



GSOE9820 – Engineering Project Management

Corey Martin

Never Stand Still

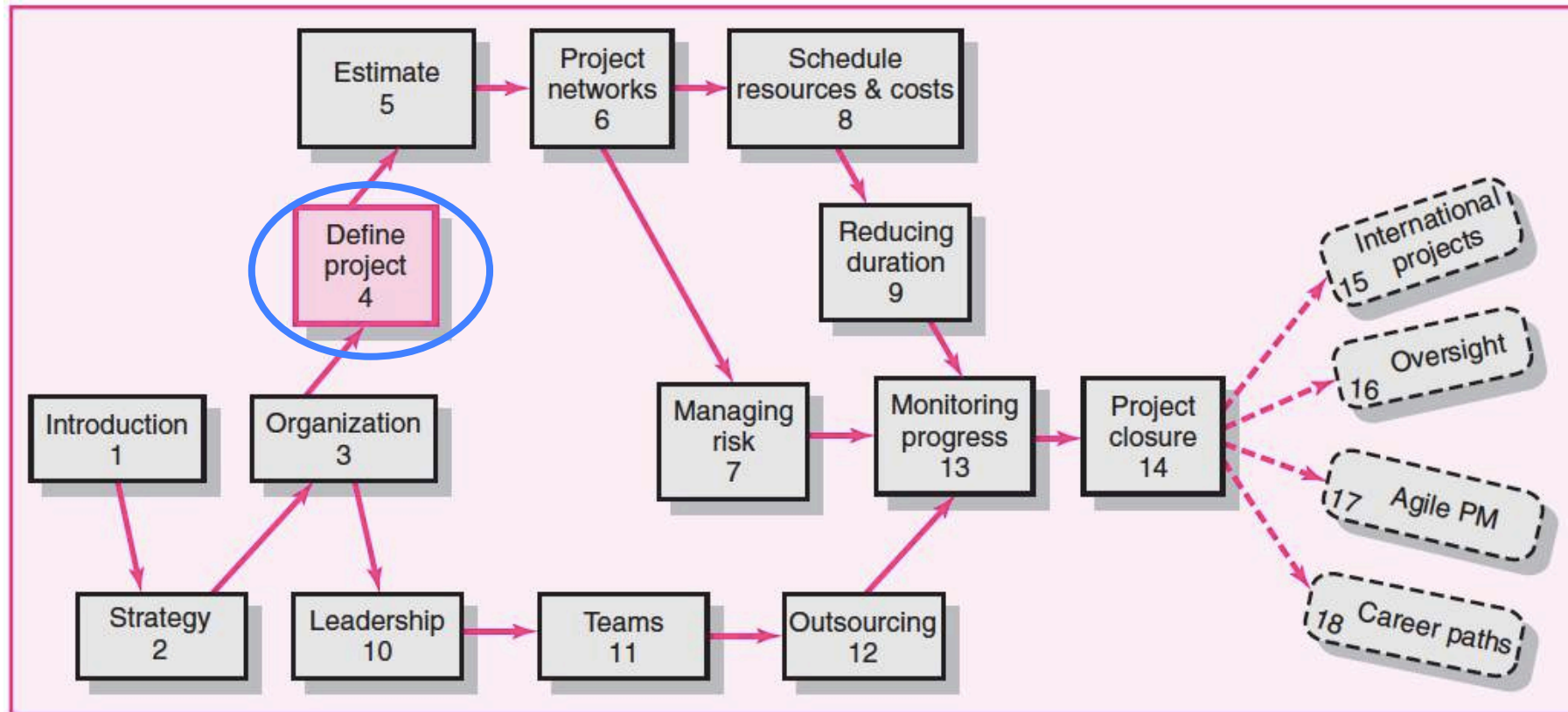
Faculty of Engineering

School of Mechanical and Manufacturing Engineering

# Week 3

## Defining Projects

# Course Roadmap



Reference: Gray, C & Larson, E, Project Management, 5<sup>th</sup> Ed. McGraw-Hill

# Sources of project failure



35-50% of failed projects are due to poorly defined scope

Sources:  
Smith and Tucker 1984  
Gobeli and Larson 1986  
<http://www.pmi.org/>

# Project Scale !





# Defining the project

STEP 1 : Defining the Project Scope

STEP 2 : Establishing Project Priorities

STEP 3 : Creating the Work/Product/Process Breakdown Structure (WBS/PBS)

STEP 4 : Coding the WBS/PBS for the Information System

STEP 5 : Integrating the WBS/PBS with the Organisation



**Iterative**

# Step 1: Defining the Project Scope

- Project Scope
  - A definition of the end result or mission of the project. This is often in the form of a product or service for a customer.
  - The work that needs to be accomplished to deliver a product, service, or result with the specified features and functions.<sup>[1]</sup>
- 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.

