UNIVERSITY OF WOLLONGONG IN DUBAI

ECTE250

ENGINEERING DESIGN AND MANAGEMENT 2

Winter 2025 / Spring 2025

Project Management II

Textbook and Readings

Textbook

- Project Management: the Managerial Process, 6th Edition, by Erik W Larson & Clifford F Gray, McGraw Hill
  - Chapter 3
  - Chapter 4

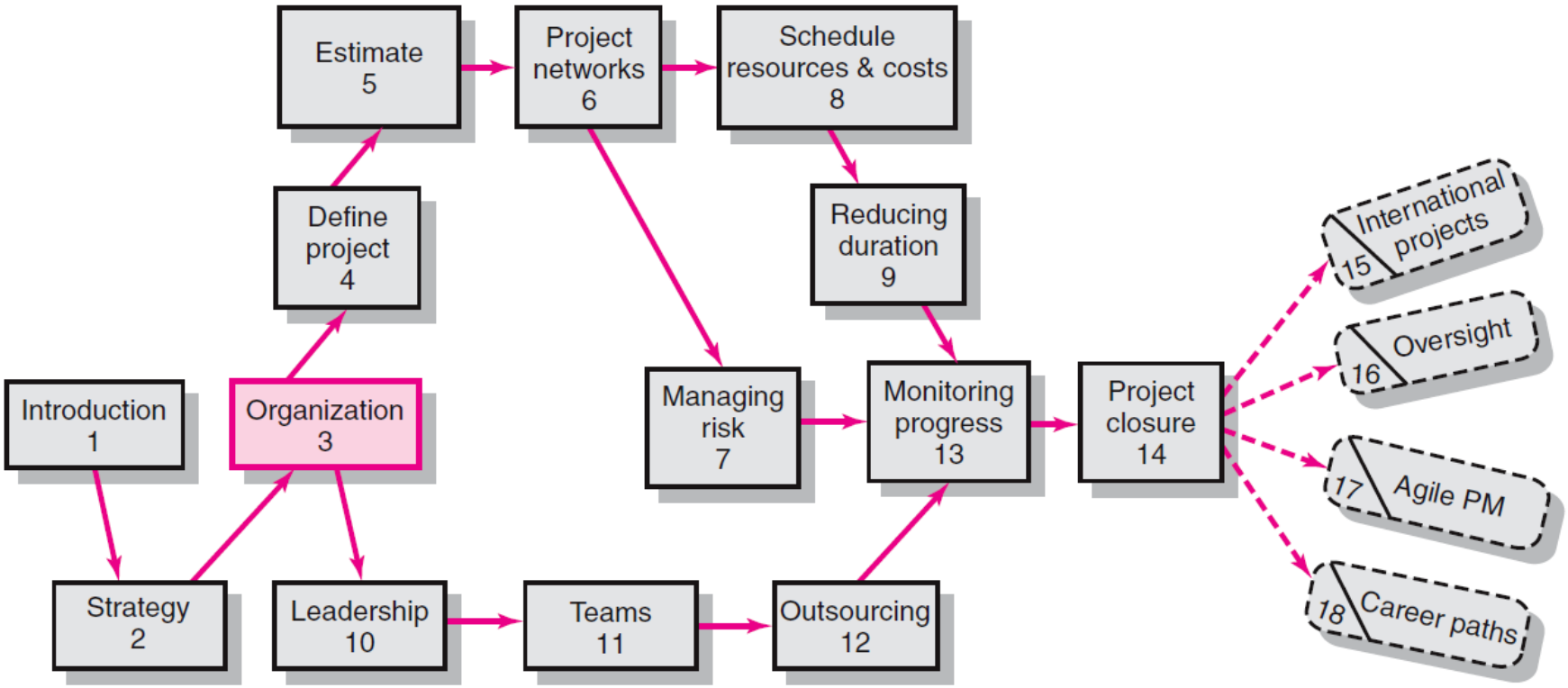
Acknowledgement

- Slides from Project Management: the Managerial Process, by Erik W Larson & Clifford F Gray

Ch. 3

Organization Structure and Culture

Where We Are Now



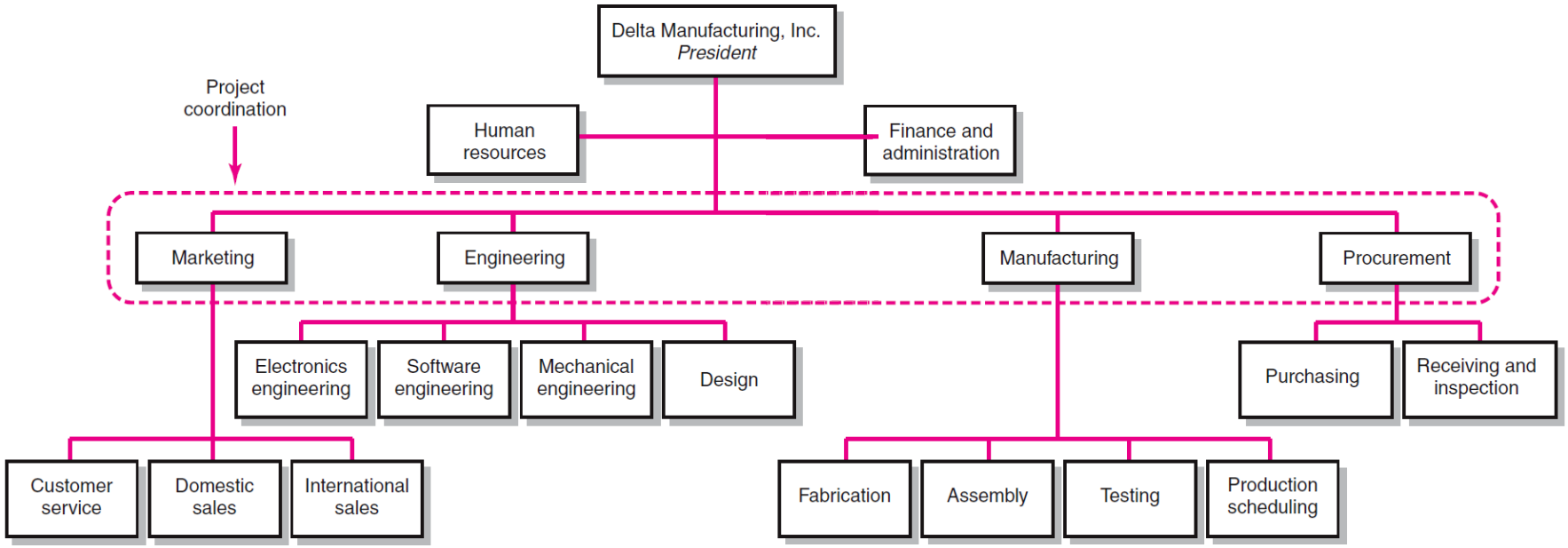
Project Management Structures

- Challenges to Organizing Projects
  - The uniqueness and short duration of projects relative to ongoing longer-term organizational activities
  - The multidisciplinary and cross-functional nature of projects creates authority and responsibility dilemmas.
- Choosing an Appropriate Project Management Structure
  - The best system balances the needs of the project with the needs of the organization.

Project Management Structures

- Organizing Projects: Functional organization
  - Different segments of the project are delegated to respective functional units.
  - Coordination is maintained through normal management channels.
  - Used when the interest of one functional area dominates the project or one functional area has a dominant interest in the project's success.

Functional Organizations



Functional Organization of Projects

Advantages

1. No Structural Change
2. Flexibility
3. In-Depth Expertise
4. Easy Post-Project Transition

Disadvantages

1. Lack of Focus
2. Poor Integration
3. Slow
4. Lack of Ownership

Project Management Structures

- Organizing Projects: Dedicated Teams
  - Teams operate as separate units under the leadership of a full-time project manager.
  - In a ***projectized*** organization where projects are the dominant form of business, functional departments are responsible for providing support for its teams.

