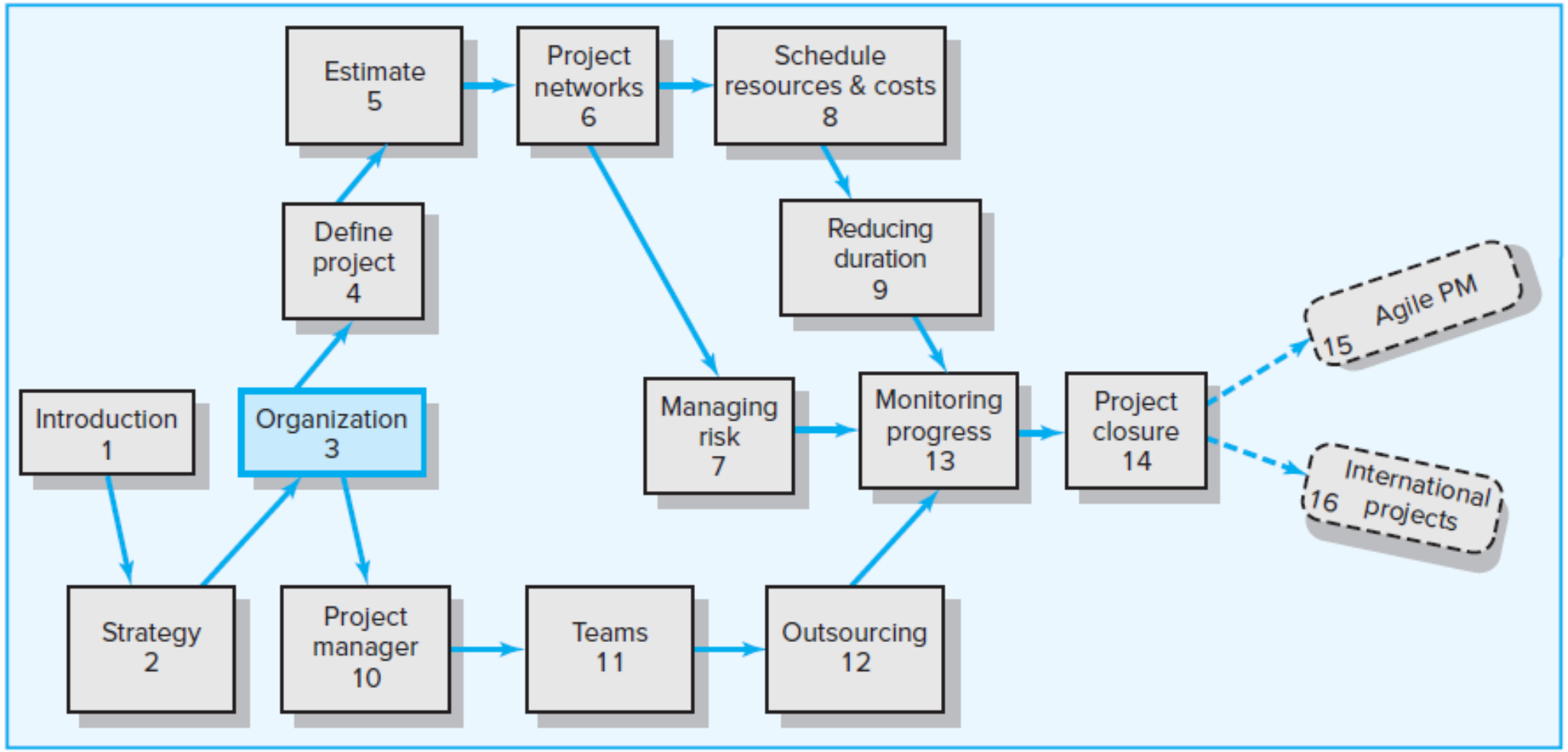
OntarioTech
Engineering
& Applied Science

Project Management for Engineers - ENGR 5410G
Fall 2024

Unit 2:
Organization (3) & Scope (4)

Where We Are Now



Learning Objectives

03-01 Identify different **project management structures** and understand their strengths and weaknesses.

03-02 Distinguish three different types of **matrix structures** and understand their strengths and weaknesses.

03-03 Describe how project management offices **(PMOs**) can support and improve project execution.

03-04 Understand organizational and project considerations that should be considered in choosing an appropriate project management structure.

03-05 Appreciate the significant role that **organizational culture** plays in managing projects.

03-06 Interpret the culture of an organization.

03-07 Understand the interaction between project management structure and the culture of an organization.

Chapter Outline

3.1 Project Management Structures

Three different project management structures are:

1. Functional organization
2. Dedicated project teams
3. Matrix structure
   - Weak matrix
   - Balanced matrix
   - Strong matrix

Organizing Projects within the Functional Organization

- Top management decides to implement the project, and different segments of the project are distributed to appropriate areas.
- Coordination is maintained through normal management channels.
- It is commonly used when one functional area plays a dominant role in completing the project or has a dominant interest in the success of the project.

Functional Organizations

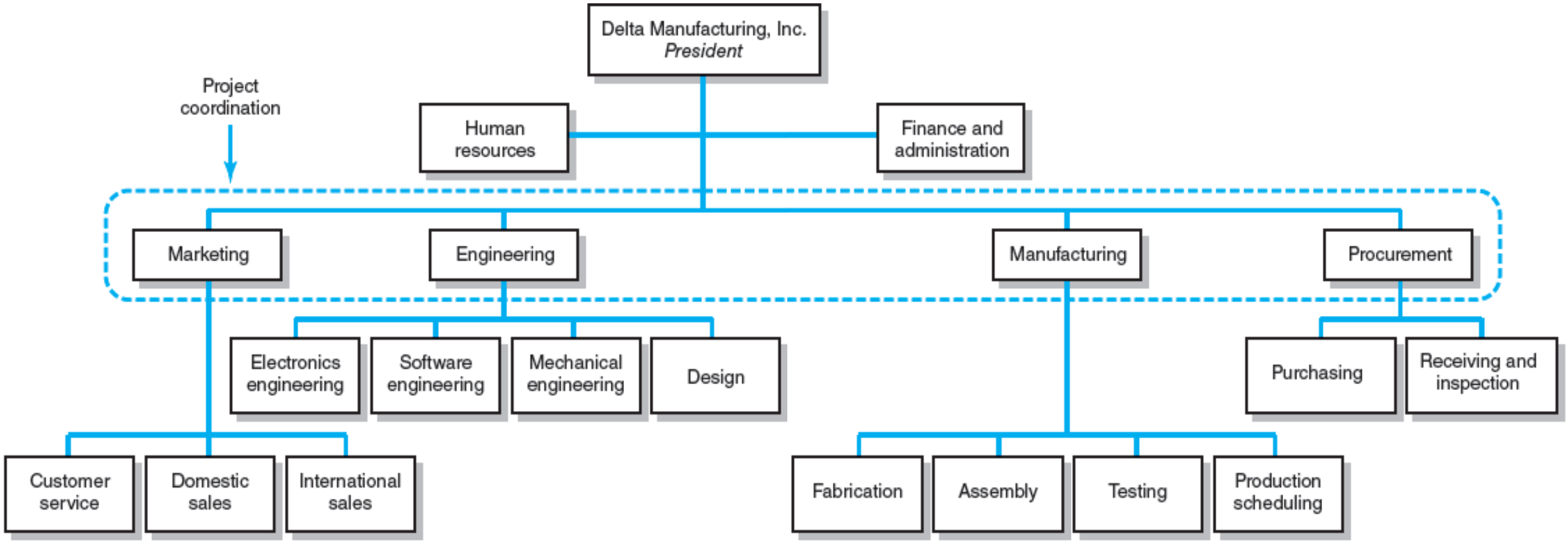
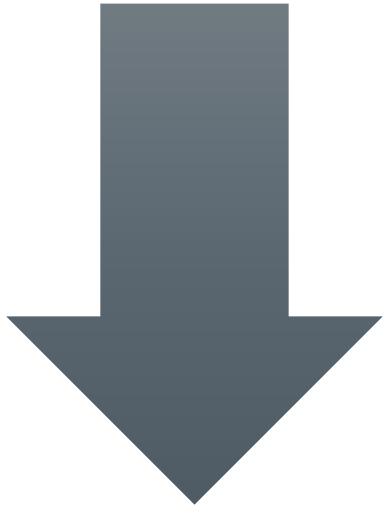


FIGURE 3.1

Advantages and Disadvantages of using Functional Organization to Administer and Complete projects