Reference 1: A Guide to the Project Management Body of Knowledge (PMBOK Guide) – 4th Edition. Project Management Institute, 2008

# Project Scope Checklist



# Some common project terms

- 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.
  - Can have a positive or negative effect on the project.



# Step 2: Establishing Project Priorities

Quality and the ultimate success of a project are traditionally defined as meeting and/or exceeding the expectations of the key stakeholders.

E.g. Customers/Upper management.

It is often measured in terms of

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



# Triple Constraint Model



# Trade-Offs / Compromises

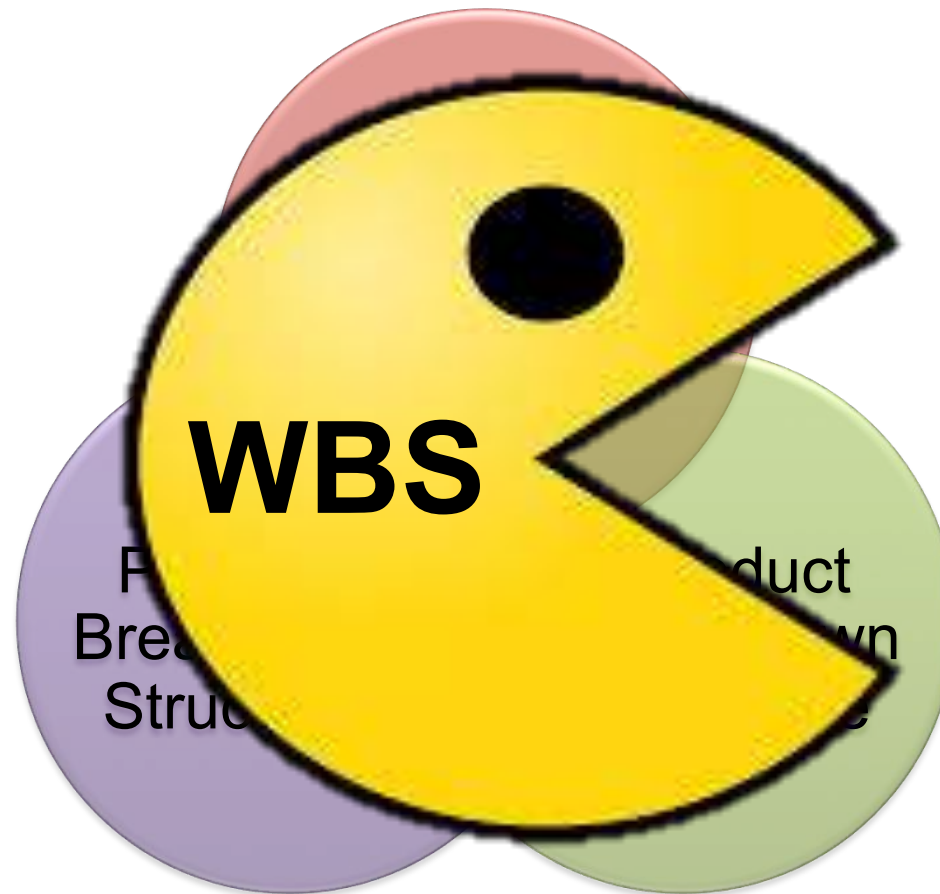
- Causes of Project Trade-offs
  - Shifts in the relative importance of criteria related to cost, time and performance.
- Managing the Priorities of Project Trade-offs
  - Constrain
    - a parameter is a fixed requirement.
  - Enhance
    - optimizing a criterion over others.
  - Accept
    - reducing (or not meeting) a criterion requirement.

# Project Priority Matrix

The purpose is to define and agree on what the priorities and constraints of the project are so that the right decisions can be made at the appropriate time.

	Time	Performance	Cost
Constrain		●	
Enhance	●		
Accept			●

# Step 3: Creating the Work/Product/Process Breakdown Structure (WBS/PBS)





# History of WBS vs PBS

The concept of a WBS goes back to the development of PERT in the USA, in the 1950s

The concept of a PBS is integral to the PRINCE2 methodology. The origins of PRINCE can be traced back to the UK in the 1970s.

