*CHAPTER 4:*

# DEFINING A PROJECT

1

## CONTENTS

1. Defining a project

2. Estimating project times and costs

2

# DEFINING A PROJECT

3

## Defining the Project

Step 1: Defining the Project Scope

Step 2: Establishing Project Priorities

Step 3: Creating the Work Breakdown Structure (WBS)

Step 4: Integrating the WBS with the Organization

Step 5: Coding the WBS for the Information System

4

## Why we need to define the project scope?

5

## Step 1: Defining the Project Scope

1. 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.
2. 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.

6

## Project Scope Checklist

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

7

## Step 2: Establishing Project Priorities

1. 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
2. Managing the Priorities of Project Trade-offs
   - Constrain: a parameter is a fixed requirement.
   - Enhance: optimizing a parameter over others.
   - Accept: reducing (or not meeting) a parameter requirement.

8

## Project Management Trade-offs

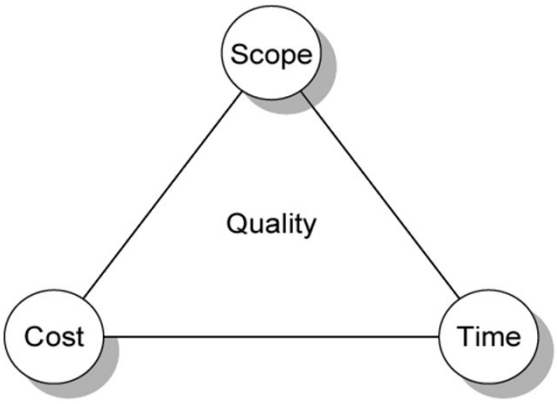
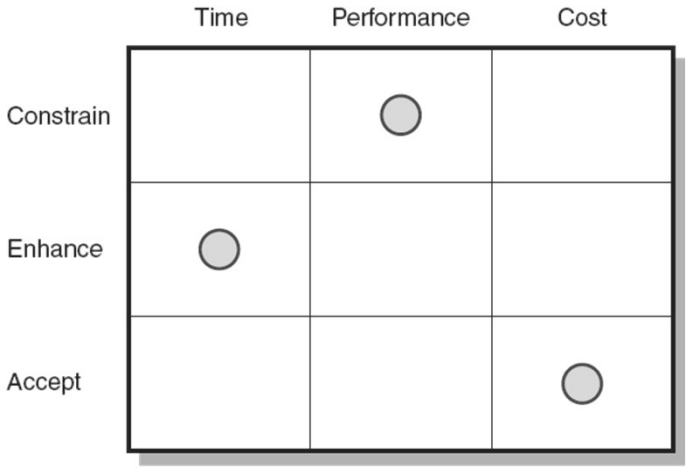



FIGURE 4.1

9

## Project Priority Matrix

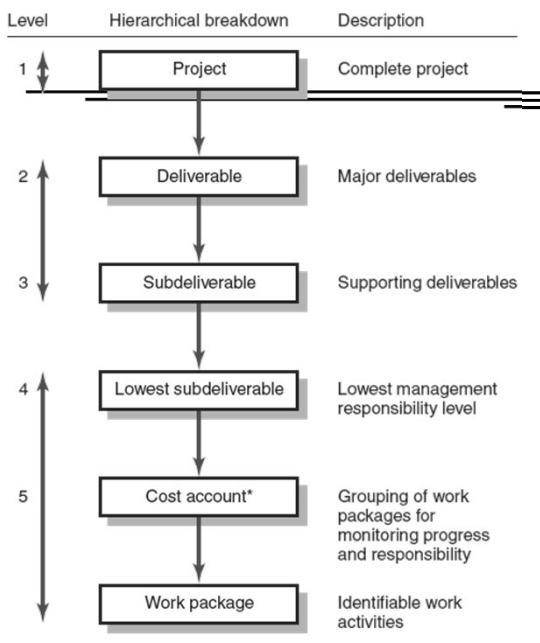



10

## Step 3: Creating the Work Breakdown Structure

1. 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.

11




**Hierarchical Breakdown of the WBS**

12

## How WBS Helps the Project Manager?

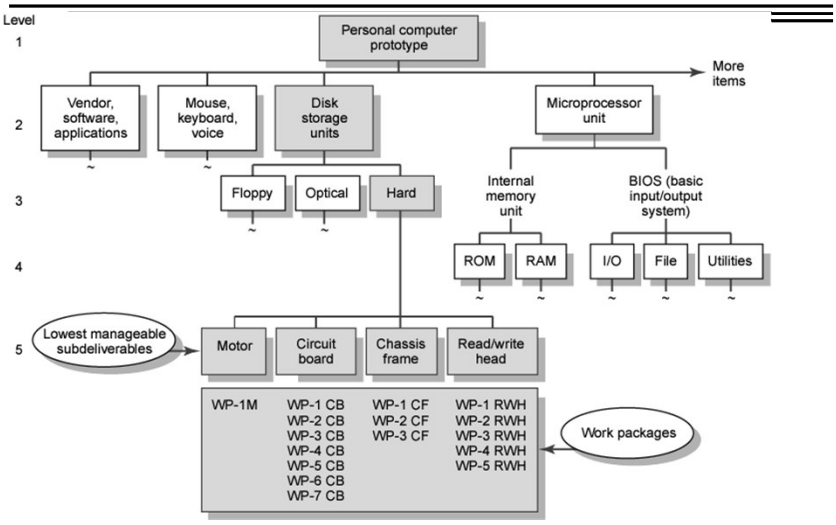
13

## How WBS Helps the Project Manager

1. WBS
   - Helps manage plan, schedule, and budget.
   - 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
   - Defines communication channels and assists in coordinating the various project elements.