Dedicated Project Team

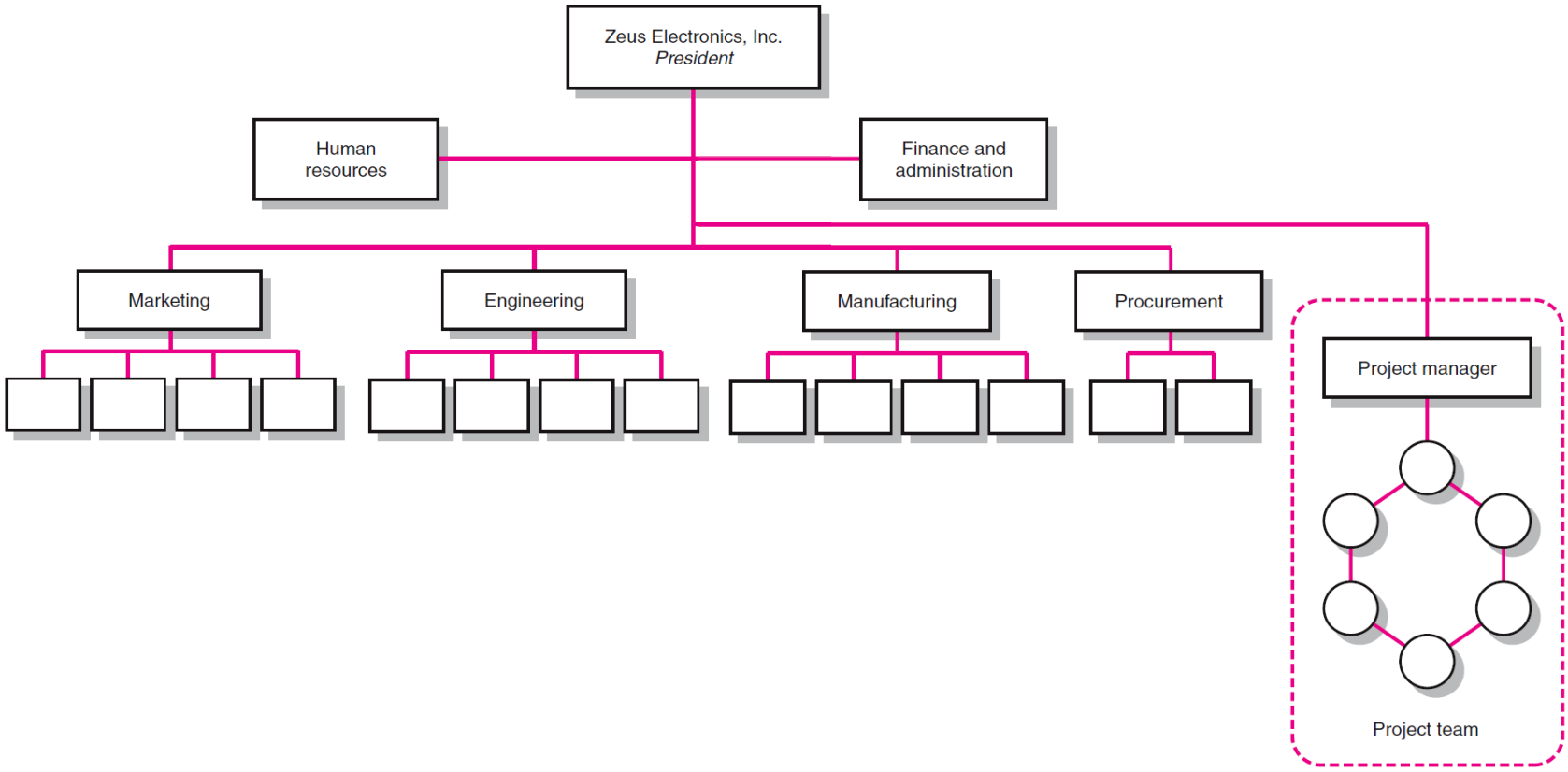


FIGURE 3.2

Project Organization: Dedicated Team

- **Advantages**
  1. Simple
  2. Fast
  3. Cohesive
  4. Cross-Functional Integration
- **Disadvantages**
  1. Expensive
  2. Internal Strife
  3. Limited Technological Expertise
  4. Difficult Post-Project Transition

SNAPSHOT FROM PRACTICE

The Birth of the Mac*

One of the advantages of creating dedicated project teams is that project participants from different functional areas can develop into a highly cohesive work team that is strongly committed to completing the project. While such teams often produce Herculean efforts in pursuit of project completion, there is a negative dimension to this commitment that is often referred to in the literature as **projectitis.** A we–they attitude can emerge between project team members and the rest of the organization. The project team succumbs to *hubris* and develops a holier-than-thou attitude that antagonizes the parent organization. People not assigned to the project become jealous of the attention and prestige being showered on the project team, especially when they believe that it is their hard work that is financing the endeavor. The tendency to assign project teams exotic titles such as "Silver Bullets" and "Tiger Teams," as well as give them special perks, tends to intensify the gap between the project team and the parent organization.

Such appears to have been the case with Apple's highly successful Macintosh development team. Steve Jobs, who at the time was both the chairman of Apple and the project manager for the Mac team, pampered his team with perks including at-the-desk massages, coolers stocked with freshly squeezed orange juice, a Bosendorfer grand piano, and first-class plane tickets. No other employees at Apple got to travel first class. Jobs considered his team to be the elite of Apple and had a tendency to refer to everyone else as "Bozos" who "didn't get it." Engineers from the Apple II division, which was the bread and butter of Apple's sales, became incensed with the special treatment their colleagues were getting.

One evening at Ely McFly's, a local watering hole, the tensions between Apple II engineers seated at one table and those of a Mac team at another boiled over. Aaron Goldberg, a long-time industry consultant, watched from his barstool as the squabbling escalated. "The Mac guys were screaming, 'We're the future!' The Apple II guys were screaming, 'We're the money!' Then there was a geek brawl. Pocket protectors and pens were flying. I was waiting for a notebook to drop, so they would stop and pick up the papers."

© Apic/Getty Images

Although comical from a distance, the discord between the Apple II and Mac groups severely hampered Apple's performance during the 1980s. John Sculley, who replaced Steve Jobs as chairman of Apple, observed that Apple had evolved into two "warring companies" and referred to the street between the Apple II and Macintosh buildings as "the DMZ" (demilitarized zone).

* J. Carlton, *Apple: The Inside Story of Intrigue, Egomania, and Business Blunders* (New York: Random House, 1997), pp. 13–14; J. Sculley, *Odyssey: Pepsi to Apple . . . A Journey of Adventure, Ideas, and the Future* (New York: Harper & Row, 1987), pp. 270–79.