# Creating the WBS

## Work Breakdown Structure (WBS)

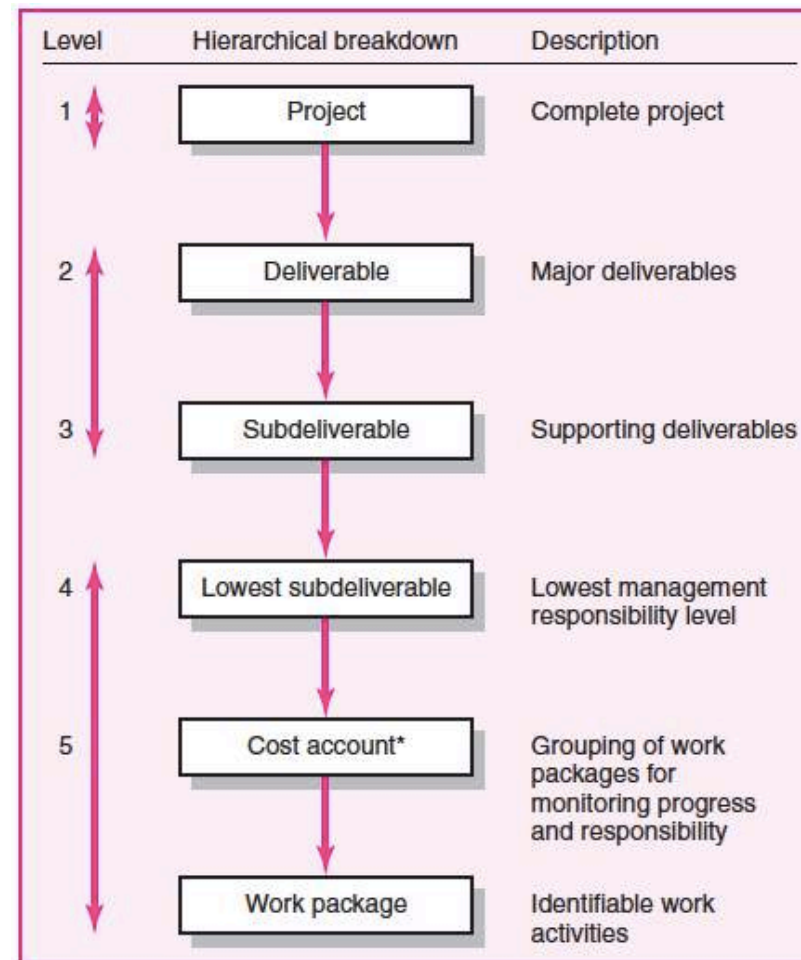
- An hierarchical outline (map) that identifies the **total scope of work** to be carried out by the project team to accomplish the project objectives and create the required deliverables.
- Defines the relationship of the final deliverable (the project) to its sub-deliverables, and in turn, their relationships to **work packages**.

