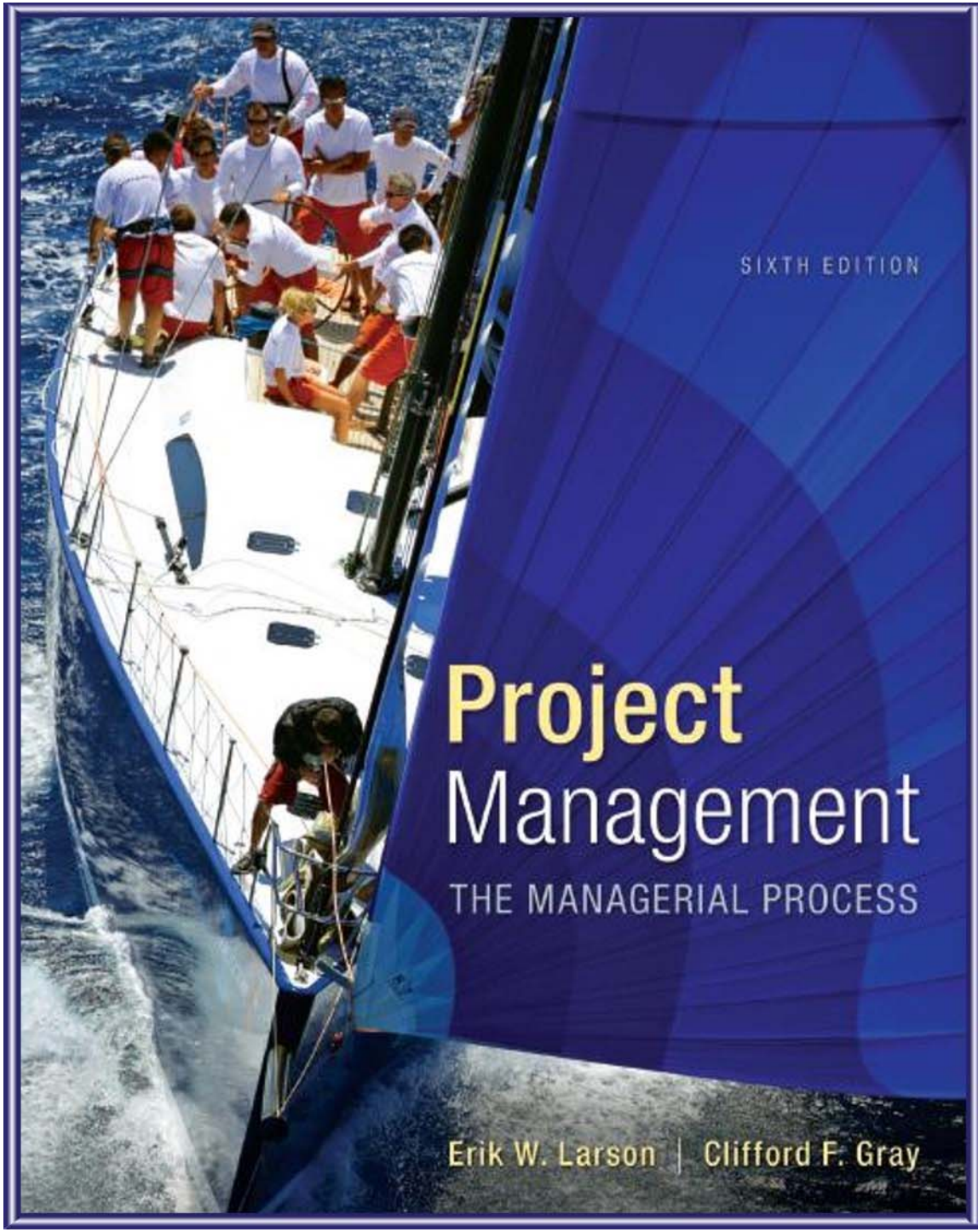
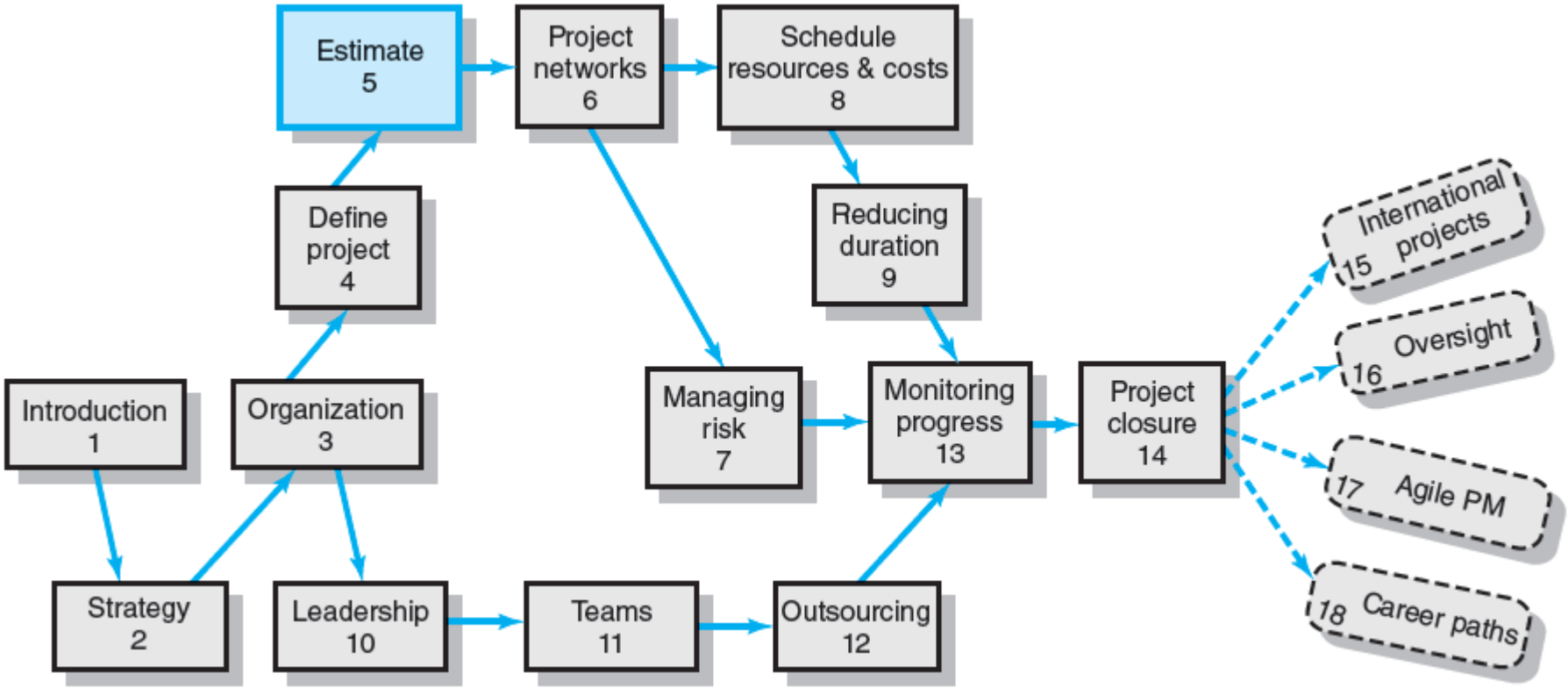