Advantages

- No change
- Flexibility
- In-depth expertise
- Easy post-project transition



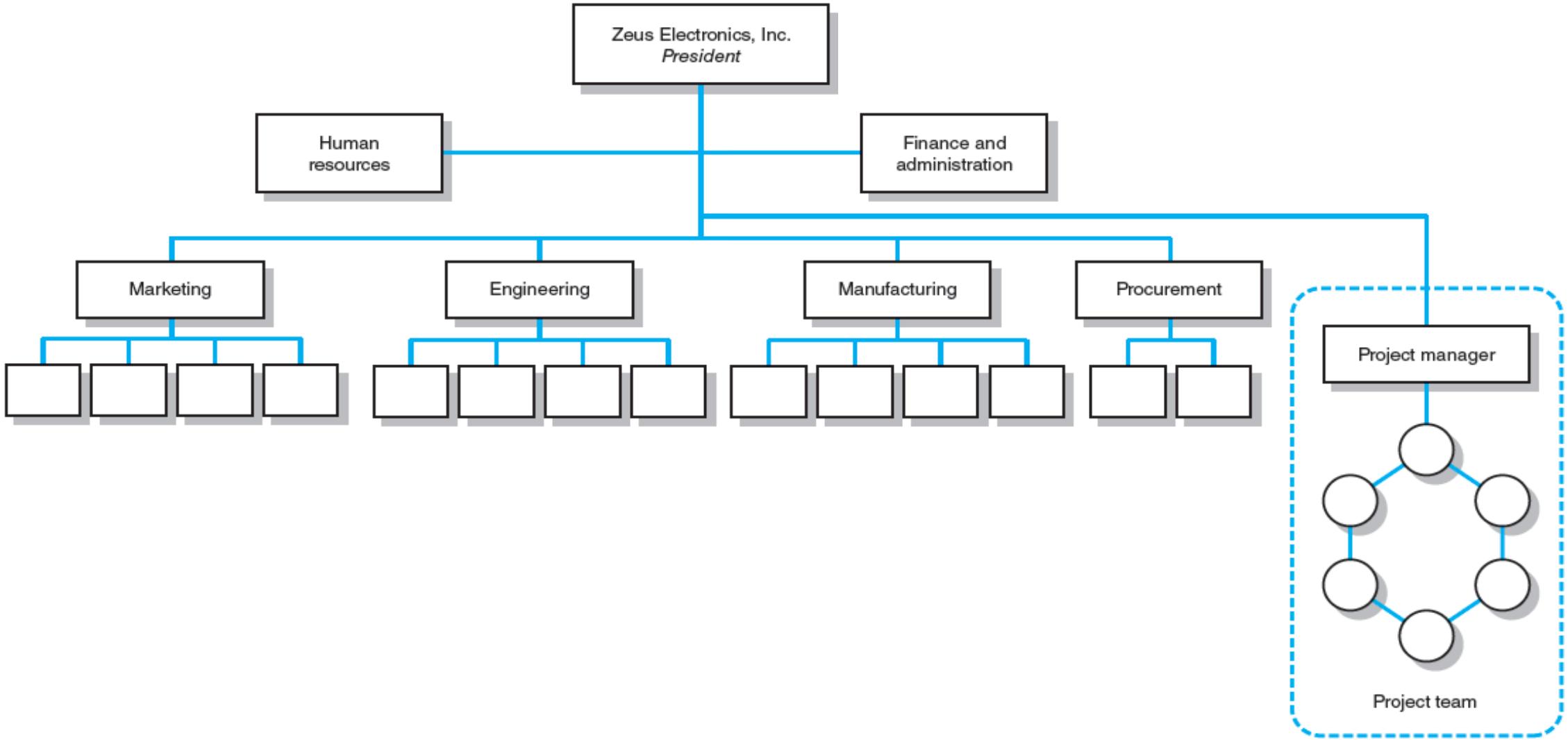
Disadvantages

- Lack of focus
- Poor integration
- Slow
- Lack of ownership

Organizing Projects as Dedicated Teams

- Dedicated project teams operate as units separate from the rest of the parent organization.
- A full-time project manager is designated to pull together a core group of specialists who work full time on the project.
- The project manager recruits necessary personnel from both within and outside the parent company.
- In a projectized organization where projects are the dominant form of business, the entire organization is designed to support project teams.
- "Projectitis" is referred to as a negative dimension to dedicated project teams. A we-they attitude can emerge between project team members and the rest of the organization.

Dedicated Project Team



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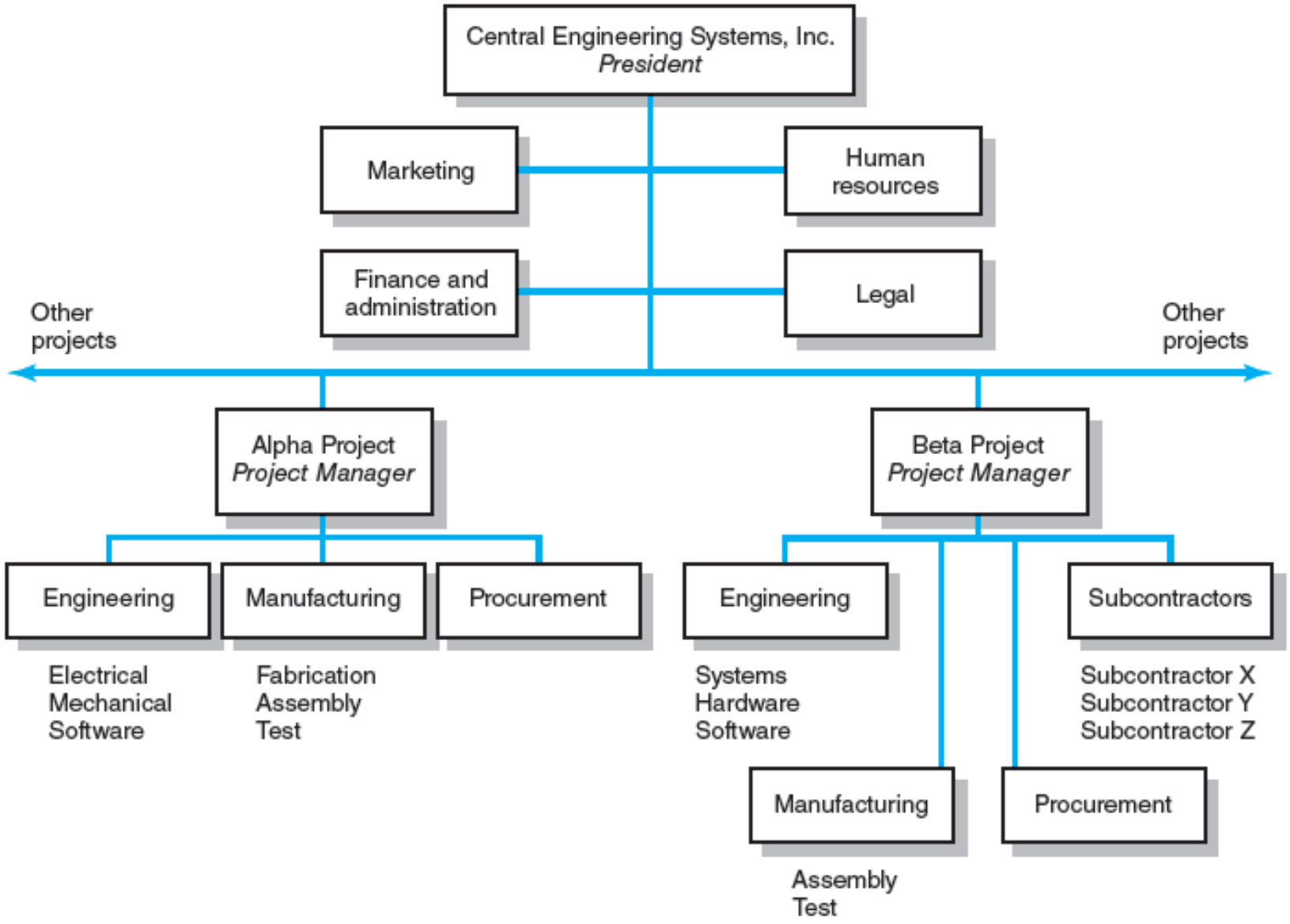
Projectized Organization Structure



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Strengths and Weaknesses of the Dedicated Project Team Approach

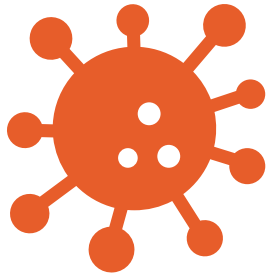
Strengths

Simple

Fast

Cohesive

Cross-functional integration



Weaknesses

Expensive

Internal strife

Limited technological expertise

Difficult post-project transition

Organizing Projects within a Matrix Arrangement

- Matrix management is a hybrid organizational form in which horizontal project management structure is overlaid on the normal functional hierarchy.
  - There are usually two chains of command, one along functional lines and the other along project lines.
  - Project participants report simultaneously to both functional and project managers.
- The matrix structure is designed to utilize resources optimally.
  - Individuals work on multiple projects as well as being capable of performing normal functional duties.
  - It attempts to achieve greater integration by creating and legitimizing the authority of a project manager.
  - It provides dual focus between functional/technical expertise and project requirements.