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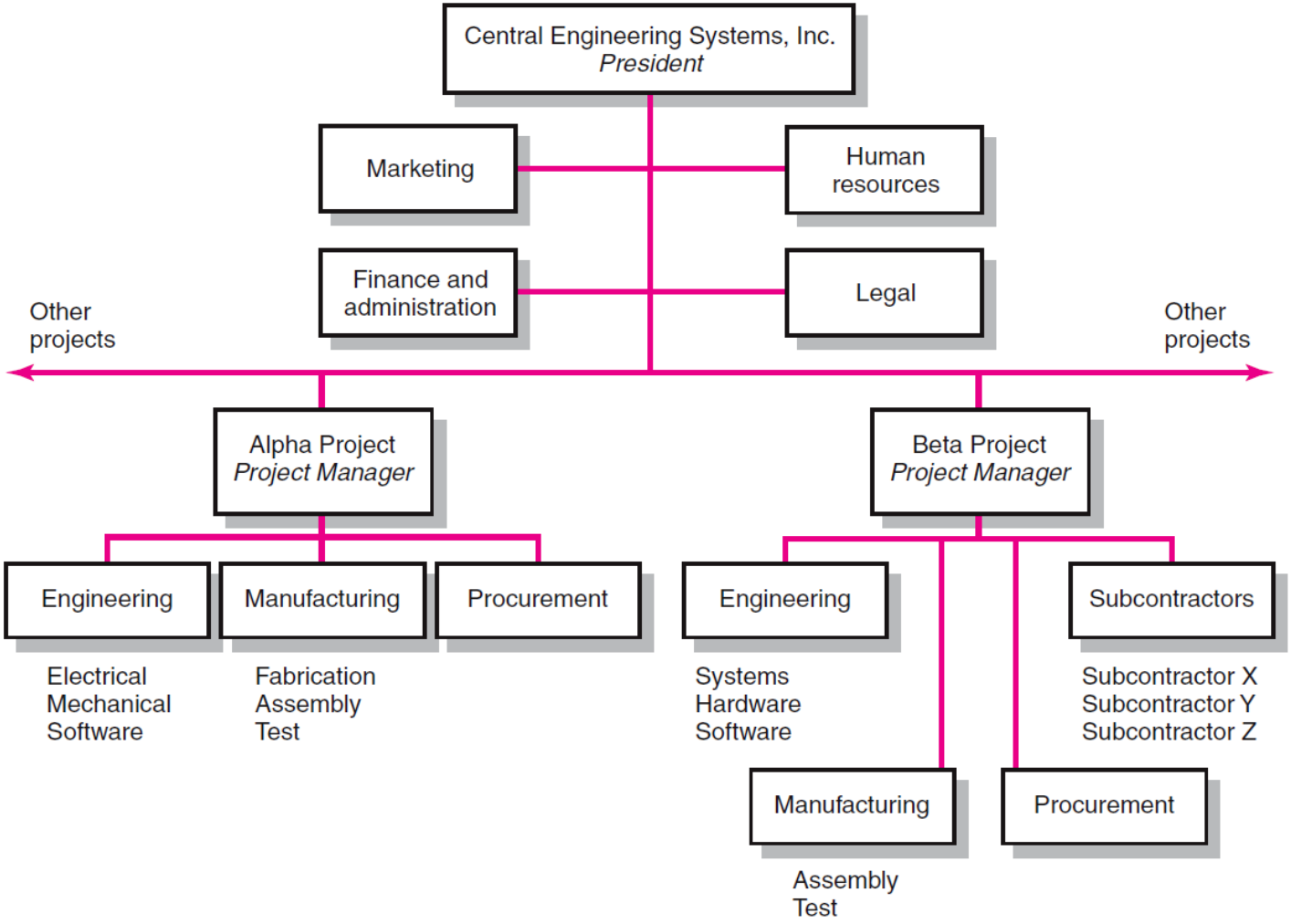
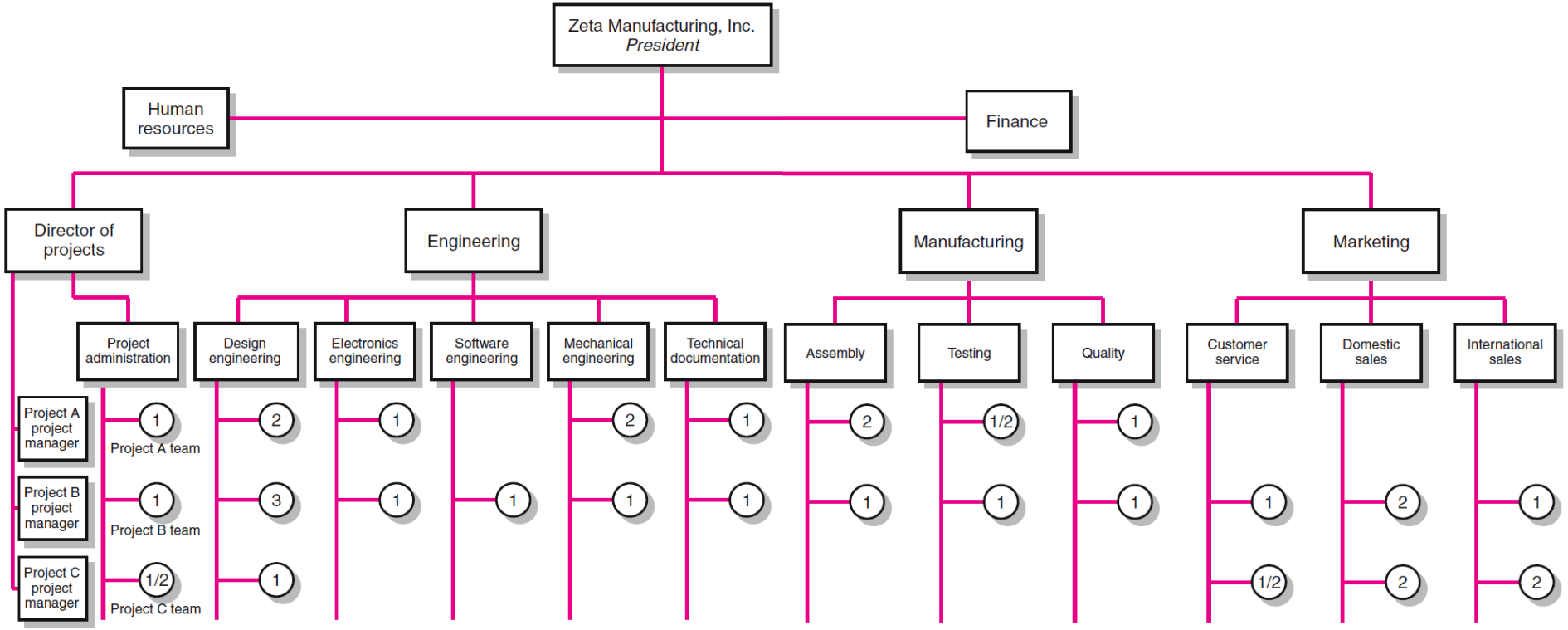
Projectized Organizational Structure



Project Management Structures (cont'd)

- Organizing Projects: Matrix Structure
  - Hybrid organizational structure (matrix) is overlaid on the normal functional structure.
    - Two chains of command (functional and project)
    - Project participants report simultaneously to both functional and project managers.
  - Matrix structure optimizes the use of resources.
    - Allows for participation on multiple projects while performing normal functional duties.
    - Achieves a greater integration of expertise and project requirements.

Matrix Organization Structure



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 Form
  - The authority of the functional manager predominates and the project manager has indirect authority.
- Balanced Form
  - The project manager sets the overall plan and the functional manager determines how work to be done.
- Strong Form
  - The project manager has broader control and functional departments act as subcontractors to the project.

Project Organization: Matrix Form

- **Advantages**
  1. **Efficient**
  2. **Strong Project Focus**
  3. **Easier Post-Project Transition**
  4. **Flexible**
- **Disadvantages**
  1. **Dysfunctional Conflict**
  2. **Infighting**
  3. **Stressful**
  4. **Slow**

Choosing the Appropriate Project Management Structure

- Organization (Form) Considerations
  - How important is the project to the firm's success?
  - What percentage of core work involves projects?
  - What level of resources (human and physical) are available?

Choosing the Appropriate Project Management Structure (cont'd)

- Project Considerations (the higher the more autonomy and authority the PM and PT need for success)
  - 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

Organizational Culture

- Organizational Culture Defined
  - A system of shared norms, beliefs, values, and assumptions which bind people together, thereby creating shared meanings. (e.g. dress code expression of egalitarism or hierarchy)
  - The "personality" of the organization that sets it apart from other organizations.
    - Provides a sense of identify to its members.
    - Helps legitimize the management system of the organization.
    - Clarifies and reinforces standards of behavior.
    - May differ across functional units

Key Dimensions Defining an Organization's Culture

Clarifies and reinforces standards of behavior

Helps to create social order

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 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. 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.