CHAPTER FIVE

Estimating Project Times and Costs

PowerPoint Presentation by Charlie Cook

Where We Are Now



Estimating Projects

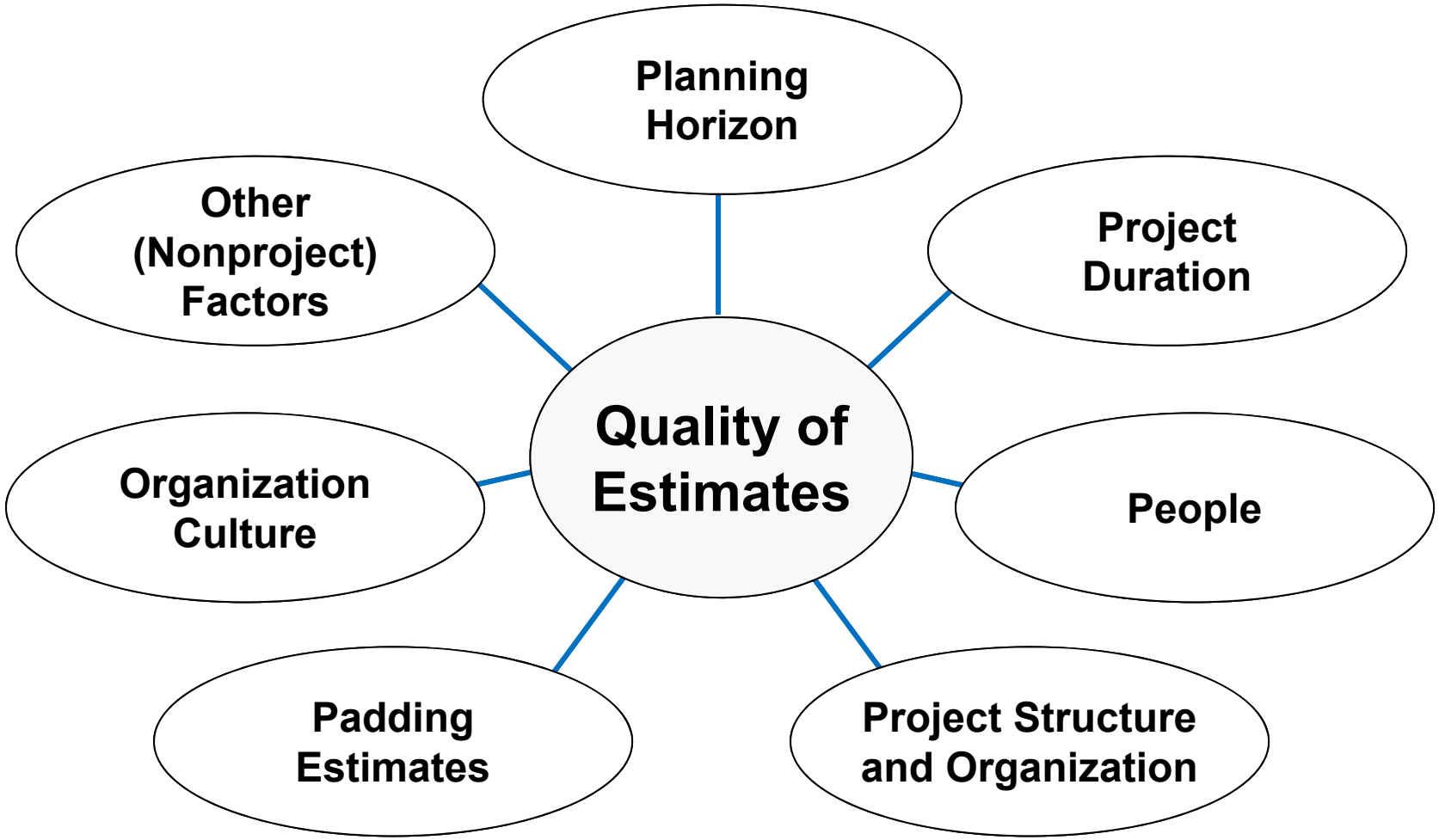
- Estimating
  - The process of forecasting or approximating the time and cost of completing project deliverables.
  - The task of balancing expectations of stakeholders and need for control while the project is implemented.
- Types of Estimates
  - Top-down (macro) estimates: analogy, group consensus, or mathematical relationships
  - Bottom-up (micro) estimates: estimates of elements of the work breakdown structure