# Advantages of using a WBS

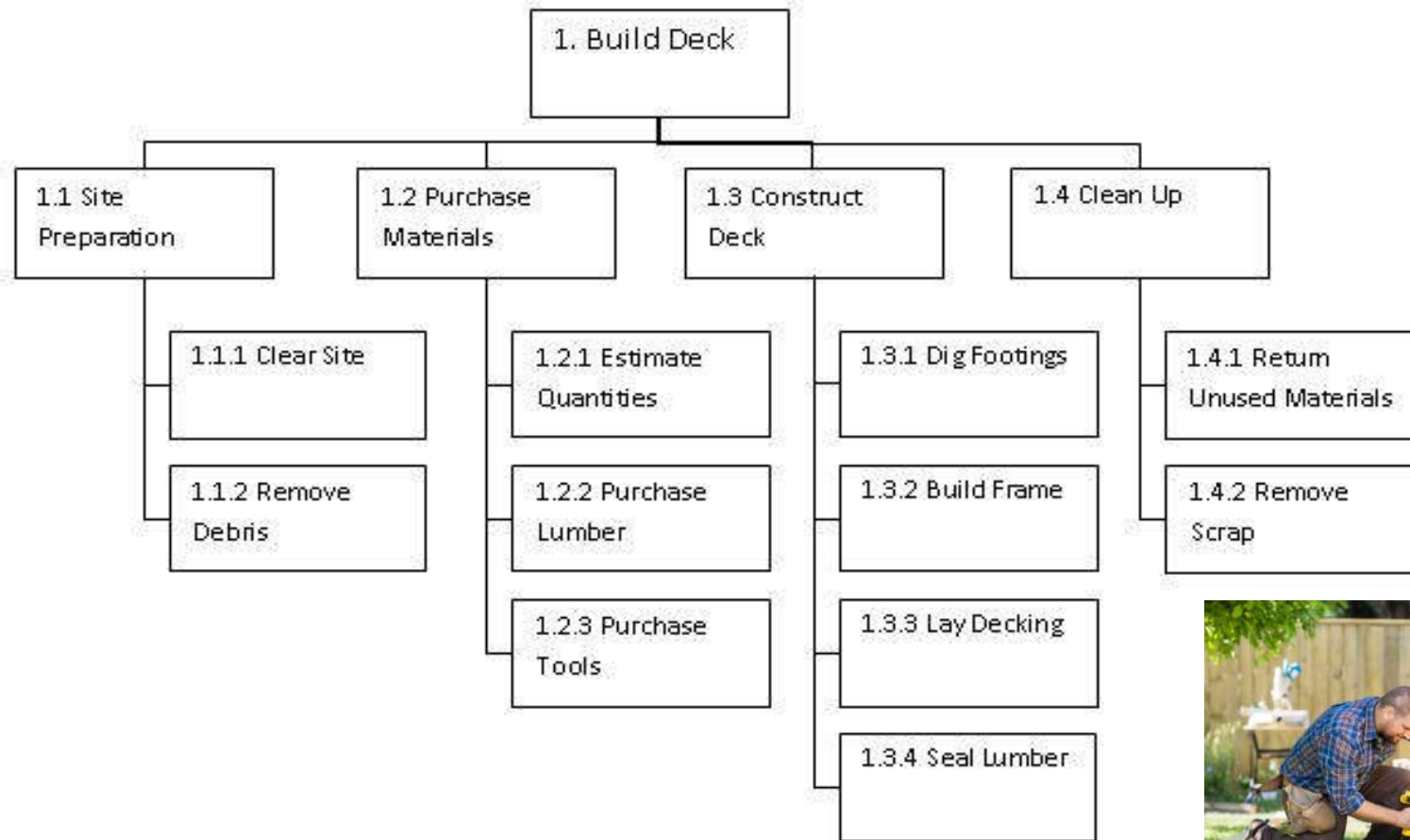
- To improve estimating
- To better control the project execution
- To more accurately verify project completion
- To improve the opportunity for use of historical information, which, can aid in both speed and accuracy of future projects.
- Is a repeatable process that can be used as a template for future similar projects.

Reference: Project Management Body of Knowledge (PMBOK®), and the Practice Standard for Work Breakdown Structures – Second Edition from the Project Management Institute (PMI)