Matrix Organization Structure

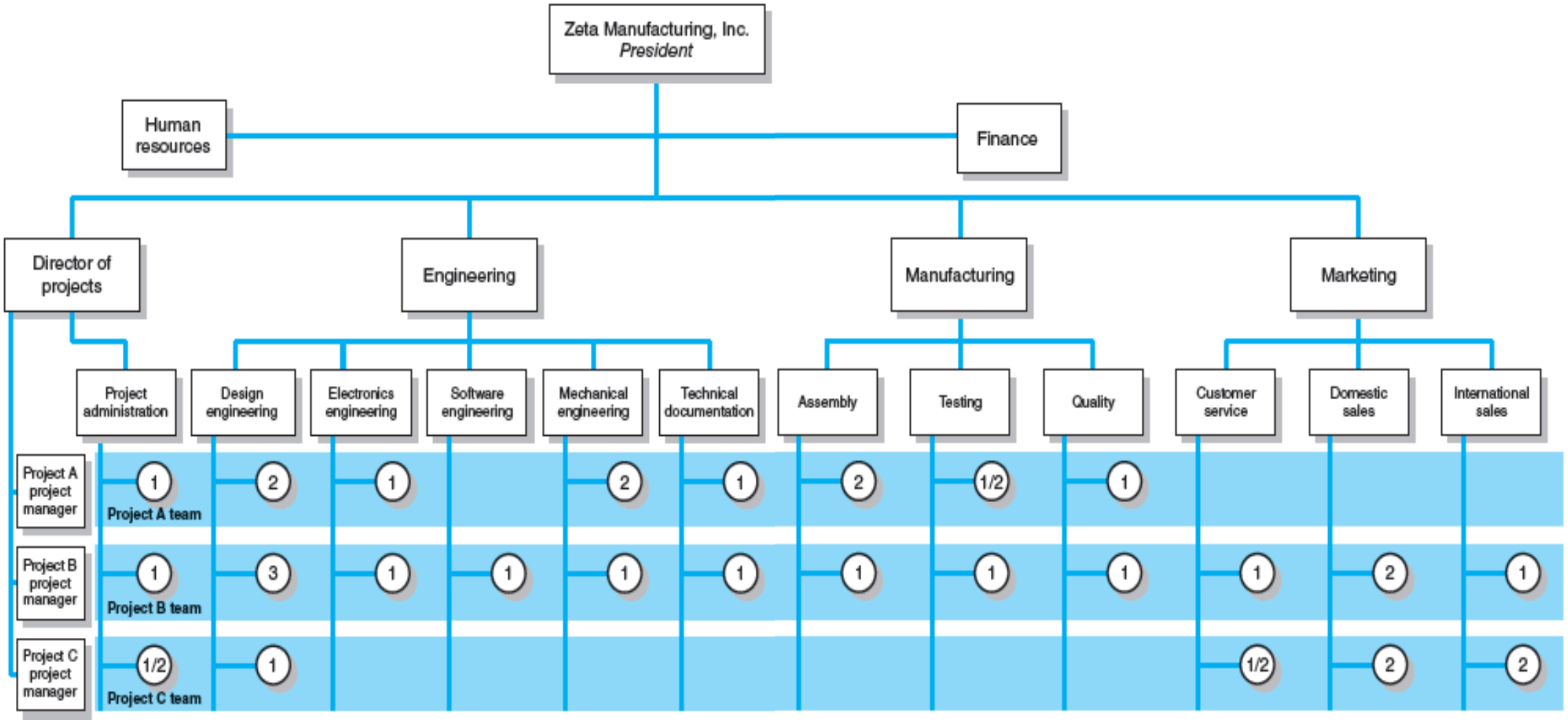


FIGURE 3.4

Division of Project Manager and Functional Manager Responsibilities in a Matrix Structure

Project Manager	Negotiated Issues	Functional Manager
What has to be done?	Who will do the task?	How will it be done?
When should the task be done?	Where will the task be done?	
How much money is available to do the task?	Why will the task be done?	How will the project involvement impact normal functional activities?
How well has the total project been done?	Is the task satisfactorily completed?	How well has the functional input been integrated?

Different Matrix Forms

Weak matrix

- This form is very similar to a functional approach with the exception that there is a formally designed project manager responsible for coordinating project activities.
- Functional managers are responsible for managing their segment of the project.
- The project manager acts as a staff assistant who draws the schedules and checklists, collects information on the status of the work, and facilitates project completion.

Different Matrix Forms (Continued)

Balanced matrix

- The project manager is responsible for defining what needs to be accomplished. The project manager establishes the overall plan for completing the project, integrates the contribution of the different disciplines, set schedules, and monitors progress.
- The functional managers are concerned with how it will be accomplished. The functional managers are responsible for assigning personnel and executing their segment of the project according to the standards and schedules set by the project manager.

Different Matrix Forms (Continued)

Strong matrix

- The project manager controls most aspects of the project, including scope trade-offs and assignment of functional personnel. The project manager controls when and what specialists do and has final say on major project decisions.
- The functional managers have title over their people and are consulted on a need basis. The functional managers serve as subcontractors for the project.

Advantages and Disadvantages of Matrix Management

Disadvantages

- Dysfunctional conflict
- Infighting
- Stressful
- Slow

Advantages

- Efficient
- Strong project focus
- Easier post-project transition
- Flexible

3.2 Project Management Office (PMO)

- Is a centralized unit within an organization or a department that oversees and supports the execution of projects.
- Plays a critical role in helping matrix systems mature into more effective project delivery platforms.
- Can be characterized in different kinds:
  - Weather station—tracks and monitors project performance.
  - Control tower—improves project execution.
  - Resource pool—provides the organization with a cadre of trained project managers and professionals.
  - Command and control center—has direct authority over the project.

3.3 What Is the Right Project Management Structure?

Organization Considerations

- How important is the project management to the success of the firm?
  - What percentage of core work involves projects?
- What level of resources are available?

Project Considerations

- Size of project
- Strategic importance
- Novelty and need for innovation
- Need for integration (number of departments involved)
- Environmental complexity (number of external interfaces)
- Budget and time constraints
- Stability of resource requirements

3.4 Organizational Culture

Organizational Culture Defined

- *Is a system of shared norms, beliefs, values, and assumptions that blinds people together, thereby creating shared meanings.*
- Reflects the "**personality**" of the organization.
- Performs several important functions in organizations.
  - Provides a sense of identity for its members
  - Helps legitimize the management system
  - Clarifies and reinforces standards of behavior
  - Helps create social order

Key Dimensions Defining an Organization's Culture

FIG

Identifying Cultural Characteristics

- Study the physical characteristics of an organization.
- Read about the organization.
- Observe how people interact within the organization.
- Interpret stories and folklore surrounding the organization.

Organizational Culture Diagnosis Worksheet

Power Corp.

I. Physical Characteristics:
Architecture, office layout, décor, attire

Corporate HQ is a 20-story modern building—president on top floor. Offices are bigger in the top floors than lower floors. Formal business attire (white shirts, ties, power suits, . . .). Power appears to increase the higher up you are.

II. Public Documents:
Annual reports, internal newsletters, vision statements

At the heart of the Power Corp. way is our vision . . . to be the global energy company most admired for its people, partnership, and performance.

Integrity. We are honest with others and ourselves. We meet the highest ethical standards in all business dealings. We do what we say we will do.

III. Behavior:
Pace, language, meetings, issues discussed, decision-making style, communication patterns, rituals

Hierarchical decision making, pace brisk but orderly, meetings start on time and end on time, subordinates choose their words very carefully when talking to superiors, people rarely work past 6:00 p.m., president takes top-performing unit on a boat cruise each year. . . .