Why Estimating Time and Cost Are Important

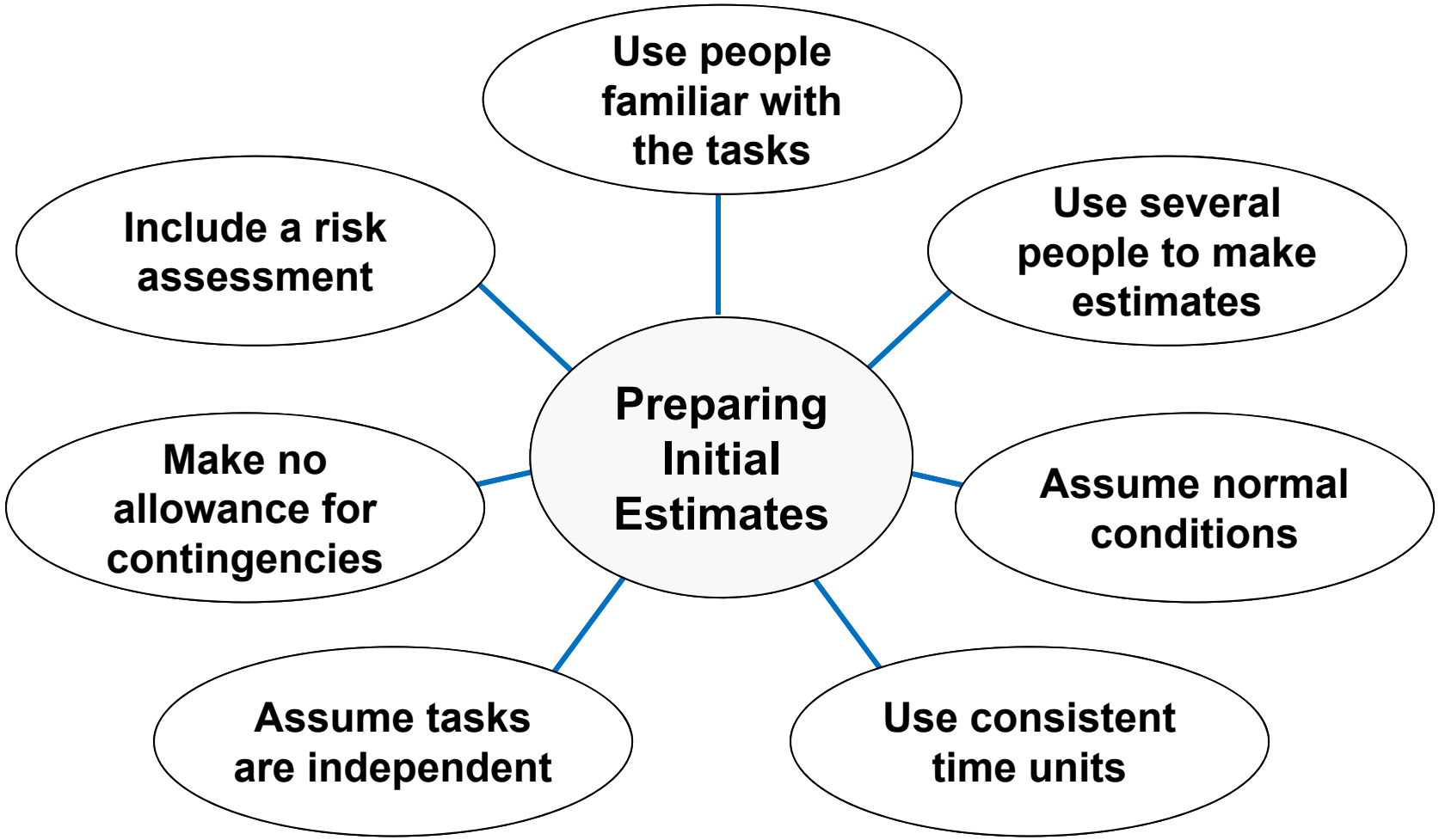
- To support good decisions.
- To schedule work.
- To determine how long the project should take and its cost.
- To determine whether the project is worth doing.
- To develop cash flow needs.
- To determine how well the project is progressing.
- To develop time-phased budgets and establish the project baseline.

EXHIBIT 5.1

Factors Influencing the Quality of Estimates



Developing Work Package Estimates



Estimating Guidelines for Times, Costs, and Resources

1. Have people familiar with the tasks make the estimate.
2. Use several people to make estimates.
3. Base estimates on normal conditions, efficient methods, and a normal level of resources.
4. Use consistent time units in estimating task times.
5. Treat each task as independent, don't aggregate.
6. Do not make allowances for contingencies.
7. Add a risk assessment to avoid surprises to stakeholders.