Implications of Organizational Culture for Organizing Projects

- Challenges for Project Managers in Navigating Organizational Cultures
  - Interacting with the culture and subcultures of the parent organization
  - Interacting with the project's clients or customer organizations
  - Interacting with other organizations connected to the project

Cultural Dimensions of an Organization Supportive of Project Management

FIGURE 3.7

Project Management Structures (cont'd)

- Organizing Projects: Network Organizations
  - An alliance of several organizations for the purpose of creating products or services.
    - A "hub" or "core" firm with strong core competencies outsources key activities to a collaborative cluster of satellite organizations.

Project Organization: Network Form

- Advantages
  - Cost Reduction
  - High Level of Expertise
  - Flexible
- Disadvantages
  - Coordination of Breakdowns
  - Loss of Control
  - Conflict

Key Terms

Balanced matrix

Dedicated project team

Matrix

Organizational culture

Projectitis

Projectized organization

Project Office (PO)

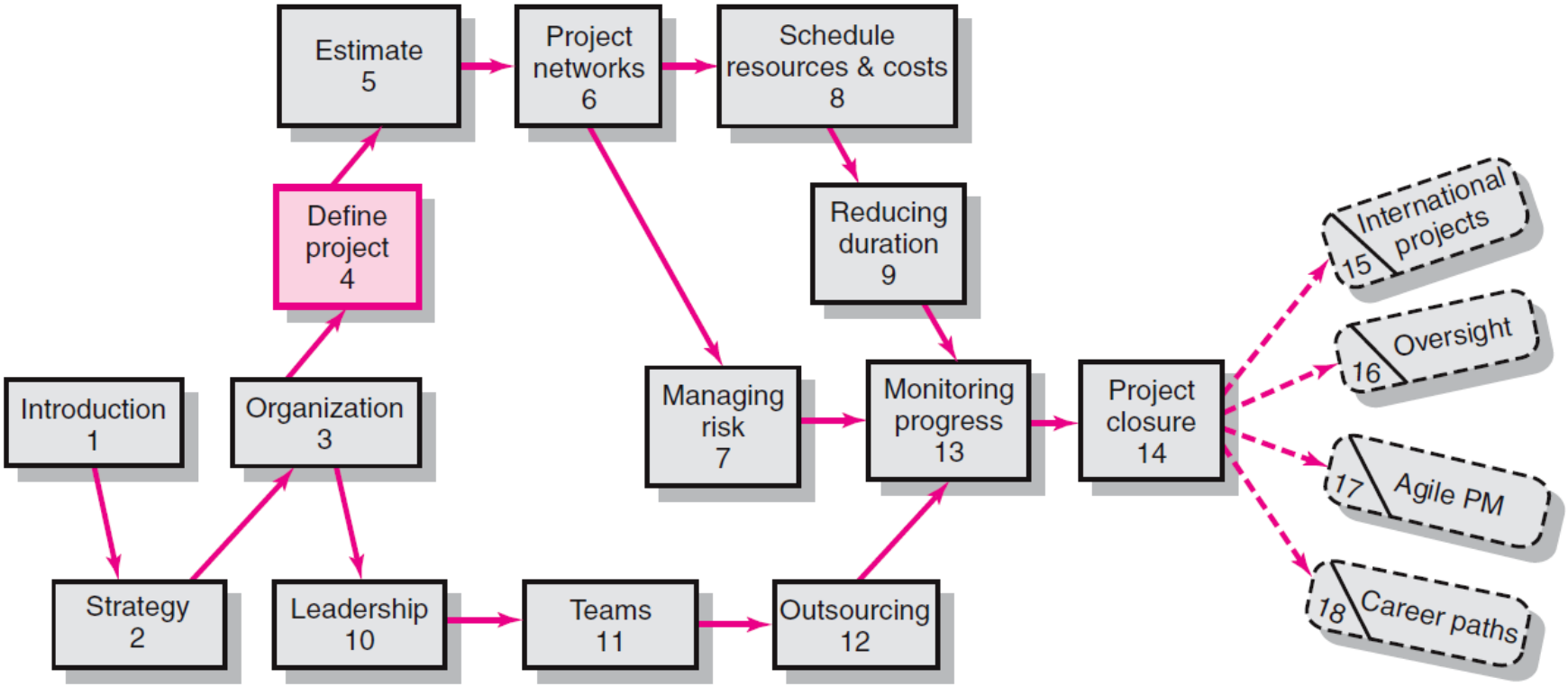
Strong matrix

Weak matrix

Ch. 4

Defining The Project

Where We Are Now



Defining the Project

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

Step 1: Defining the Project Scope

- Project Scope
  - A definition of the end result or mission of the project—a product or service for the client/customer—in specific, tangible, and measurable terms.
  - *We can control only what we have planned*
- Purpose of the Scope Statement
  - To clearly define the deliverable(s) for the end user.
  - To focus the project on successful completion of its goals.
  - To be used by the project owner and participants as a planning tool and for measuring project success.

Project Scope Checklist

1. Project objective
2. Deliverables
3. Milestones
4. Technical requirements
5. Limits and exclusions
6. Reviews with customer

SNAPSHOT FROM PRACTICE

Scope Statement

PROJECT OBJECTIVE

To construct a high-quality, custom home within five months at cost not to exceed $500,000.

DELIVERABLES

- A 2,200-square-foot, 2½-bath, 3-bedroom, finished home.
- A finished garage, insulated and sheetrocked.
- Kitchen appliances to include range, oven, microwave, and dishwasher.
- High-efficiency gas furnace with programmable thermostat.

MILESTONES

1. Permits approved—March 5
2. Foundation poured—March 14
3. Drywall in. Framing, sheathing, plumbing, electrical, and mechanical inspections passed—May 25
4. Final inspection—June 7

TECHNICAL REQUIREMENTS

1. Home must meet local building codes.
2. All windows and doors must pass NFRC class 40 energy ratings.
3. Exterior wall insulation must meet an "R" factor of 21.
4. Ceiling insulation must meet an "R" factor of 38.
5. Floor insulation must meet an "R" factor of 25.
6. Garage will accommodate two large-size cars and one 20-foot Winnebago.
7. Structure must pass seismic stability codes.

LIMITS AND EXCLUSIONS

1. The home will be built to the specifications and design of the original blueprints provided by the customer.
2. Owner is responsible for landscaping.
3. Refrigerator is not included among kitchen appliances.
4. Air conditioning is not included but prewiring is included.
5. Contractor reserves the right to contract out services.
6. Contractor is responsible for subcontracted work.
7. Site work limited to Monday through Friday, 8:00 A.M. to 6:00 P.M.

CUSTOMER REVIEW

John and Joan Smith

Project Scope: Terms and Definitions

- Scope Statements
  - Also called statements of work (SOW)
- Project Charter
  - Can contain an expanded version of scope statement
  - A document authorizing the project manager to initiate and lead the project.
- Scope Creep
  - The tendency for the project scope to expand over time due to changing requirements, specifications, and priorities.

Project Charter

Project Name			
Project Description			
Project Manager		Date Approved	
Project Sponsor		Signature	

Business Case	Expected Goals/Deliverables

Team Members

Name	Role

Risks and Constraints	Milestones	

Project Charter Example

Project Name	IVR Project		
Project Sponsor	Dave Sponsor	Project Manager	Alice Michaels
Date of Project Approval	8th Mar 2015	Last Revision Date	17th Apr 2015
Project Description	To introduce a new automated telephone system to ensure all calls get answered.		
Scope	A IVR system will be introduced to assist the sales team in taking orders, and also to ensure no orders are missed. The system is only to help the sales team at this stage, other teams such as support are out of scope.		
Business Case	To increase orders per sales team member by 20% from current levels. To reduced unhandled calls to 0%. To increase customer satisfaction by 10 points.		