IV. Folklore:
Stories, anecdotes, heroines, heroes, villains

Young project manager was fired after going over his boss's head to ask for additional funds.

Stephanie C. was considered a hero for taking complete responsibility for a technical error.

Jack S. was labeled a traitor for joining chief competitor after working for Power Corp. for 15 years.

FIG

3.5 Implications of Organizational Culture for Organizing Projects

- Project managers interact with:
  - The culture of their parent organizations as well as the subcultures of various departments.
  - The project's clients or customer organizations.
  - Other organizations connected to the project such as suppliers and vendors, subcontractors, consulting firms, government and regulatory agencies, and community groups.
- "A riverboat trip" is a metaphor describing the relationship between organizational culture and project management. Culture is the river and the project is the boat.

Cultural Dimensions of an Organization Supportive of Project Management

FIG

Key Terms

Balanced matrix

Dedicated project team

Matrix

Organizational culture

Projectitis

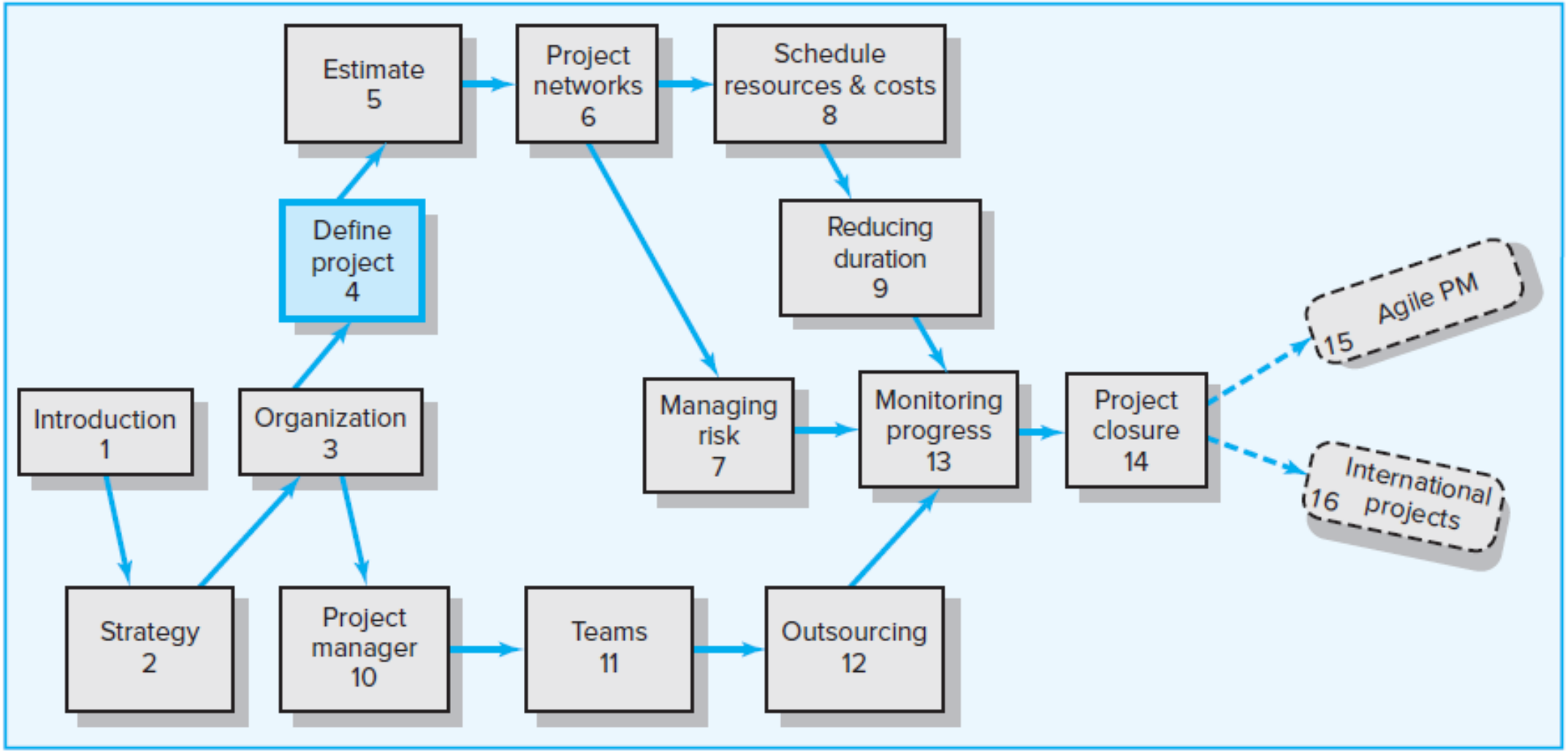
Projectized organization

Project management office (PMO)

Strong matrix

Weak matrix

Where We Are Now



Learning Objectives

04-01 Identify key elements of a project scope statement and understand why a complete scope statement is critical to project success.

04-02 Describe the causes of scope creep and ways to manage it.

04-03 Understand why it is important to establish project priorities in terms of cost, time, and performance.

04-04 Demonstrate the importance of a work breakdown structure (WBS) to the management of projects and how it serves as a database for planning and control.

04-05 Demonstrate how the organization breakdown structure (OBS) establishes accountability to organization units.

04-06 Describe a process breakdown structure (PBS) and when to use it.

04-07 Create responsibility matrices for small projects.

04-08 Create a communication plan for a project.

Chapter Outline

Five General Steps for Collecting Project Information

Step 1: Defining the Project Scope

Step 2: Establishing Project Priorities

Step 3: Creating the Work Breakdown Structure

Step 4: Integrating the WBS with the Organization

Step 5: Coding the WBS for the Information System

4.1 Step 1: Defining the Project Scope

Project Scope Defined

- Is a definition of the end result or mission of your project—a product or service for your client/customer.
- Defines the results to be achieved in specific, tangible, and measurable terms.

Purposes of the Project Scope Statement

- To clearly define the deliverable(s) for the end user
- To direct focus on the project purpose throughout the life of the project for the customer and project participants
- To be published and used by the project owner and project participants for planning and measuring project success

Project Scope Checklist

Project Scope: Terms and Definitions

Scope Statements

- Is a short, one- to two-page summary of key elements of the scope, followed by extended documentation of each element.
- Is also referred to as “statements of work (SOWs)”

Project Charter

- Is a documentation that authorizes the project manager to initiate and lead the project.
- Often includes a brief scope description as well as such items as risk limits, business case, spending limits, and even team composition.

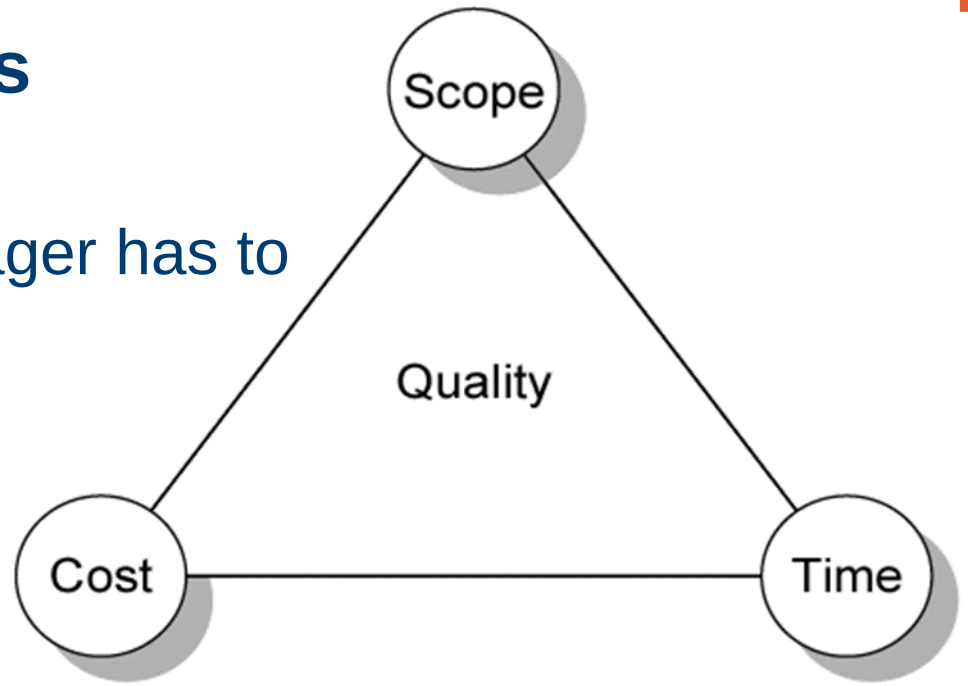
Scope Creep

- Is the tendency for the project scope to expand over time—usually by changing requirements, specifications, and priorities.

