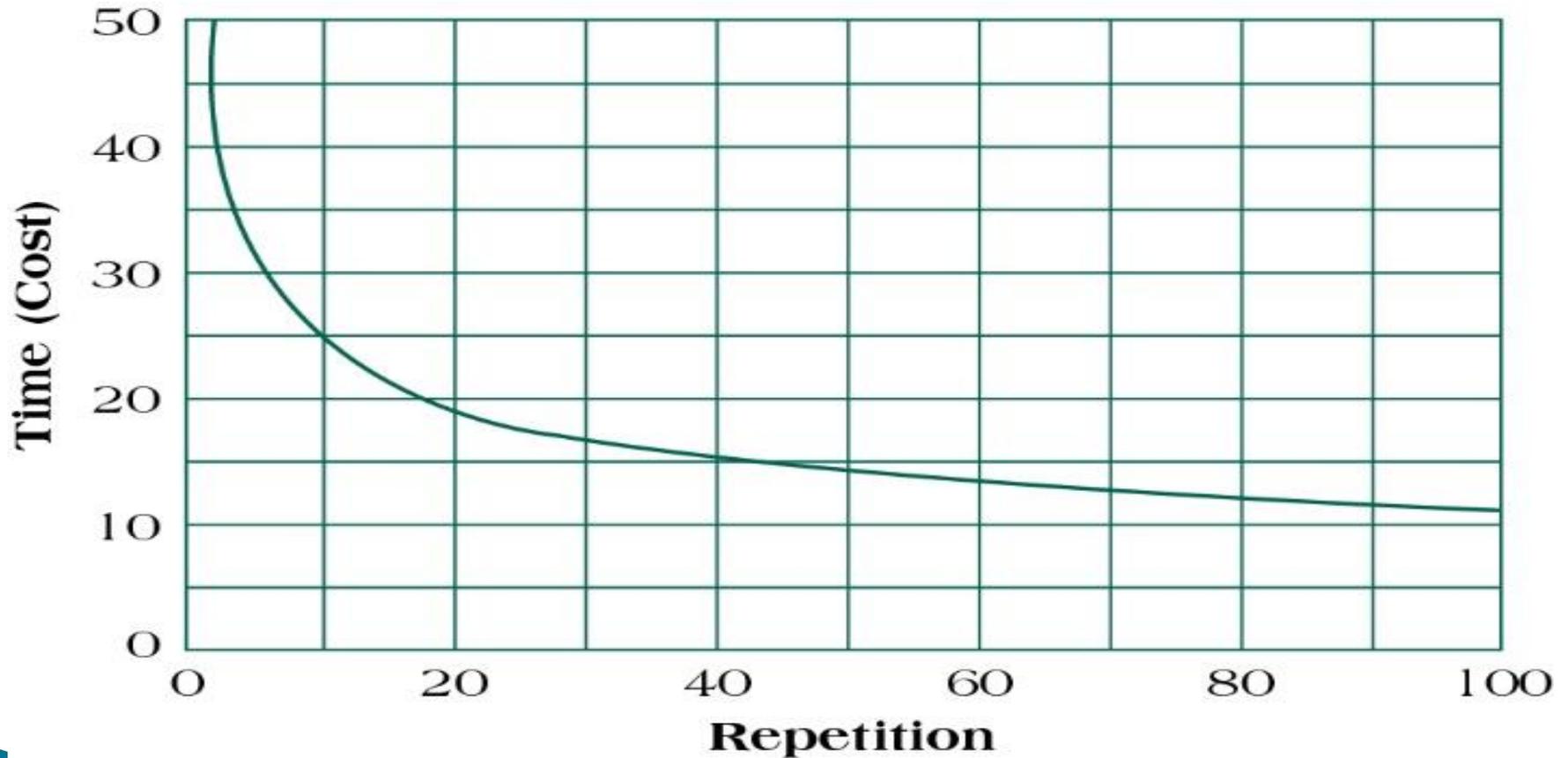
Y_x = time required for the x unit of output