Constraints (in priority order)	
Time	4 months
Budget	4 developers + 1 sales team rep
Scope	TBD
Quality	Prioritize time & budget over quality

Project Deliverables	An IVS system to assist the sales team + training for the sales team + support during the first operational month of the system.
Benefits (measurable results)	See KPIs below + business case above

KPI	Baseline	Goal
Orders per sales person pd	20	24
Unhandled calls pd	11	0
Customer satisfaction	17	27

Steering Committee		Project Team	
	CEO		Sales Rep
	Finance Director		4x developers TBD
	Sales Director		

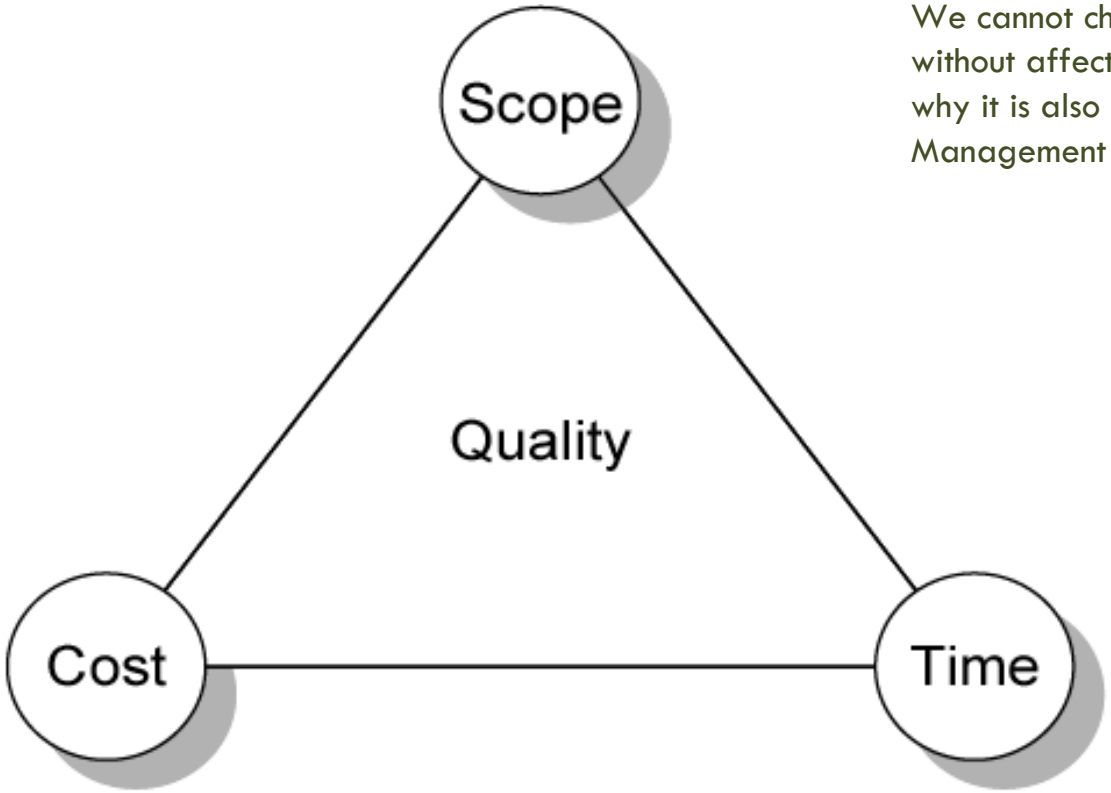
Key Stateholders	Name	Success Criteria

Risks	No team members have any previous experience of IVR setup, so there is a chance we've hugely underestimated the work involved.

Step 2: Establishing Project Priorities

- Causes of Project Trade-offs
  - Shifts in the relative importance of criterions related to cost, time, and performance parameters
    - Budget–Cost
    - Schedule–Time
    - Performance–Scope
- Managing the Priorities of Project Trade-offs
  - Constrain: a parameter is a fixed requirement.
  - Enhance: optimizing a criterion over others.
  - Accept: reducing (or not meeting) a criterion requirement.

Project Management Trade-offs

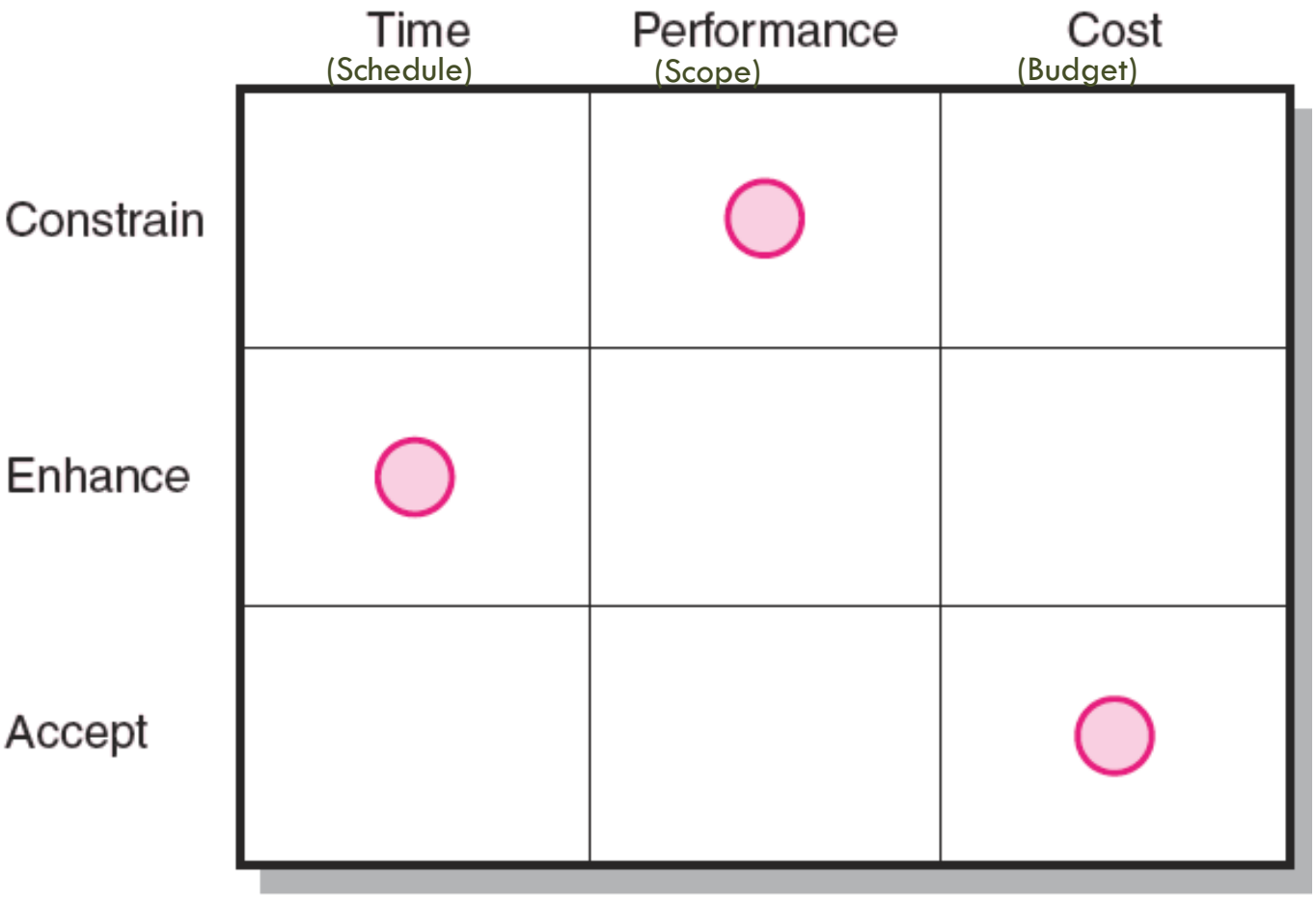


We cannot change one aspect without affecting another. That is why it is also called Project Management Triangle.