Five of the Most Common Causes of Scope Creep

- Poor requirement analysis
- Not involving users early enough
- Underestimating project complexity
- Lack of change control
- Gold plating

4.2 Step 2: Establishing Project Priorities



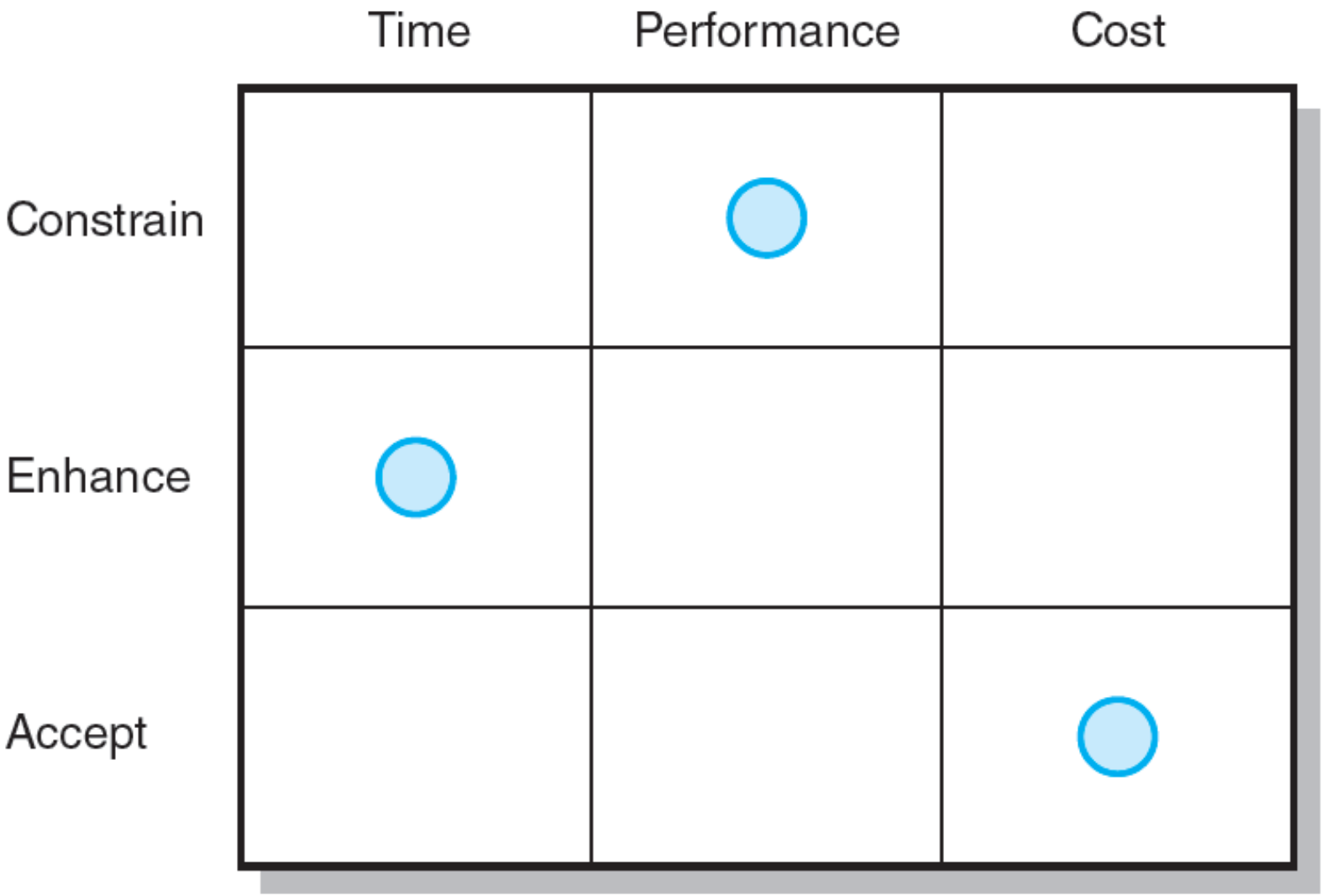
Three major criteria (trade-offs) that a project manager has to manage are:

- Cost (budget)
- Time (schedule)
- Performance (scope)

A project manager can manage the project trade-offs by completing a **priority matrix** for the project and identifying which criterion is:

- Constrain—original parameter is fixed.
- Enhance—a criterion should be optimized.
- Accept—a criterion is tolerable not to meet the original parameter.

Project Priority Matrix for the Development of a New Wireless Router



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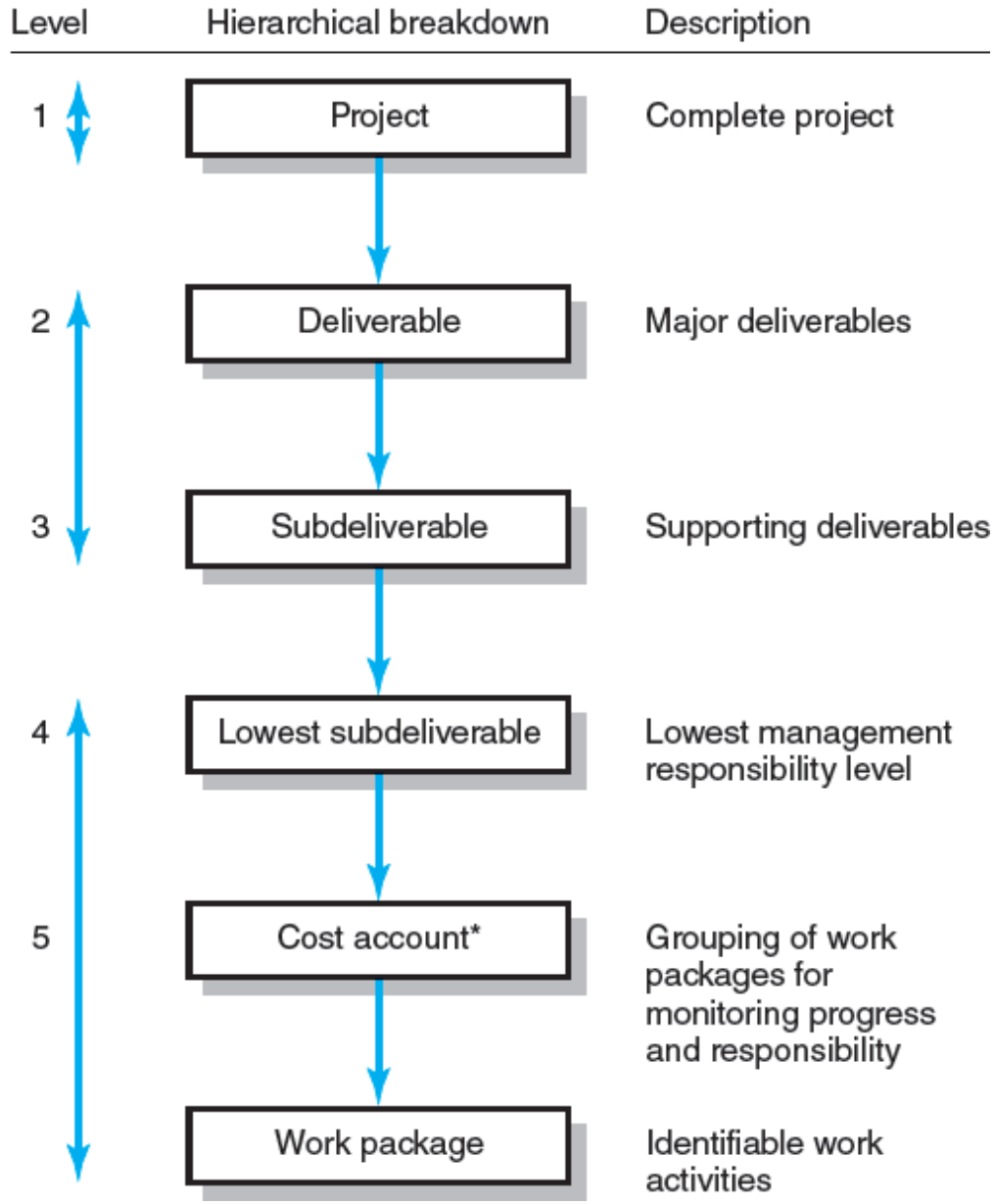
4.3 Step 3: Creating the Work Breakdown Structure

Work Breakdown Structure (WBS)

- Is a hierarchical outline of the project with different levels of detail.
- Identifies the products and work elements involved in a project.
- Defines the relationship of the final deliverable (the project) to its sub-deliverables, and, in turn, their relationships to work packages.
- Serves as a framework for tracking cost and work performance.
- Is best suited for design and build projects that have tangible outcomes rather than process-oriented projects.