a = time required for the initial unit of output

X = the number of units to be produced

b = learning curve slope = $\log(\text{learning \%})/\log(2)$

Unit Learning Curve Log-Linear Model

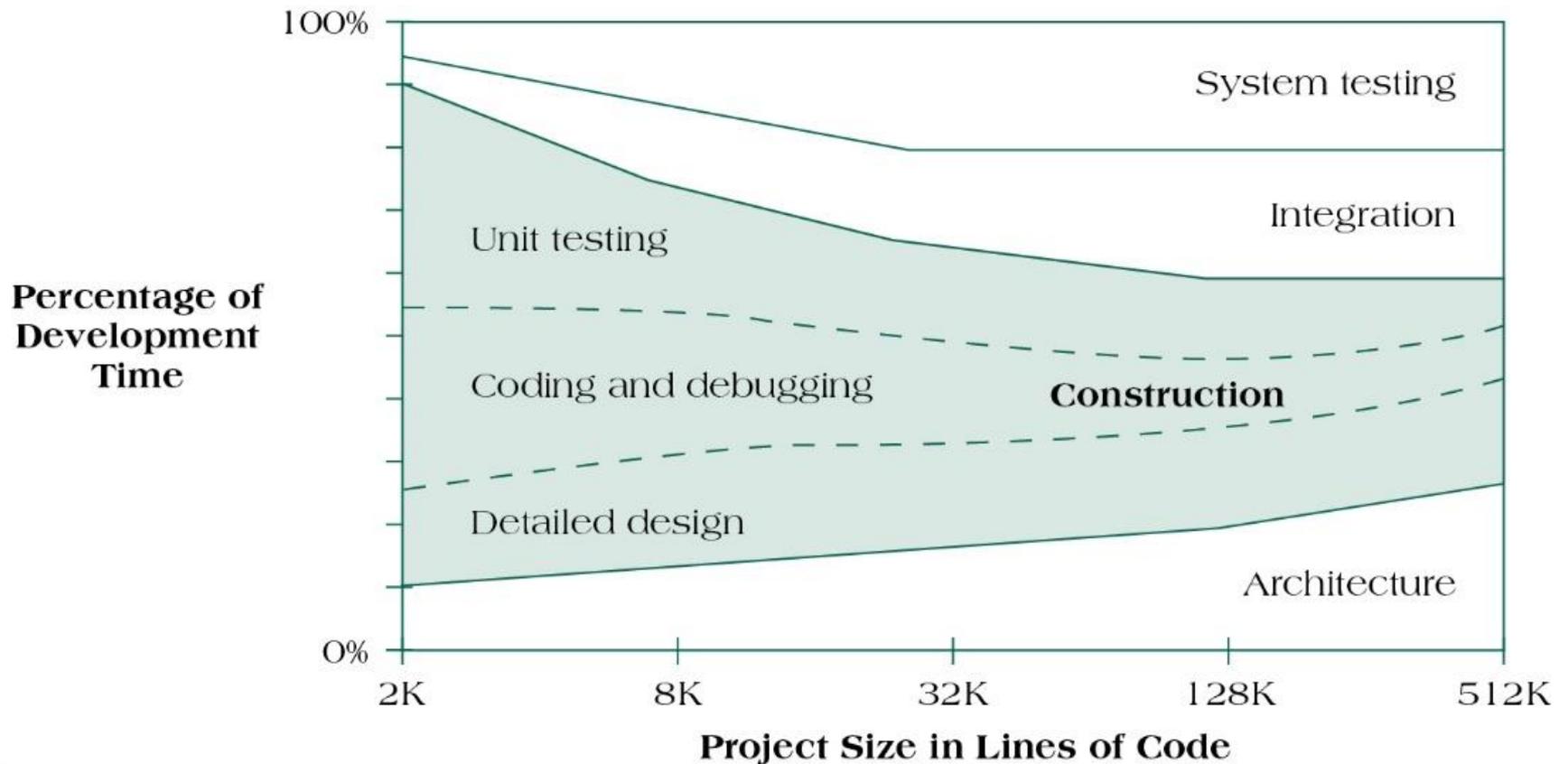


SOFTWARE PROJECT ESTIMATION – FUNCTION POINTS

Function Point Analysis is a system for estimating the size of software projects based on what the software does.

Function Points are a standard unit of measure that represents the functional size of a software application.