FIGURE 4.1

Project Priority Matrix

In this example,
willing to accept the change in cost, meaning a reduced budget to complete the project
Not willing to accept changes to performance, meaning scopeis the constraint
willing to enhance the time if possible



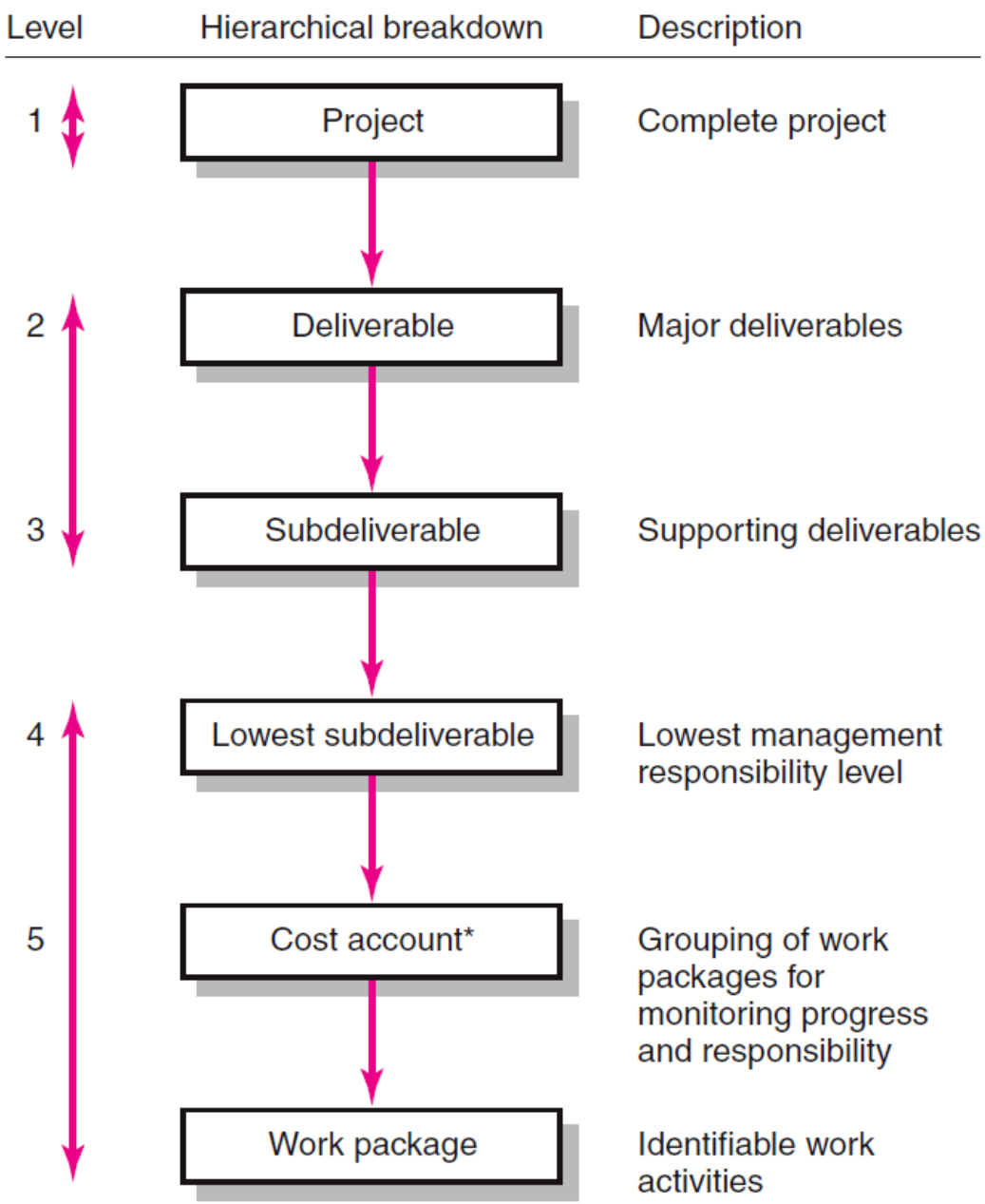
The time might be enhanced
as long as it only leads to reduced cost but
not if it means a decrease in performance

FIGURE 4.2

Step 3:Creating the Work Breakdown Structure

- Work Breakdown Structure (WBS)
  - An hierarchical outline (map) that identifies the products and work elements involved in a project.
  - Defines the relationship of the final deliverable (the project) to its subdeliverables, and in turn, their relationships to work packages.
  - Best suited for design and build projects that have tangible outcomes rather than process-oriented projects.

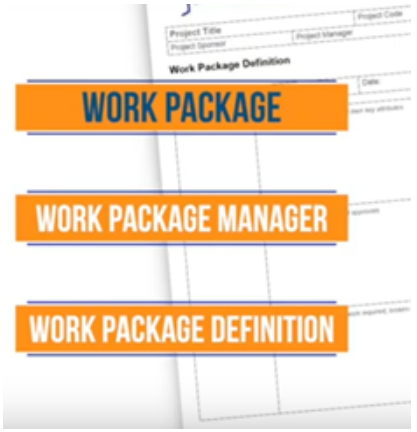
Hierarchical Breakdown of the WBS



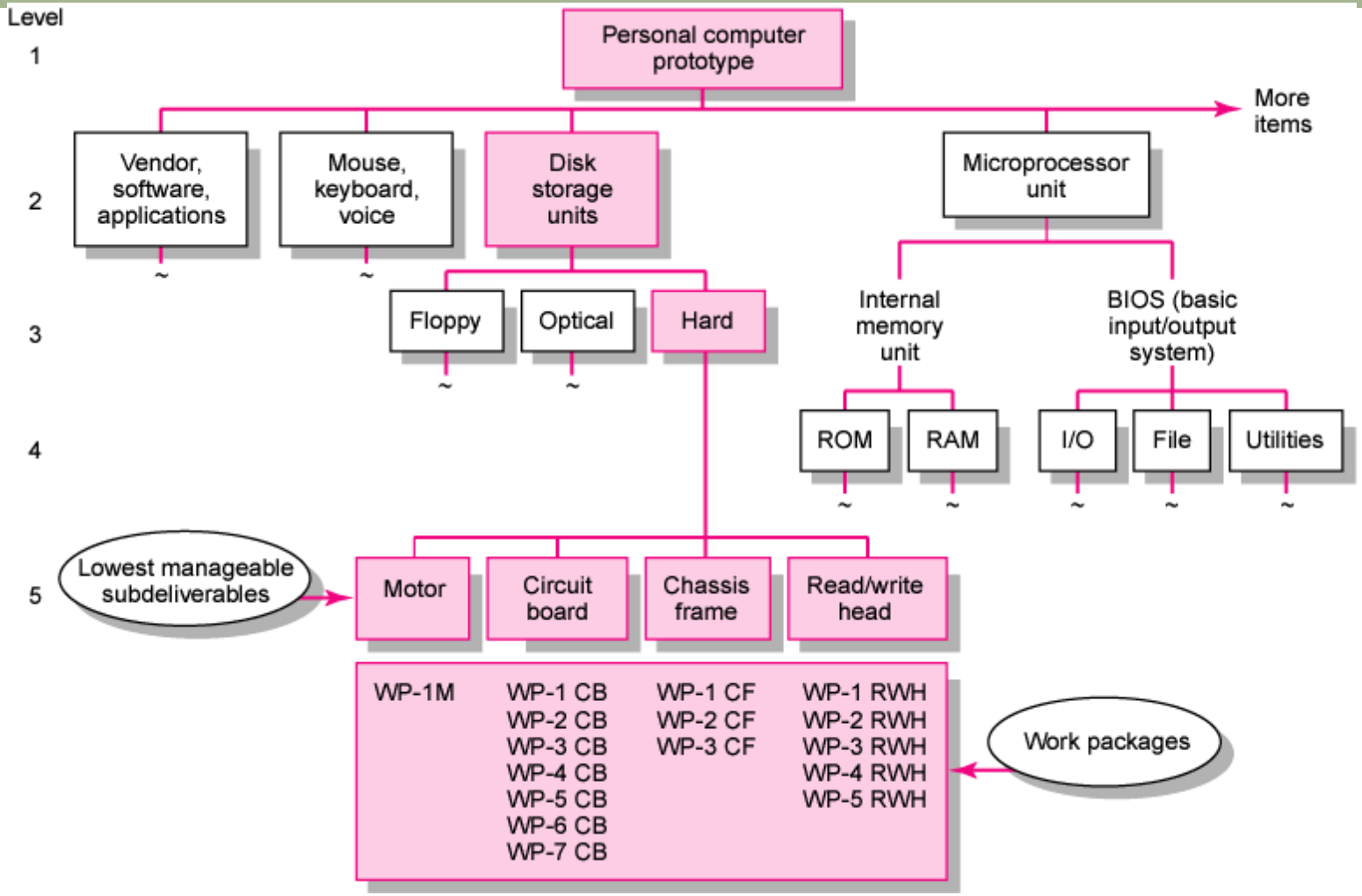
* This breakdown groups work packages by type of work within a deliverable and allows assignment of responsibility to an organizational unit. This extra step facilitates a system for monitoring project progress (discussed in Chapter 13).