Top-Down versus Bottom-Up Estimating

- Top-Down Estimates
  - Are usually derived from someone who uses experience and/or information to determine the project duration and total cost.
  - Are made by top managers who have little knowledge of the processes used to complete the project.
- Bottom-Up Approach
  - Can serve as a check on cost elements in the WBS by rolling up the work packages and associated cost accounts to major deliverables at the work package level.

Top-Down versus Bottom-Up Estimating

Conditions for Preferring Top-Down or Bottom-up Time and Cost Estimates

Condition	Top-down Estimates	Bottom-up Estimates
Strategic decision making	X	
Cost and time important		X
High uncertainty	X	
Internal, small project	X	
Fixed-price contract		X
Customer wants details		X
Unstable scope	X	

TABLE 5.1

Estimating Projects: Preferred Approach

- Make rough top-down estimates.
- Develop the WBS/OBS.
- Make bottom-up estimates.
- Develop schedules and budgets.
- Reconcile differences between top-down and bottom-up estimates

Top-Down Approaches for Estimating Project Times and Costs

- Consensus methods
- Ratio methods
- Apportion method
- Function point methods for software and system projects
- Learning curves

Apportion Method of Allocating Project Costs Using the Work Breakdown Structure

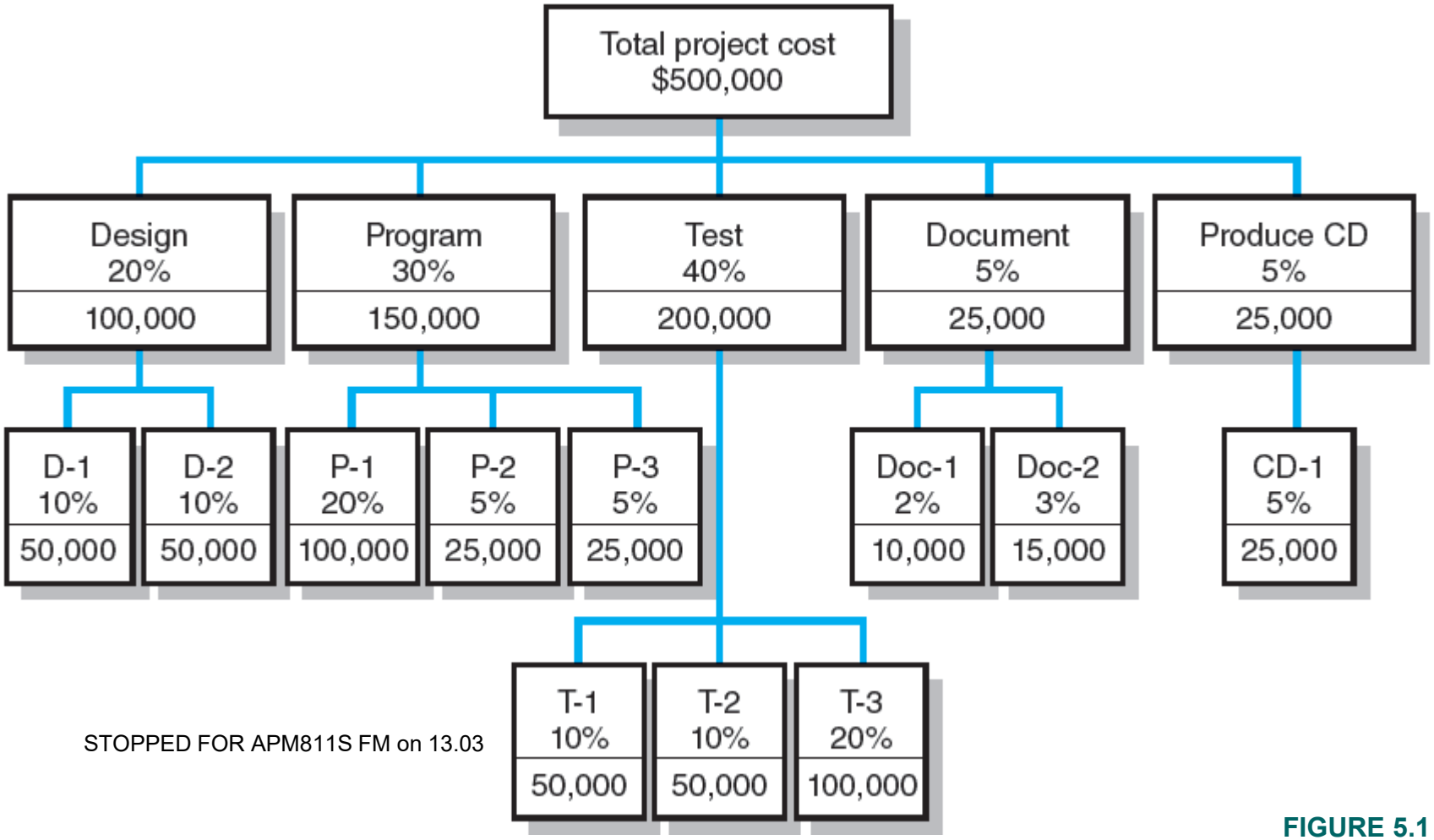


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FIGURE 5.1

Simplified Basic Function Point Count Process for a Prospective Project or Deliverable

	Complexity Weighting			
Element	**Low**	**Average**	**High**	**Total**
Number of *inputs*	_____ × 2 +	_____ × 3 +	_____ × 4	= _____
Number of *outputs*	_____ × 3 +	_____ × 6 +	_____ × 9	= _____
Number of *inquiries*	_____ × 2 +	_____ × 4 +	_____ × 6	= _____
Number of *files*	_____ × 5 +	_____ × 8 +	_____ × 12	= _____
Number of *interfaces*	_____ × 5 +	_____ × 10 +	_____ × 15	= _____