# Building a WBS Hierarchy



# Sample WBS



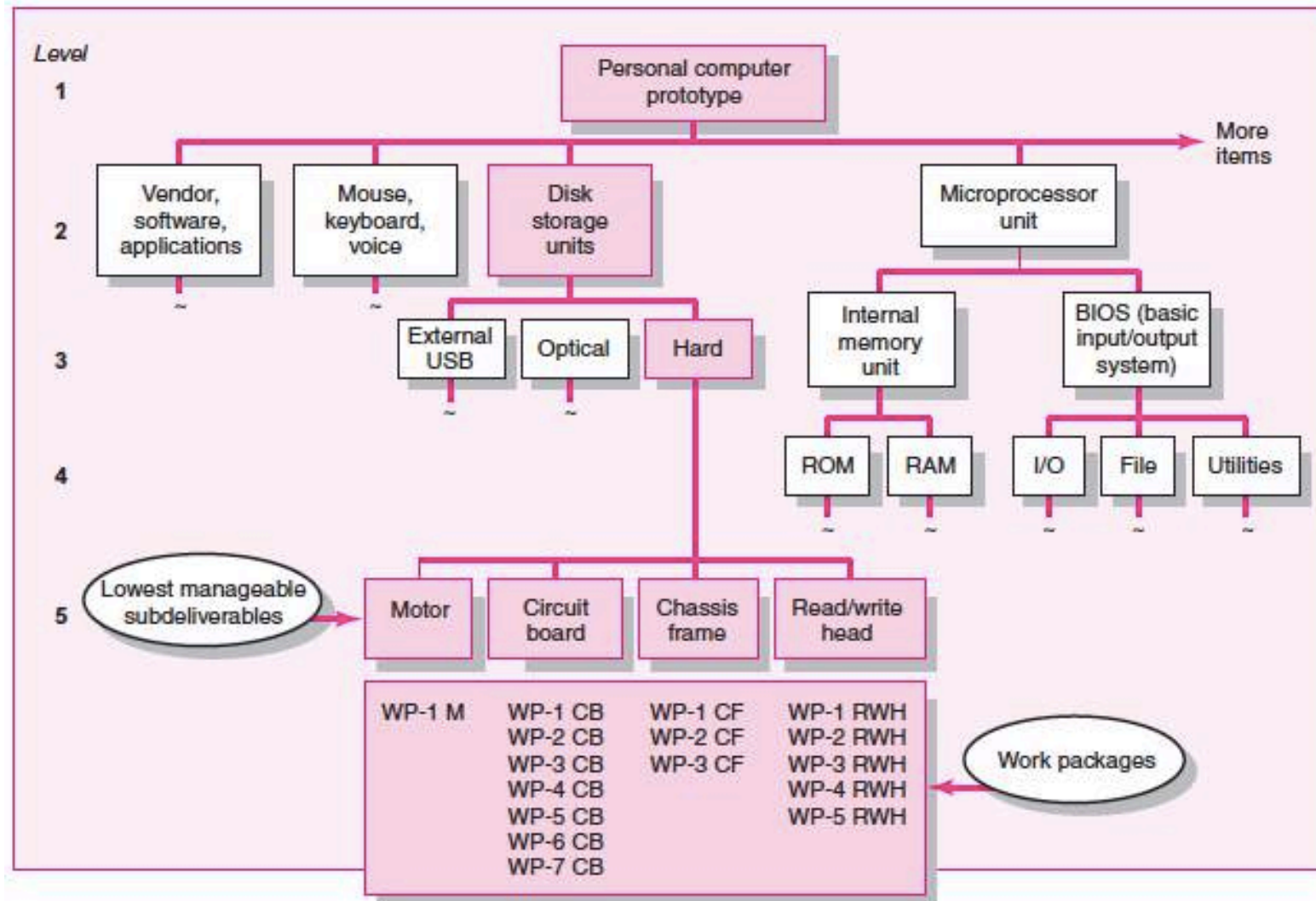


# Creating the PBS

## Product Breakdown Structure (PBS)

- An hierarchical outline (map) that identifies **ALL** the **things** that the project will make or outcomes that it will deliver.
- The PBS diagram differentiates between the different types of product (e.g. final product, assemblies, internal and external products):