How WBS Helps the Project Manager

- WBS
  - Facilitates evaluation of cost, time, and technical performance of the organization on a project.
  - Provides management with information appropriate to each organizational level.
  - Helps in the development of the Organization Breakdown Structure (OBS). which assigns project responsibilities to organizational units and individuals
  - Helps manage plan, schedule, and budget.
  - Defines communication channels and assists in coordinating the various project elements.

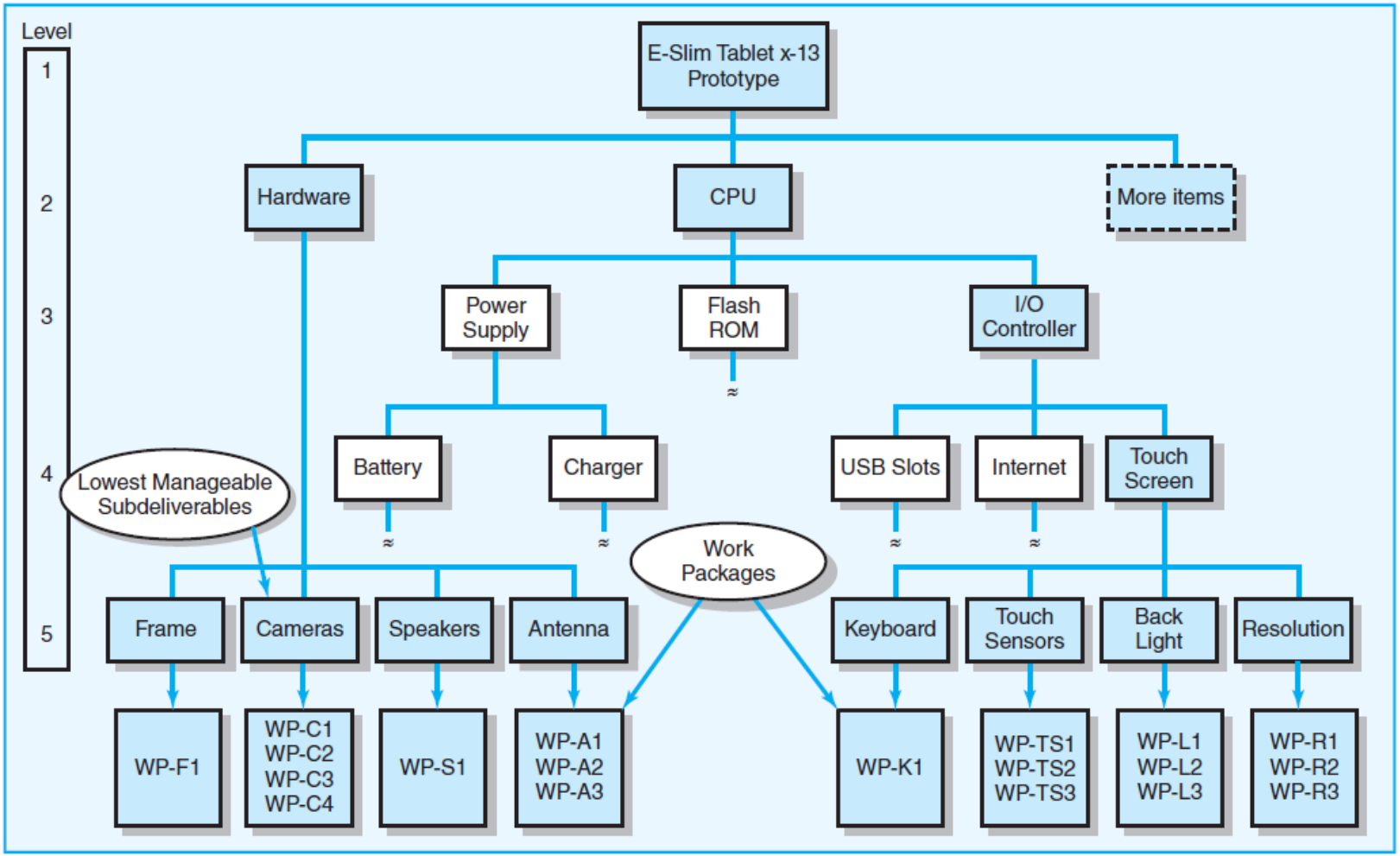


Work Breakdown Structure Example 1



WBS breaks down the product into its component parts. In each component there are tasks to complete that part, and this is the work package.