Software Project Development Activities as a Function of Size



Complexity Weighting Table for Function Point Analysis

Function	Complexity Weighting			Total
	Low	Medium	High	
Number of Inputs	2 x _____ =	4 x _____ =	6 x _____ =	
Number of Outputs	4 x _____ =	6 x _____ =	10 x _____ =	
Number of Interfaces	3 x _____ =	7 x _____ =	12 x _____ =	
Number of Queries	5 x _____ =	10 x _____ =	15 x _____ =	
Number of Files	2 x _____ =	4 x _____ =	8 x _____ =	

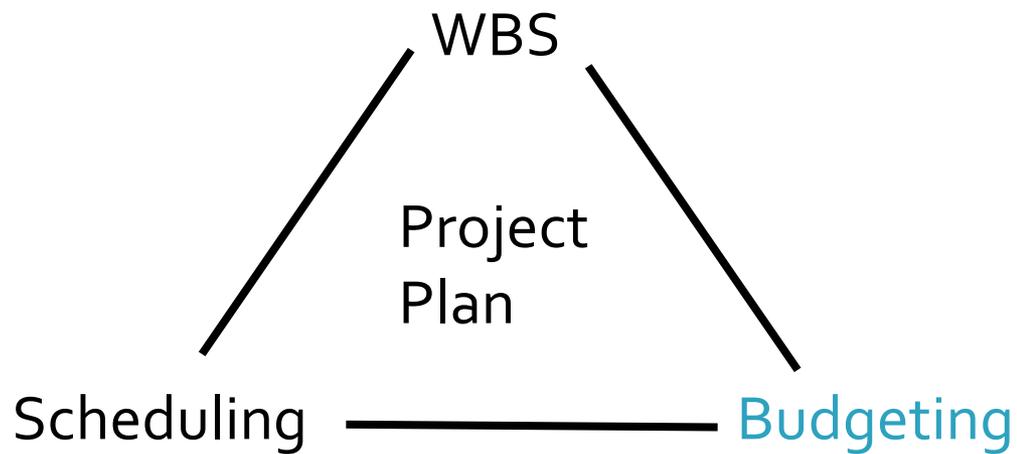
Function Point Calculations for Restaurant Reorder System

Function	Complexity Weighting			Total
	Low	Medium	High	
Number of Inputs		4 x 15 =		60
Number of Outputs			10 x 20 =	200
Number of Interfaces	3 x 3 =			9
Number of Queries		10 x 6 =		60
Number of Files	2 x 40 =			80
Total				409

Problems with Cost Estimation

- ✓ Low initial estimates
 - ✓ Unexpected technical difficulties
 - ✓ Lack of definition
 - ✓ Specification changes
 - ✓ External factors
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Creating a Project Budget

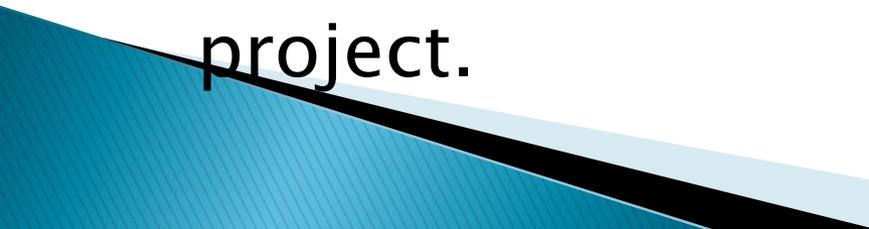


The *budget is a plan* that identifies the resources, goals, and schedule that allows a firm to achieve those goals.

- ▶ Top-down
- ▶ Bottom-up
- ▶ Activity-based costing (ABC)

Activity-Based Costing

Projects use activities & activities use resources.

1. **Assign costs** to activities that use resources.
 2. **Identify cost drivers** associated with this activity.
 3. **Compute a cost rate** per cost driver unit or transaction.
 4. **Multiply** the cost driver **rate times** the **volume** of cost driver units used by the project.
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Sample Project Budget

Activity	Direct Costs	Budget Overhead	Total Cost
Survey	3,500	500	4,000
Design	7,000	1,000	8,000
Clear Site	3,500	500	4,000
Foundation	6,750	750	7,500
Framing	8,000	2,000	10,000
Plumb and Wire	3,750	1,250	5,000