# Sample Product Breakdown Structure (PBS)



# Sample Process Breakdown Structure (PBS)

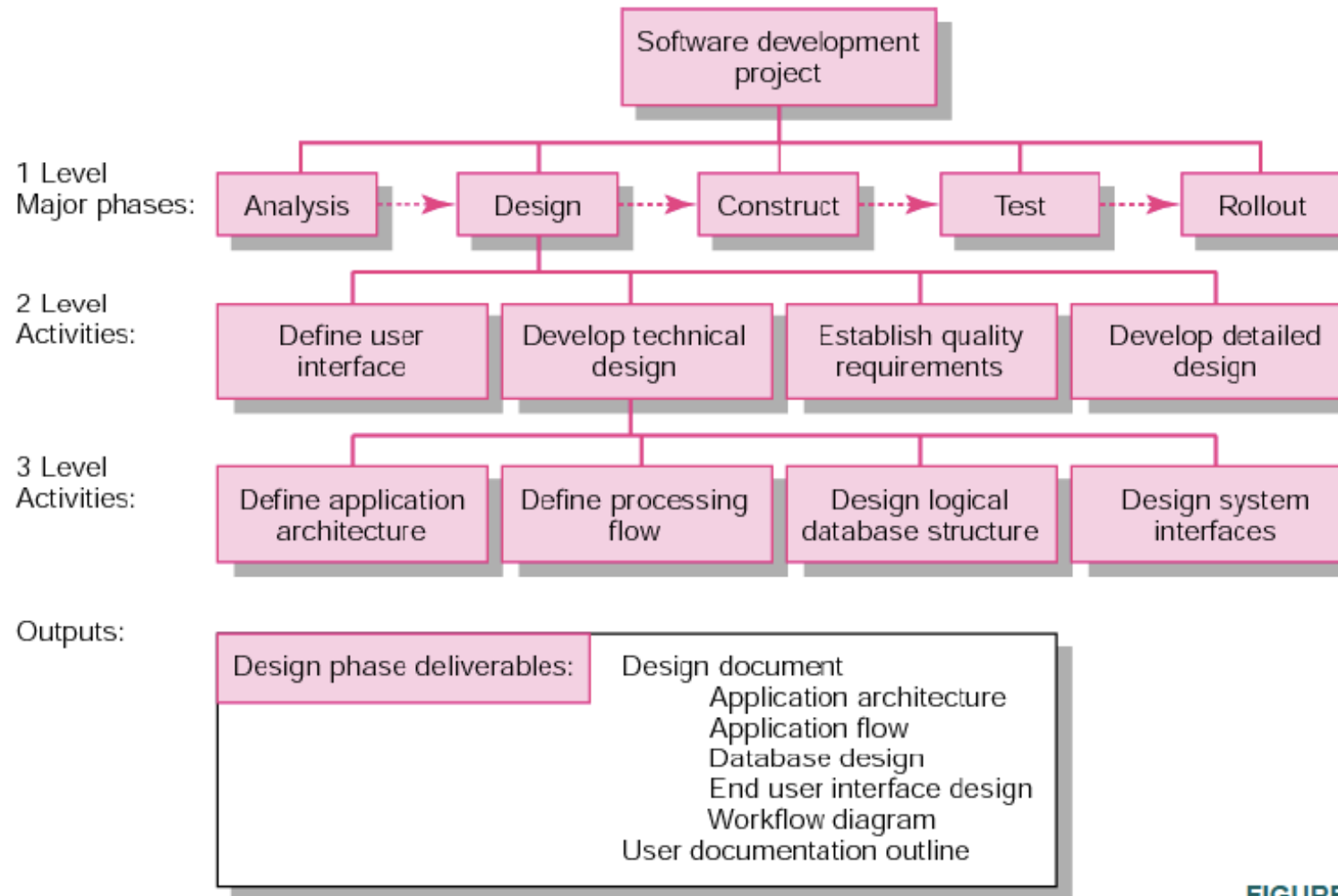


FIGURE 4.8

# Work Packages

A work package is the lowest level of the WBS.

It is **output-oriented** and contains the project details:

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.

# Sample work package

WP Description <u>Final version</u>	Page <u>1</u> of <u>1</u>
WP ID <u>1.1.3.2</u>	Project <u>PC proto</u>
Deliverable <u>Circuit board</u>	Date <u>9/29/XX</u>
Original Unit <u>Software</u>	Estimator <u>RMG</u>
WP Duration <u>3</u> work weeks	Total Budget \$ <u>265</u>

Time-Phased Budget (\$)

		Work periods					
Labor costs	Rate	1	2	3	4	5	Total
Code	\$ XX/hr	50	30	20			\$100
Document	\$ XX/hr		10	15			25
Publish	\$ XX/hr			5			5
<b>Total labor</b>		50	40	40			\$130
Materials			20				20
Equipment	\$ XX/hr	50	15	50			115
Other _____							
<b>Total direct</b>		100	75	90			\$265



# Step 4: Coding the WBS

The WBS Coding System defines:

- Levels and elements of the WBS
- Organization elements
- Work packages
- Budget and cost information

The most commonly used scheme is numeric indention

Allows reports to be consolidated at any level in the organization structure

# Sample WBS Coding

Numbering element	Description	Level
1.0	Project/Contract name	1
1.1	Major project Subsystem	2
1.1.1	Task	3
1.1.1.1	Subtask	4
1.1.1.1.1	Work Package	5
1.1.1.1.1.1	Components	6

Example of alternative coding scheme : **3R-237A-P2-33.6**

# WBS Tips

- **Plan outcomes, not just actions**
- **100% Rule**
  - The WBS must capture all deliverables of the project
- **Have mutually exclusive work packages**
  - No work package should be described in more than one sub-deliverable
- **Level of Detail**
  - Sub-deliverables should be small enough for 1 person to be responsible
  - No activity should be longer than 10 days or a single reporting period