TABLE 5.2

Example: Function Point Count Method

Software Project 13: Patient Admitting and Billing			
15	Inputs	Rated complexity as low	(2)
5	Outputs	Rated complexity as average	(6)
10	Inquiries	Rated complexity as average	(4)
30	Files	Rated complexity as high	(12)
20	Interfaces	Rated complexity as average	(10)

Application of Complexity Factor

Element	Count	Low	Average	High	Total
Inputs	15	× 2			= 30
Outputs	5		× 6		= 30
Inquiries	10		× 4		= 40
Files	30			× 12	= 360
Interfaces	20		× 10		= 200
				Total	660

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TABLE 5.3

Bottom-Up Approaches for Estimating Project Times and Costs

- Template methods
- Parametric procedures applied to specific tasks
- Range estimates for the WBS work packages
- Phase estimating: A hybrid

Range Estimating Template

	A	B	C	D	E	F	G
1	Project number: 18				Project Manager: Dawn O'Connor		
2	Project description: New Organic Wine Launch				Date: 2/17/2xxx		
3			Organic Wine Launch Project				
4			Range Estimates				
5							
6	WBS	Description	Low	Average	High	Range	Risk
7	ID		Estimate	Estimate	Estimate		Level
8			Days	Days	Days	Days	
9							
10	102	Approval	1	1	3	2	low
11	103	Design packaging	4	7	12	8	medium
12	104	ID potential customers	14	21	35	21	high
13	105	Design bottle logo	5	7	10	5	low
14	106	Contract kiosk space	8	10	15	7	medium
15	107	Construct kiosk	4	4	8	4	medium
16	108	Design fair brochure	6	7	12	6	high
17	109	Trade journal advertising	10	12	15	5	medium
18	110	Production test	10	14	20	10	high
19	111	Produce to inventory	5	5	10	5	high
20	112	Business card scanner hookup	1	2	3	2	low
21	113	Video hook up	2	2	4	2	medium
22	114	Event rehearsal	2	2	5	3	high

FIGURE 5.2

Phase Estimating over Product Life Cycle

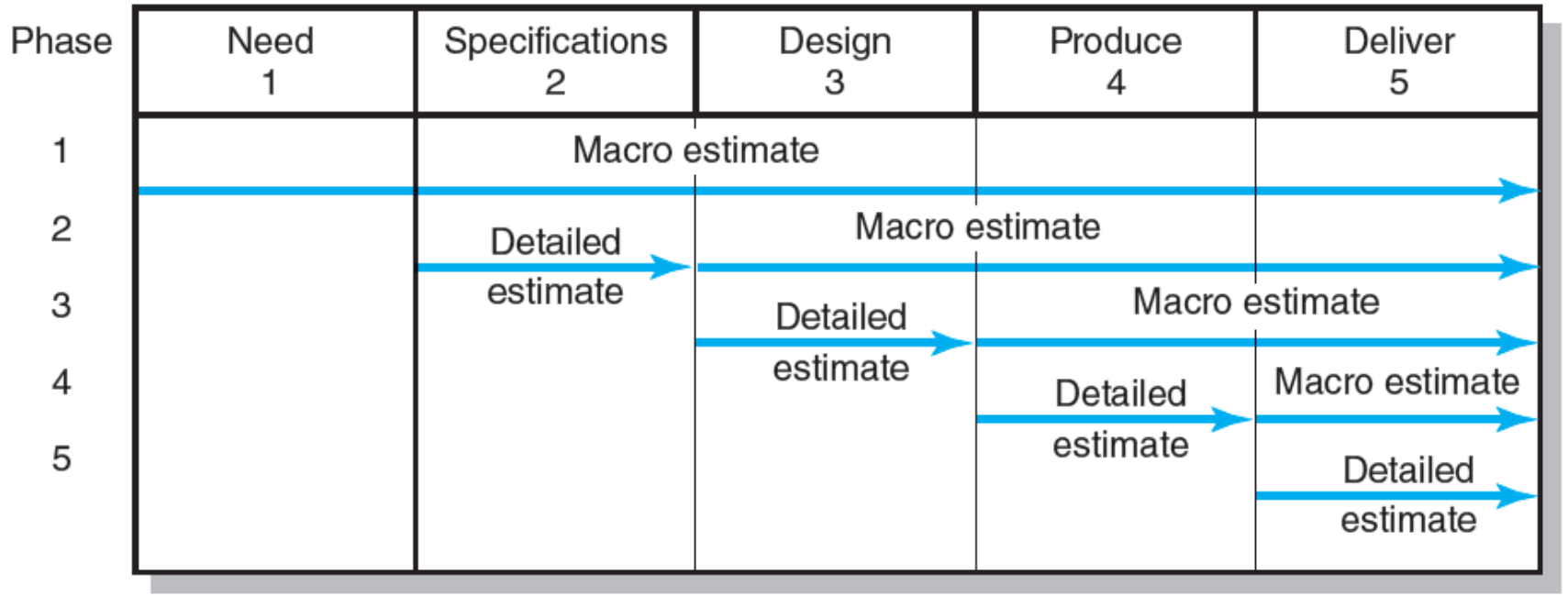


FIGURE 5.3

Top-Down and Bottom-Up Estimates

Top-Down Estimates	Bottom-Up Estimates
Intended Use Feasibility/conceptual phase Rough time/cost estimate Fund requirements Resource capacity planning	**Intended Use** Budgeting Scheduling Resource requirements Fund timing
Preparation Cost 1/10 to 3/10 of a percent of total project cost	**Preparation Cost** 3/10 of a percent to 1.0 percent of total project cost
Accuracy Minus 20%, to plus 60%	**Accuracy** Minus 10%, to plus 30%
Method Consensus Ratio Apportion Function point Learning curves	**Method** Template Parametric WBS packages Range estimates