Hierarchical Breakdown of the WBS

* This breakdown groups work packages by type of work within a deliverable and allows assignment of responsibility to an organizational unit. This extra step facilitates a system for monitoring project progress (discussed in Chapter 13).



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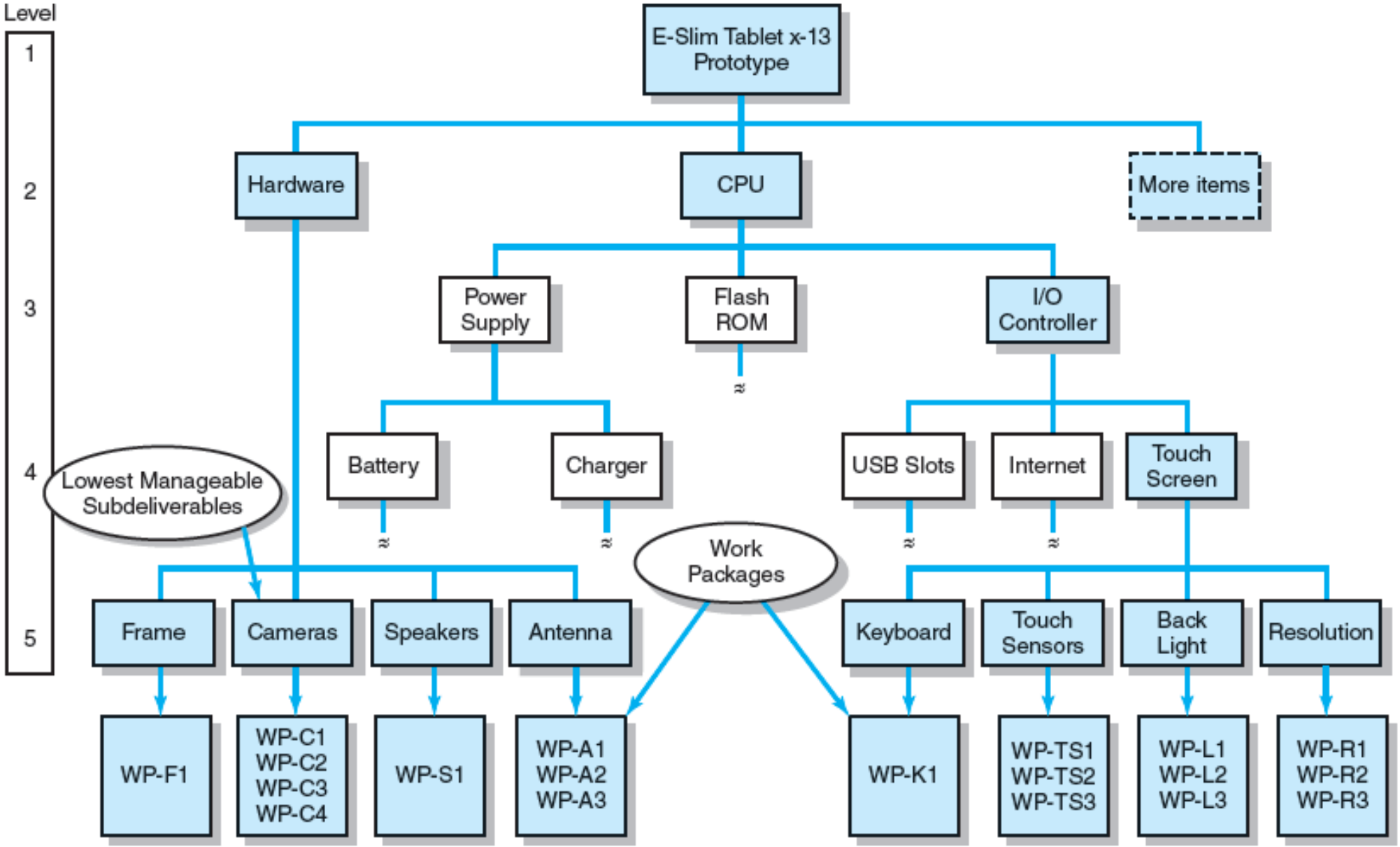
How WBS Helps the Project Manager

- Assures project managers that all products and work elements are identified, to integrate the project with the current organization, and to establish a basis for control.
- Facilitates the evaluation of cost, time, and technical performance at all levels in the organization over the life of the project.
- Provides management with information appropriate to each organizational level.
- Helps project managers to plan, schedule, and budget the project.
- Helps in the development of the organization breakdown structure (OBS), which assigns project responsibilities to organization units and individuals.
- Provides the opportunity to “roll up” (sum) the budget and actual costs of the smaller work packages into larger work elements.
- Defines communication channels and assists in understanding and coordinating many parts of the project.

Work Breakdown Structure



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A Work Package

- Is the lowest level of the WBS.
- Is a short-duration task that has a definite start and stop point, consumes resources, and represents cost.
- Should not exceed 10 workdays or one reporting period.
- Should be as independent of other work packages of the project as possible.
- Is the basic unit used for planning, scheduling, and controlling the project.

Each Work Package in the WBS

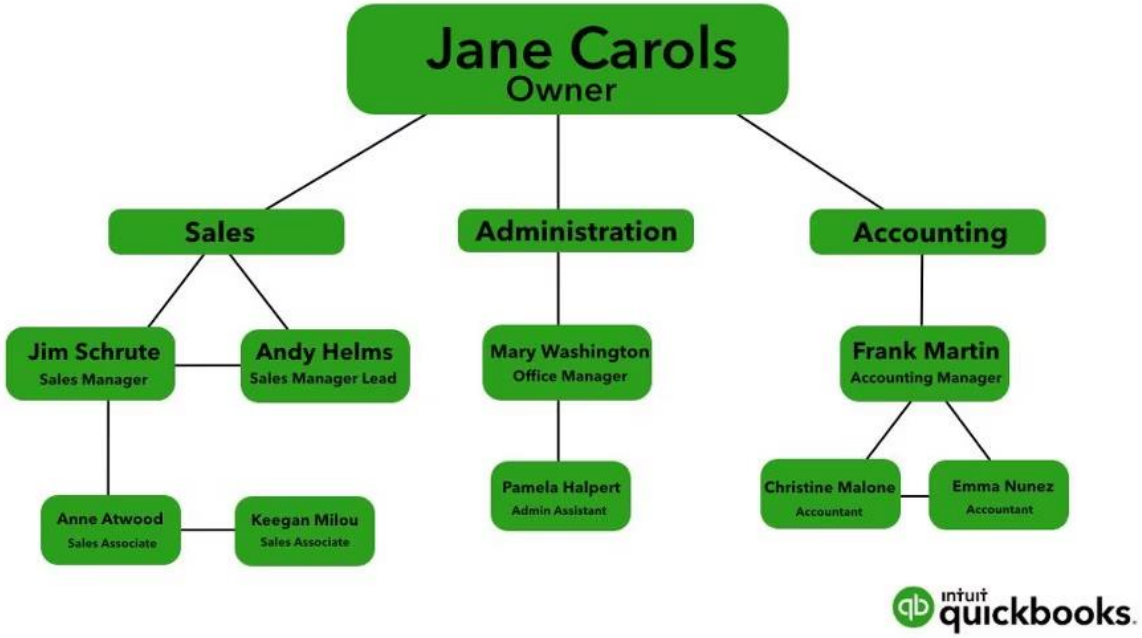
- Defines work (**what**).
- Identifies time to complete a work package (**how long**).
- Identifies a time-phased budget to complete a work package (**cost**).
- Identifies resources needed to complete a work package (**how much**).
- Identifies a single person responsible for units of work (**who**).
- Identifies monitoring points for measuring progress (**how well**).