# Common WBS Misconceptions

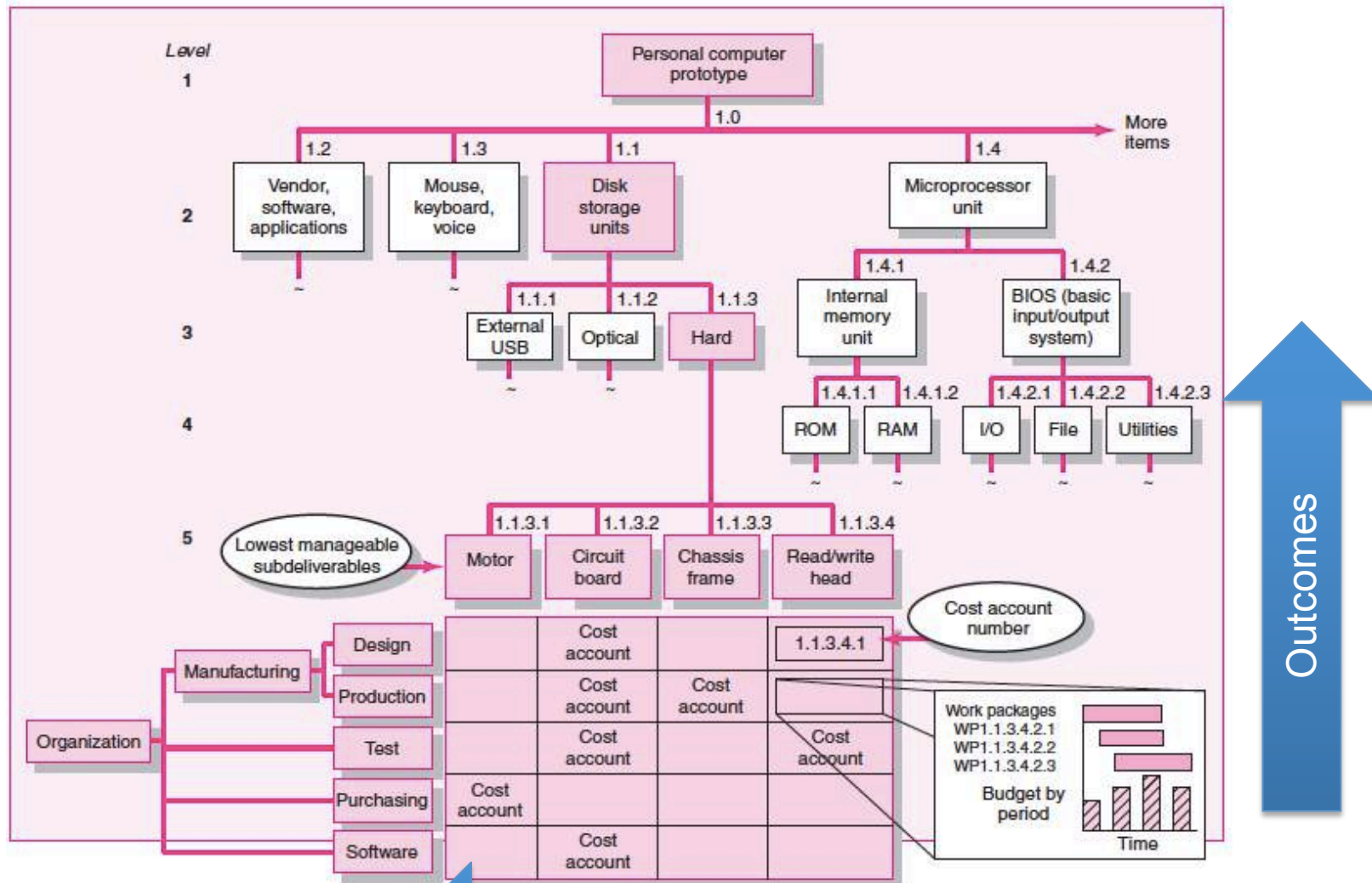
- A WBS is not an exhaustive list of work. It is instead a comprehensive classification of project scope.
- A WBS is neither a project plan, a schedule, nor a chronological listing. It specifies **what** will be done, not how or when.
- A WBS is not an organizational hierarchy, although it may be used when assigning responsibilities.