Work Breakdown Structure Example 2



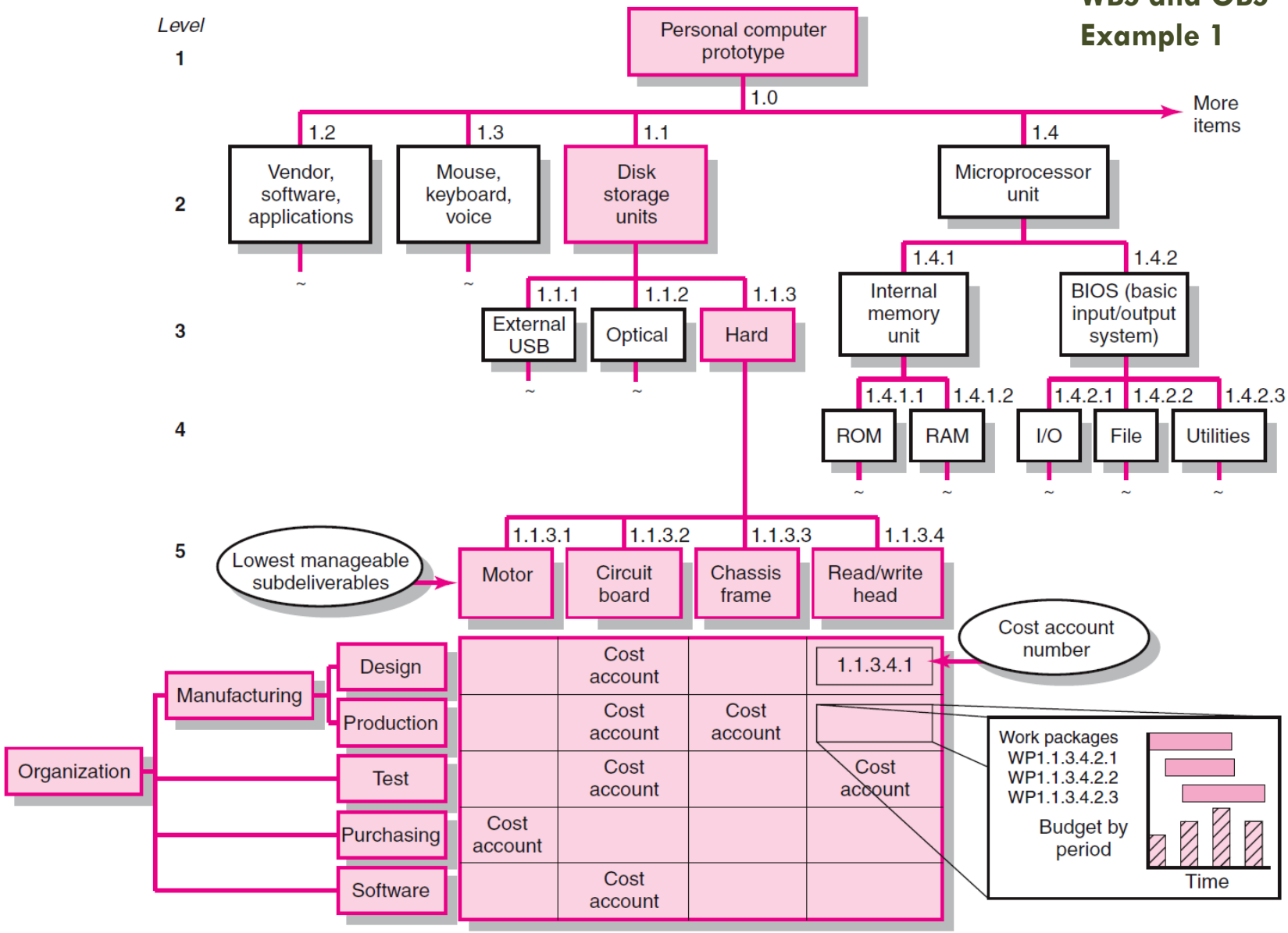
Work Packages

- A work package is the lowest level of the WBS.
  - It is output-oriented in that it:
    1. Defines work (what).
    2. Identifies time to complete a work package (how long).
    3. Identifies a *time-phased budget* to complete a work package (cost).
    4. Identifies resources needed to complete a work package (how much).
    5. Identifies a person responsible for units of work (who).
    6. Identifies monitoring points (milestones) for measuring success.

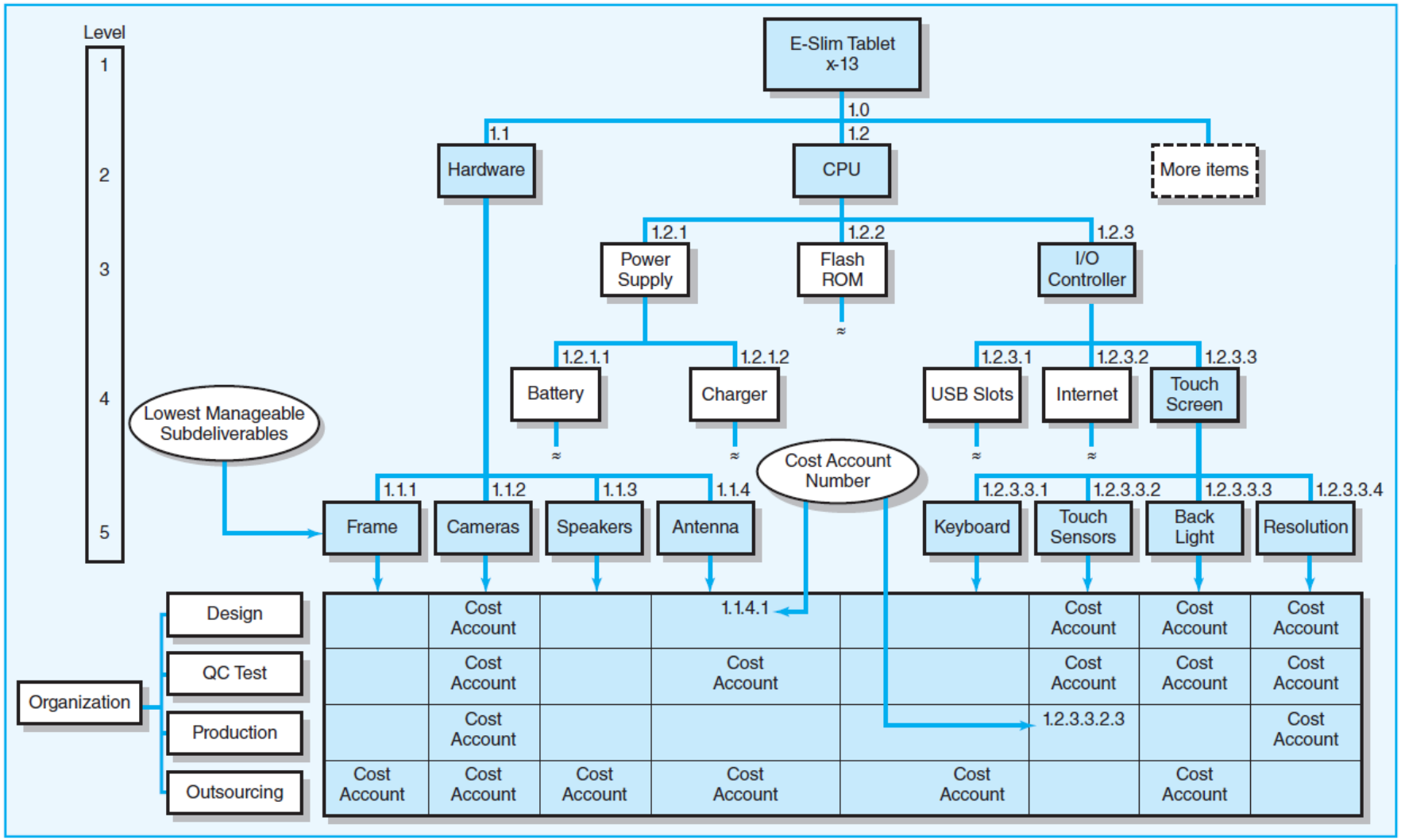
Step 4: Integrating the WBS with the Organization

- Organizational Breakdown Structure (OBS)
  - Depicts how the firm is organized to discharge its work responsibility for a project.
    - Provides a framework to summarize organization work unit performance.
    - Identifies organization units responsible for work packages.
    - Ties the organizational units to cost control accounts.

Integration of WBS and OBS Example 1



Integration of WBS and OBS Example 2



Step 5: Coding the WBS for the Information System

- WBS Coding System
  - Defines:
    - Levels and elements of the WBS
    - Organization elements
    - Work packages
    - Budget and cost information
  - Allows reports to be consolidated at any level in the organization structure

WBS Coding Example 1

1.0 Computer project
- 1.1 Disk storage units
  - 1.1.1 External USB
  - 1.1.2 Optical
  - 1.1.3 Hard
    - 1.1.3.1 Motor
      - 1.1.3.1.1 Sourcing work package
      - .
      - .
    - 1.1.3.4 Read/write head
      - 1.1.3.4.1 Cost account
      - 1.1.3.4.2 Cost account
        - 1.1.3.4.2.1 WP
        - 1.1.3.4.2.2 WP
        - 1.1.3.4.2.3 WP
      - 1.1.3.4.3 Cost account
      - .
      - .
      - .
      - etc.

WBS Coding Example 2

	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)

Responsibility Matrices

- Responsibility Matrix (RM)
  - Also called a linear responsibility chart.
  - Summarizes the tasks to be accomplished and who is responsible for what on the project.
    - Lists project activities and participants.
    - Clarifies **critical** interfaces between units and individuals that need **coordination**.
    - Provide an means for all participants to view their responsibilities and agree on their assignments.
    - Clarifies the extent or type of authority that can be 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

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

Project Communication Plan

- 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?

Information Needs

- Project status reports
- Deliverable issues
- Changes in scope
- Team status meetings
- Gating decisions
- Accepted request changes
- Action items
- Milestone reports

Developing a Communication Plan

1. Stakeholder analysis
2. Information needs
3. Sources of information
4. Dissemination modes
5. Responsibility and timing

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

Key Terms

Cost account

Milestone

Organization breakdown structure (OBS)

Scope creep

Priority matrix

Responsibility matrix

Scope statement

Process breakdown structure (PBS)

Work breakdown structure (WBS)

Work package