4.4 Step 4: Integrating the WBS with the Organization

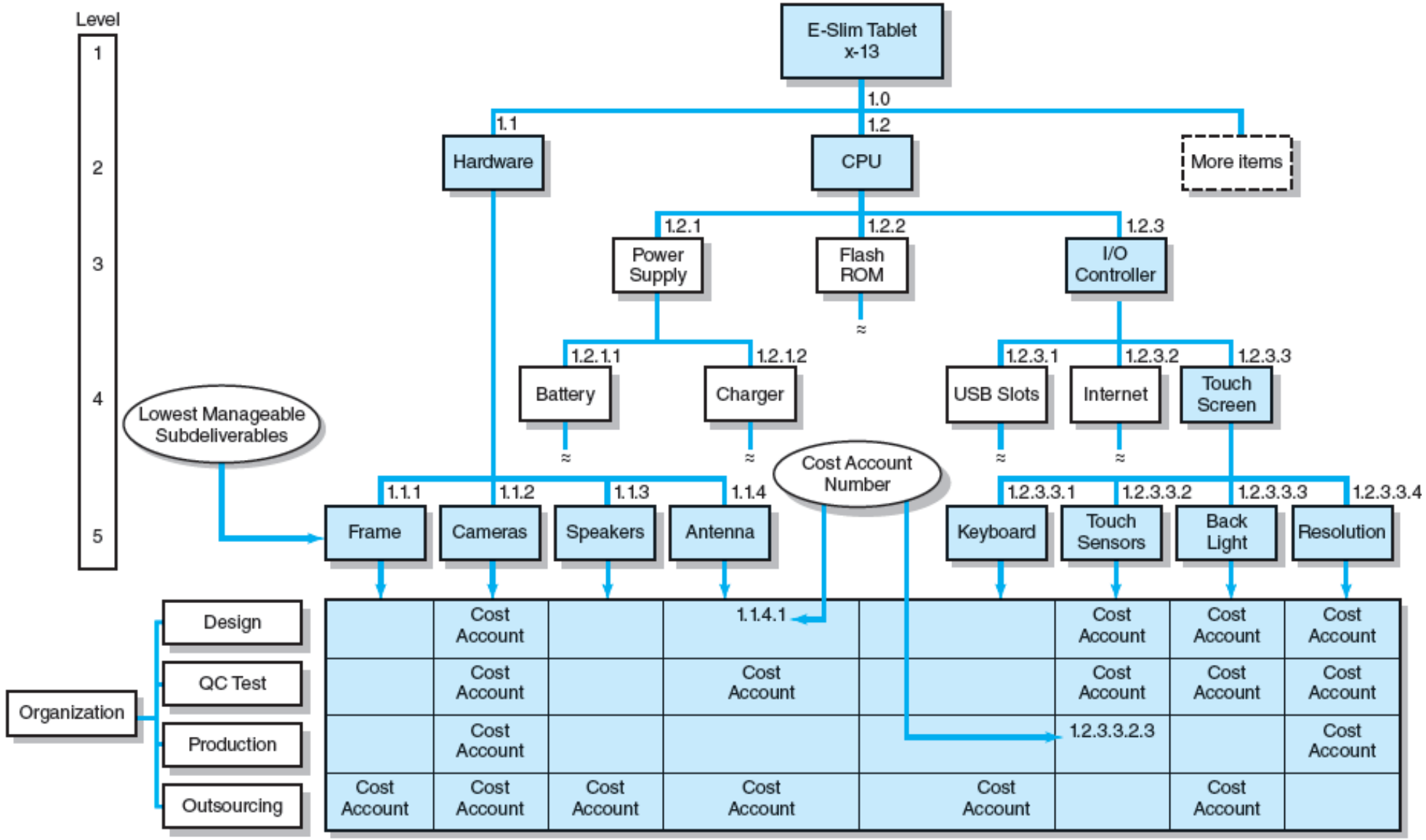
Organization Breakdown Structure (OBS)

- Depicts how the firm has organized to discharge work responsibility.
- Provides a framework to summarize organization unit work performance.
- Identifies the organization units responsible for work packages.
- Ties the organizational unit to cost control accounts.

The intersection of work packages and the organization unit creates a project cost point or cost account that integrates work and responsibility.



Integration of WBS and OBS



4.5 Step 5: Coding the WBS for the Information System

WBS Coding System

- Defines
  - Levels and elements in the WBS
  - Organization elements
  - Work packages
  - Budget and cost information
- Allows reports to be consolidated at any level in the structure.

WBS Dictionary

- Provides detailed information about each element in the WBS.

Coding the WBS

	Task Mode	Task Name
1		**1 E-Slim Tablet x-13 Prototype**
2		**1.1 Hardware**
3		1.1.1 Cameras
4		1.1.2 Speakers
5		1.1.3 Antenna
6		**1.2 CPU**
7		**1.2.1 Power supply**
8		1.2.1.1 Battery (more items)
9		1.2.1.2 Charger (more items)
10		**1.2.2 Flash Rom (more items)**
11		1.2.2.1 I/O controller
12		1.2.2.2 USB slots (more items)
13		1.2.2.3 Internet (more items)
14		**1.2.3 Touch screen**
15		**1.2.3.1 Keyboard**
16		1.2.3.1.1 Work package
17		**1.2.3.2 Touch sensors**
18		1.2.3.2.1 Work package
19		1.2.3.2.2 Work package
20		1.2.3.2.3 Work package
21		1.2.3.3 Back light (more items)
22		1.2.3.4 Resolution (more items)

4.6 Process Breakdown Structure

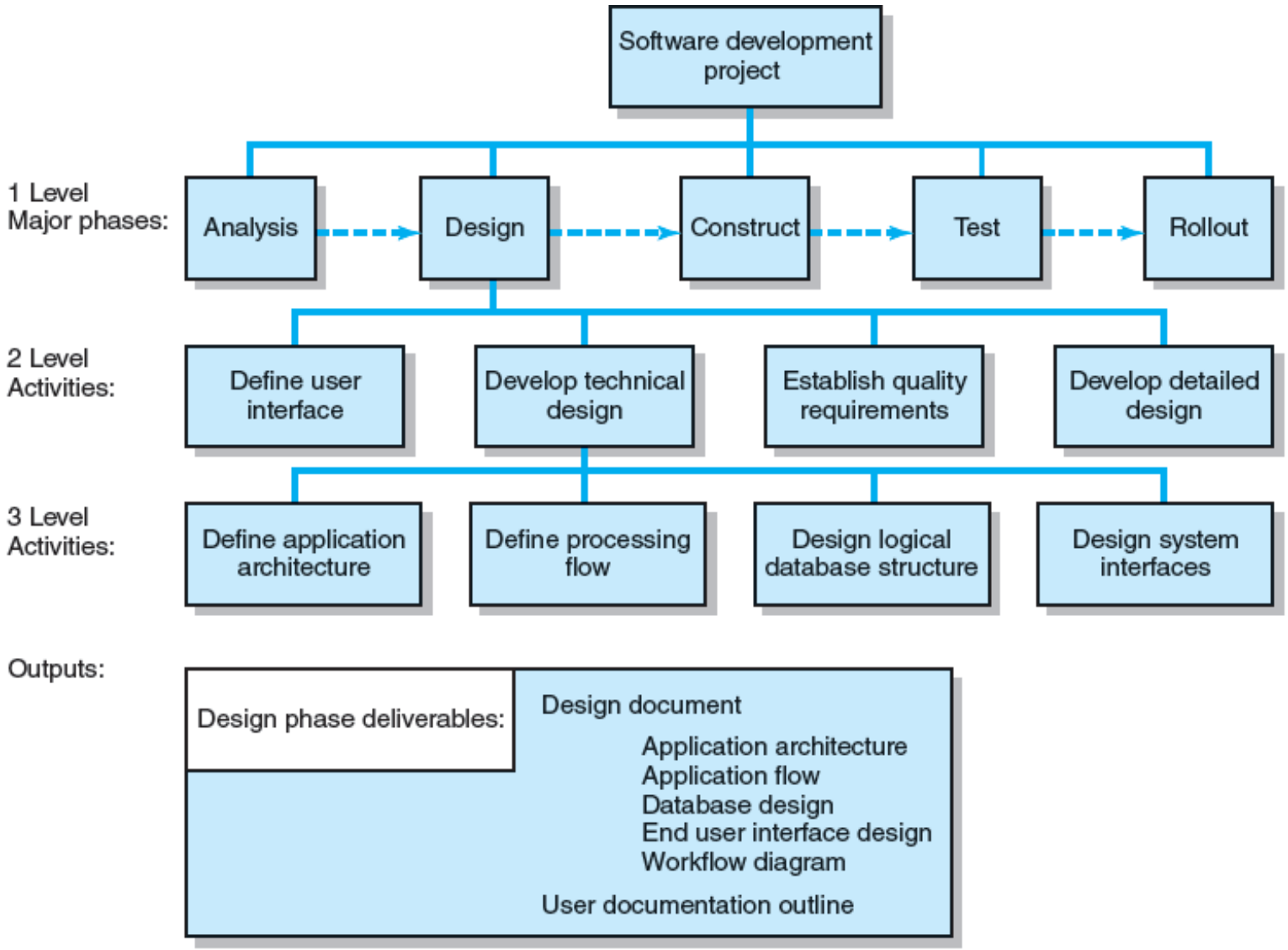
Process Breakdown Structure (PBS)

- Is used for process-oriented projects.
- Is often referred to as the “waterfall method” in the software industry.