Sample Budget Tracking Planned and Actual Activity Costs

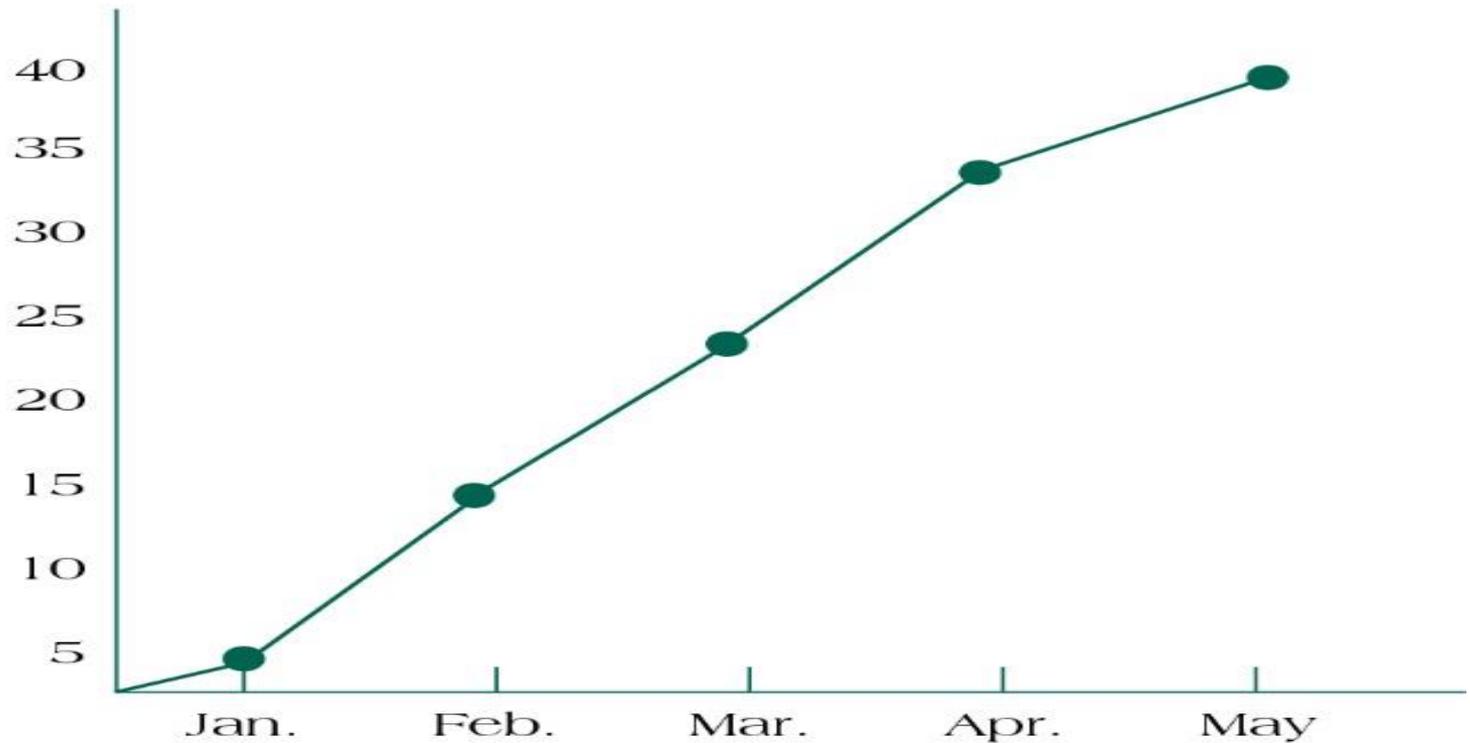
Activity	Planned	Budget Actual	Variance
Survey	4,000	4,250	250
Design	8,000	8,000	- 0 -
Clear Site	4,000	3,500	(500)
Foundation	7,500	8,500	1,000
Framing	10,000	11,250	1,250
Plumb and Wire	5,000	5,150	150
Total	38,500	40,650	2,150

Example of a Time-Phased Budget

Activity	Months					Total by Activity
	January	February	March	April	May	
Survey	4,000					4,000
Design		5,000	3,000			8,000
Clear Site		4,000				4,000
Foundation			7,500			7,500
Framing				8,000	2,000	10,000
Plumb and Wire				1,000	4,000	5,000
Monthly Planned	4,000	9,000	10,500	9,000	6,000	
Cumulative	4,000	13,000	23,500	32,500	38,500	38,500

Cumulative Budgeted Cost of the Project

Cumulative Budgeted Cost
(in thousands)



Budget Contingencies

The allocation of extra funds to cover uncertainties and improve the chance of finishing on time

Contingencies are needed because:

1. Project scope may change
2. Murphy's Law is present
3. Cost estimation must anticipate interaction costs
4. Normal conditions are rarely encountered

Benefits to contingency funding

1. Recognizes future contains unknowns
 2. Adds provision for company plans for an increase in project cost
 3. Applies contingency fund as an early warning signal to potential overdrawn budget
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