FIGURE 5.4

Level of Detail

- Level of detail is different for different levels of management.
- Level of detail in the WBS varies with the complexity of the project.
- Excessive detail is costly.
  - Fosters a focus on departmental outcomes
  - Creates unproductive paperwork
- Insufficient detail is costly.
  - Lack of focus on goals
  - Wasted effort on nonessential activities

Types of Costs

- Direct Costs
  - Costs that are clearly chargeable to a specific work package.
    - Labor, materials, equipment, and other
- Direct (Project) Overhead Costs
  - Costs incurred that are directly tied to an identifiable project deliverable or work package.
    - Salary, rents, supplies, specialized machinery
- General and Administrative Overhead Costs
  - Organization costs indirectly linked to a specific package that are apportioned to the project

Contract Bid Summary Costs

Direct costs	$80,000
Direct overhead	$20,000
Total direct costs	$100,000
G&A overhead (20%)	$20,000
Total costs	$120,000
Profit (20%)	$24,000
Total bid	$144,000

FIGURE 5.5

Three Views of Cost

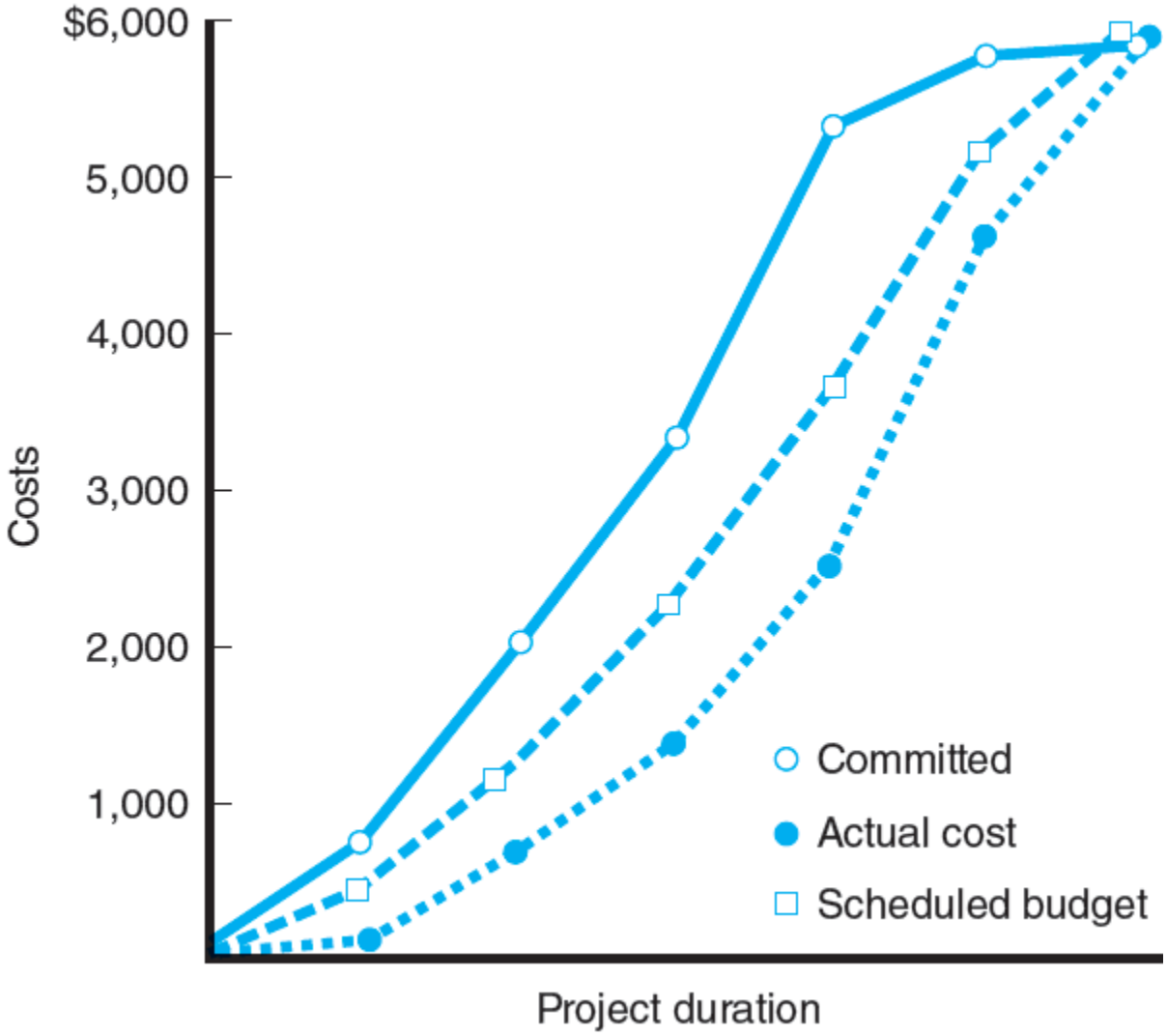


FIGURE 5.6

Refining Estimates

- Reasons for Adjusting Estimates
  - Interaction costs are hidden in estimates.
  - Normal conditions do not apply.
  - Things go wrong on projects.
  - Changes in project scope and plans.
- Adjusting Estimates
  - Time and cost estimates of specific activities are adjusted as the risks, resources, and situation particulars become more clearly defined.