Process-oriented project

- Is a project that the final outcome is a product of a series of steps and phases.
- Is a project that evolves over time with each phase affecting the next phase.
- Is a project that is driven by performance requirements, not by plans/blueprints.

PBS for Software Development Project



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4.7 Responsibility Matrices

Responsibility Matrix (RM)

- Is also called a linear responsibility chart.
- Summarizes the tasks to be accomplished and who is responsible for what on the project.
- Lists all the project activities and the participants responsible for each activity.
- Clarifies interfaces between units and individuals that require coordination.
- Provides a mean for all participants in a project to view their responsibilities and agree on their assignments.
- Clarifies the extent or type of authority exercised by each participant.

Responsibility Matrix for a Market Research Project

	Project Team				
Task	Richard	Dan	Dave	Linda	Elizabeth
Identify target customers	R	S		S	
Develop draft questionnaire	R	S	S		
Pilot-test questionnaire		R		S	
Finalize questionnaire	R	S	S	S	
Print questionnaire					R
Prepare mailing labels					R
Mail questionnaires					R
Receive and monitor returned questionnaires				R	S
Input response data			R		
Analyze results		R	S	S	
Prepare draft of report	S	R	S	S	
Prepare final report	R		S		

R = Responsible
S = Supports/assists

FIG

Responsibility Matrix for the Conveyor Belt Project

	Organization							
Deliverables	Design	Development	Documentation	Assembly	Testing	Purchasing	Quality Assur.	Manufacturing
Architectural designs	1	2			2		3	3
Hardware specifications	2	1				2	3	
Kernel specifications	1	3						3
Utilities specifications	2	1			3			
Hardware design	1			3		3		3
Disk drivers	3	1	2					
Memory management	1	3			3			
Operating system documentation	2	2	1					3
Prototypes	5		4	1	3	3	3	4
Integrated acceptance test	5	2	2		1		5	5

1 Responsible
2 Support
3 Consult
4 Notification
5 Approval

FIG

4.8 Project Communication Plan

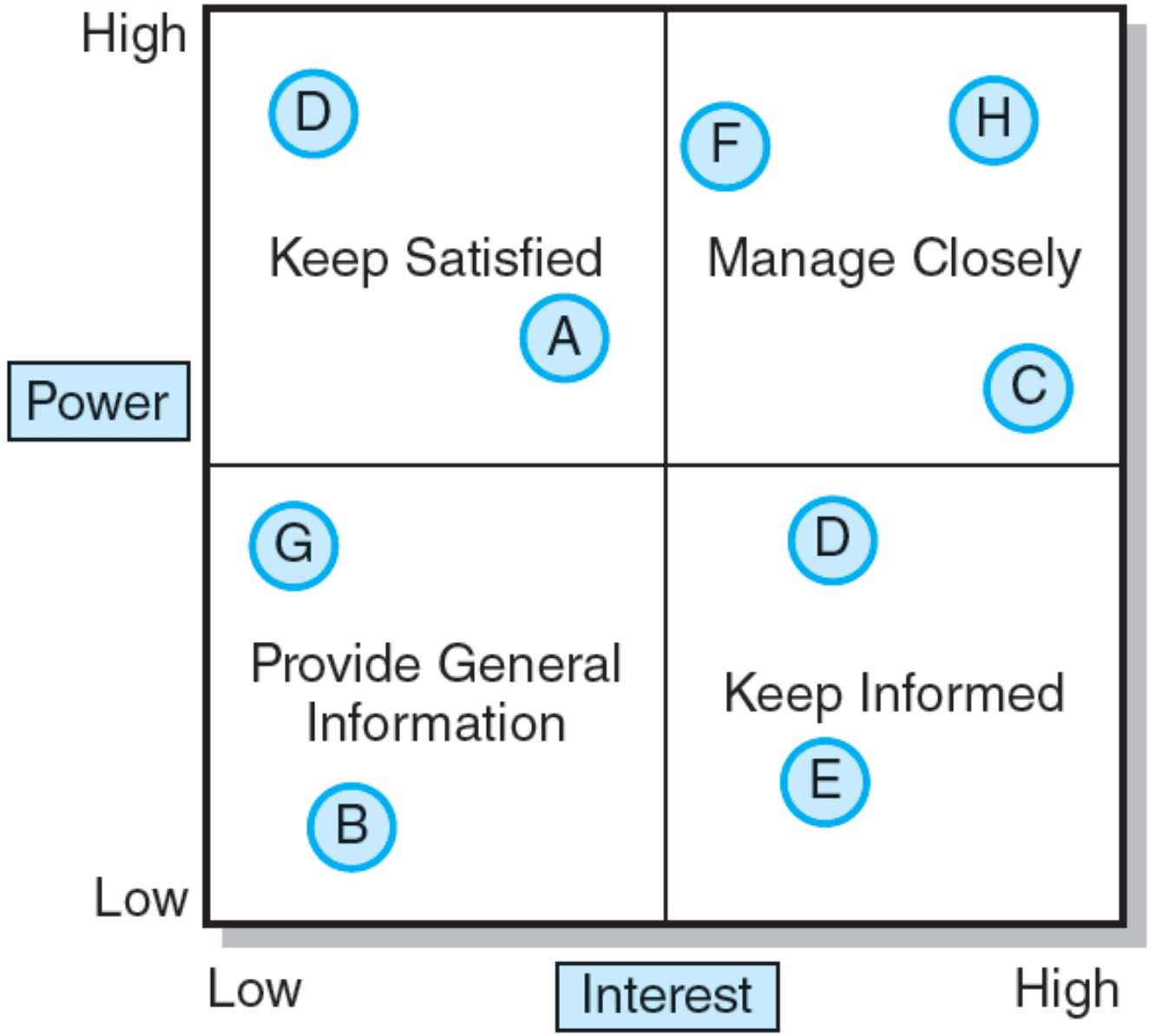
Project communication plans address the following questions:

- What information needs to be collected and when?
- Who will receive the information?
- What methods will be used to gather and store information?
- What are the limits, if any, on who has access to certain kinds of information?
- When will the information be communicated?
- How will it be communicated?

Steps for Developing a Communication Plan

1. Stakeholder analysis—identify the target groups.
2. Information needs—project status reports, deliverable issues, changes in scope, team status meetings, gating decisions, accepted request changes, action items, milestone reports, etc.
3. Sources of information—where does the information reside?
4. Dissemination modes—hardcopy, e-mail, teleconferencing, SharePoint, and a variety of database sharing programs.
5. Responsibility and timing—determine who will send out the formation and when.

Stakeholder Communications



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Shale Oil Research Project Communication Plan

What Information	*Target Audience*	*When?*	*Method of Communication*	*Provider*
Milestone report	Senior management and project manager	Bimonthly	E-mail and hardcopy	Project office
Project status reports & agendas	Staff and customer	Weekly	E-mail and hardcopy	Project manager
Team status reports	Project manager and project office	Weekly	E-mail	Team recorder
Issues report	Staff and customer	Weekly	E-mail	Team recorder
Escalation reports	Staff and customer	When needed	Meeting and hardcopy	Project manager
Outsourcing performance	Staff and customer	Bimonthly	Meeting	Project manager
Accepted change requests	Project office, senior mgmt., customer, staff, and project mgr.	Anytime	E-mail and hardcopy	Design department
Oversight gate decisions	Senior management and project manager	As required	E-mail meeting report	Oversight group or project office

FIGU

Key Terms

Acceptance criteria

Cost account

Gold plating

Milestone

Organization breakdown structure (OBS)

Priority matrix

Process breakdown structure (PBS)

Product scope description

Project charter

Responsibility matrix

Scope creep

Scope statement

WBS dictionary

Work breakdown structure (WBS)

Work package

Any Questions!