# Step 5: Integrating the WBS with the Organisation

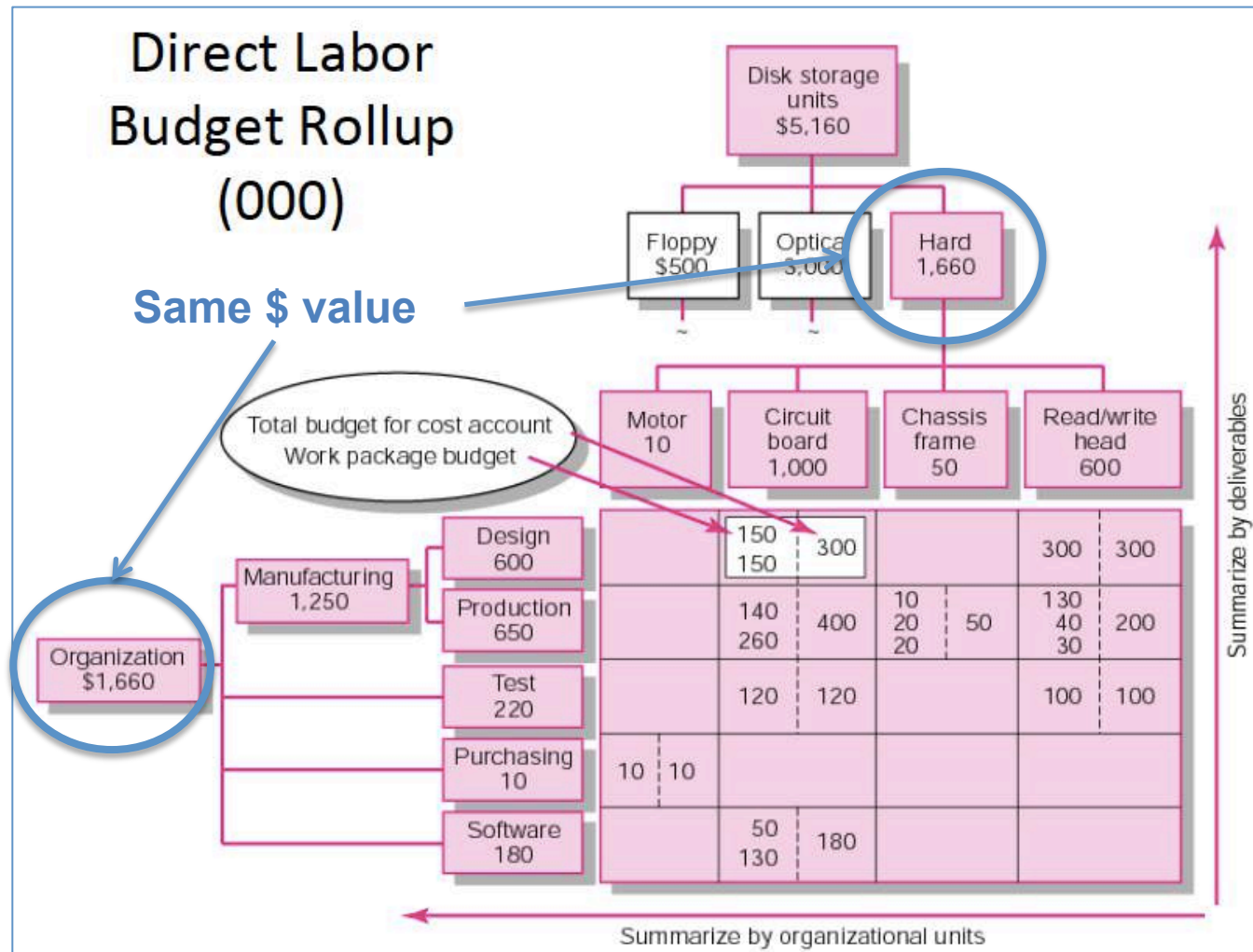
- Organizational Breakdown Structure (OBS)
  - Depicts how the firm is organized to discharge its work responsibility for a project
  - Provides a framework to summarize organization work unit performance
  - Identifies organization units responsible for work packages
  - Ties the organizational units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



# Sample PBS with integrated OBS



# Sample Cost Accounting



# Cost Accounting

- Is a technique of understanding cost
- Measures and reports information relating to the cost of acquiring and using resources
- Helps with planning and management decisions
- Is directly related to an organisations strategy. Decisions are often made on this information.

# Cost

An amount that has to be paid or given up in order to get something.



Source: <http://www.businessdictionary.com/definition/cost.html>

# Common project costs



# Financial Accounting

- Financial accounting reports on what happened in the PAST
- Financial accounting measures and records business transactions and provides financial statements based on Generally Accepted Accounting Principles (GAAP)

# Responsibility Matrix

- Often used for smaller projects
- Also known as staff matrix and linear responsibility chart
- Used by the project manager to define authority, responsibility and communications

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



# Project Communication Plan

The purpose of a project communication plan is to express what, who, how and when information will be transmitted to project stakeholders so that schedules, issues and action items can be tracked.



# Questions to be answered by the 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?

# Typical Reports found in a Communication Plan

- Project status reports
- Team status meetings
- Gating (Go / No-Go) decisions
- Accepted request changes
- Deliverable issues
- Changes in scope
- Action items
- Milestone reports
- Risk reports



# Sample Communication Plan

<i><b>What Information</b></i>	<i><b>Target Audience</b></i>	<i><b>When?</b></i>	<i><b>Method of Communication</b></i>	<i><b>Provider</b></i>
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

# Summary

- Steps in defining a project
- Project Scope
  - what's included
- Scope creep
- Understanding project priorities
- Work Breakdown Structure (WBS)
  - Work Packages
- Product and Process Breakdown Structures (PBS)
- Integrating the WBS into the organisation
- Cost Accounting
- Value of a communications plan

# Next week ...

## Dynamic Teams, Organisational structure and culture