Estimating Database Templates

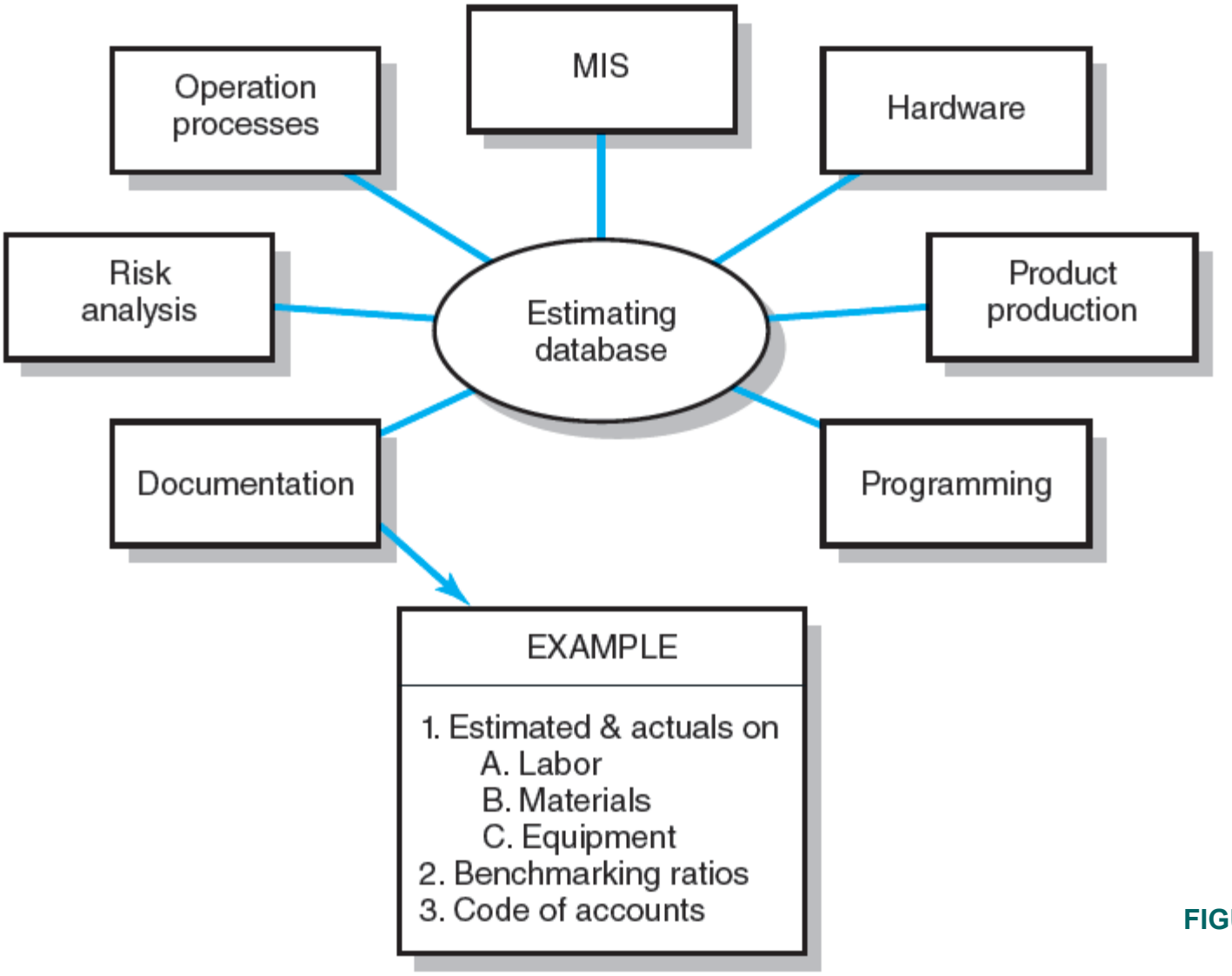
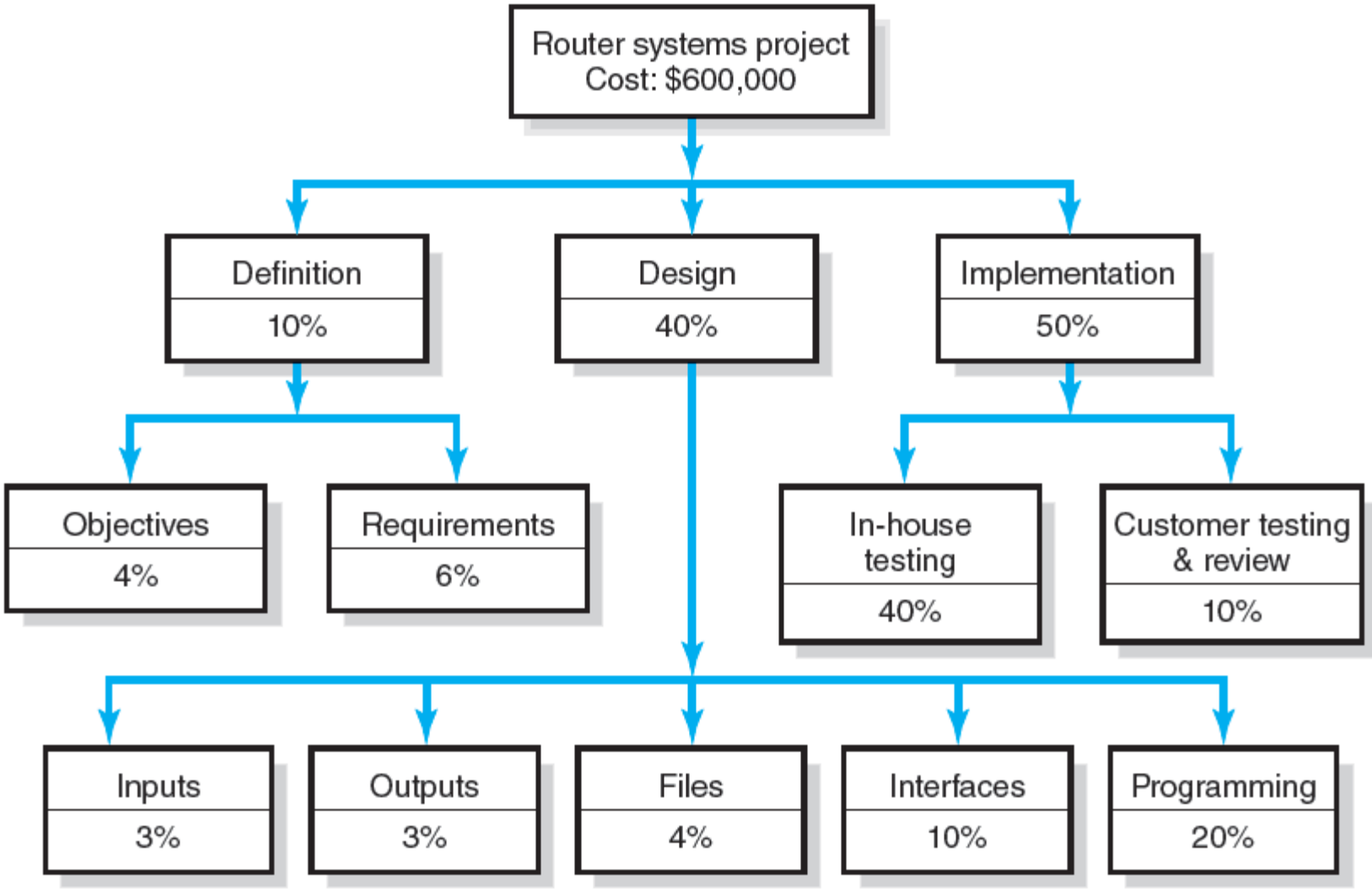


FIGURE 5.7

Key Terms

Apportionment methods
Bottom-up estimates
Contingency funds
Delphi method
Direct costs
Function points
Learning curves
Overhead costs
Padding estimates
Phase estimating
Range estimating
Ratio methods
Template method
Time and cost databases

WBS Figure



Exercise 5.3

Learning Curves Unit Values

Units	60%	65%	70%	75%	80%	85%	90%	95%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	.6000	.6500	.7000	.7500	.8000	.8500	.9000	.9500
3	.4450	.5052	.5682	.6338	.7021	.7729	.8462	.9219
4	.3600	.4225	.4900	.5625	.6400	.7225	.8100	.9025
5	.3054	.3678	.4368	.5127	.5956	.6857	.7830	.8877
6	.2670	.3284	.3977	.4754	.5617	.6570	.7616	.8758
7	.2383	.2984	.3674	.4459	.5345	.6337	.7439	.8659
8	.2160	.2746	.3430	.4219	.5120	.6141	.7290	.8574
9	.1980	.2552	.3228	.4017	.4930	.5974	.7161	.8499
10	.1832	.2391	.3058	.3846	.4765	.5828	.7047	.8433
12	.1602	.2135	.2784	.3565	.4493	.5584	.6854	.8320
14	.1430	.1940	.2572	.3344	.4276	.5386	.6696	.8226
16	.1296	.1785	.2401	.3164	.4096	.5220	.6561	.8145
18	.1188	.1659	.2260	.3013	.3944	.5078	.6445	.8074

TABLE A5.1

Learning Curves Cumulative Values

Units	60%	65%	70%	75%	80%	85%	90%	95%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	1.600	1.650	1.700	1.750	1.800	1.850	1.900	1.950
3	2.045	2.155	2.268	2.384	2.502	2.623	2.746	2.872
4	2.405	2.578	2.758	2.946	3.142	3.345	3.556	3.774
5	2.710	2.946	3.195	3.459	3.738	4.031	4.339	4.662
6	2.977	3.274	3.593	3.934	4.299	4.688	5.101	5.538
7	3.216	3.572	3.960	4.380	4.834	5.322	5.845	6.404
8	3.432	3.847	4.303	4.802	5.346	5.936	6.574	7.261
9	3.630	4.102	4.626	5.204	5.839	6.533	7.290	8.111
10	3.813	4.341	4.931	5.589	6.315	7.116	7.994	8.955
12	4.144	4.780	5.501	6.315	7.227	8.244	9.374	10.62
14	4.438	5.177	6.026	6.994	8.092	9.331	10.72	12.27
16	4.704	5.541	6.514	7.635	8.920	10.38	12.04	13.91
18	4.946	5.879	6.972	8.245	9.716	11.41	13.33	15.52
20	5.171	6.195	7.407	8.828	10.48	12.40	14.64	17.13
22	5.379	6.492	7.819	9.388	11.23	13.38	15.86	18.72
24	5.574	6.773	8.213	9.928	11.95	14.33	17.10	20.31
25	5.668	6.909	8.404	10.19	12.31	14.80	17.71	21.10

TABLE A5.2