14

## Work Breakdown Structure




15

## Work Packages

1. A work package is the lowest level of the WBS.
   - It is output-oriented in that it:
     - 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 (milestones) for measuring success.

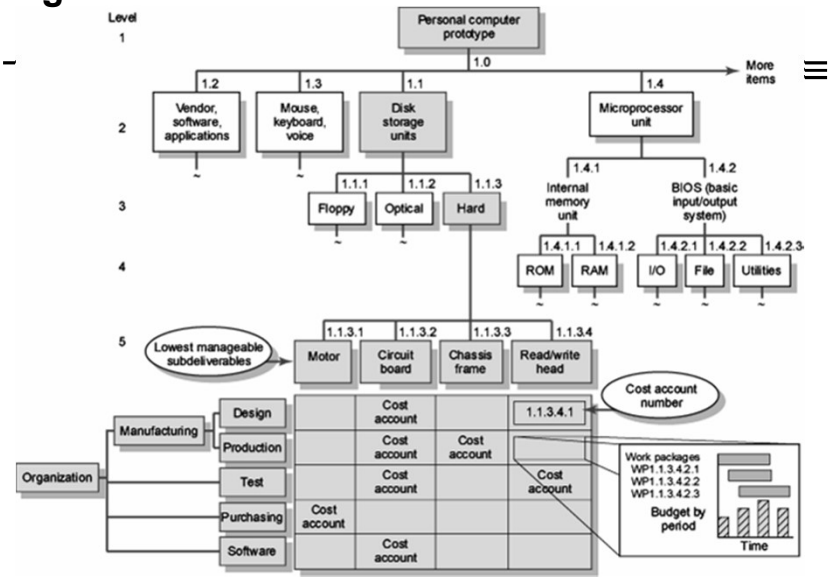
16

## Step 4: Integrating the WBS with the Organization

1. 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.

17

## Integration of WBS and OBS

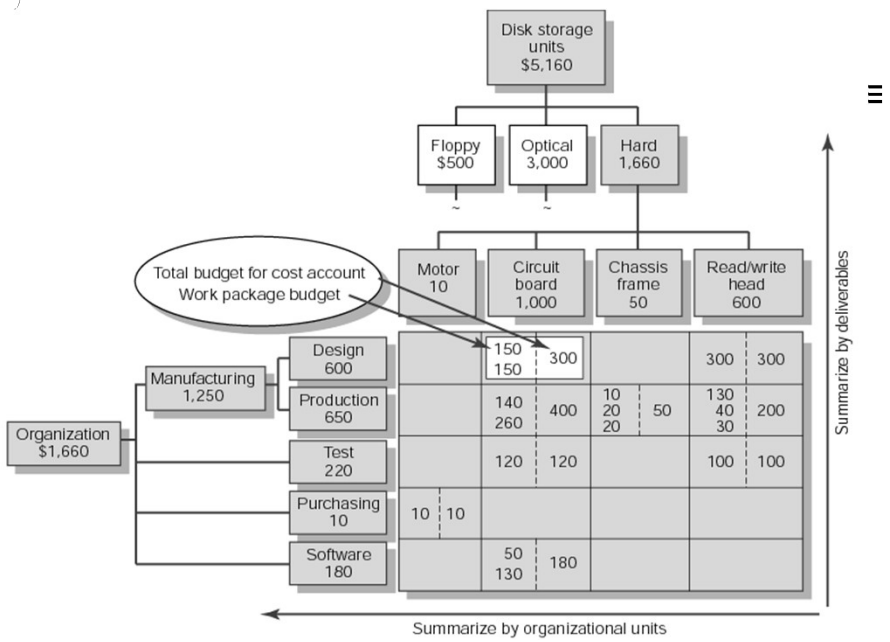



18

# Project Roll-up

1. Cost Account
   - The intersection of the WBS and the OBS that is a budgetary control point for work packages.
   - Used to provide a roll-up (summation) of costs incurred over time by a work package across organization units and levels, and by deliverables.

19



## Direct Labor Budget Sorted By WBS

| | | Direct Labor Budget | |
|---|---|---|---|
| 1.1.3 | Hard drive | 1,660 | |
| 1.1.3.1 | Motor | 10 | |
| | Purchasing | | 10 |
| 1.1.3.2 | Circuit board | 1,000 | |
| | Design | | 300 |
| | Production | | 400 |
| | Testing | | 120 |
| | Software | | 180 |
| 1.1.3.3 | Chassis frame | 50 | |
| | Production | | 50 |
| 1.1.3.4 | Read/write head | 600 | |
| | Design | | 300 |
| | Production | | 200 |
| | Testing | | 100 |

21

## Direct Labor Budget Sorted by OBS

| | | Direct Labor Budget | |
|---|---|---|---|
| Design | | 600 | |
| 1.1.3.2 | Circuit board | | 300 |
| 1.1.3.4 | Read/write head | | 300 |
| Production | | 650 | |
| 1.1.3.2 | Circuit board | | 400 |
| 1.1.3.3 | Chassis frame | | 50 |
| 1.1.3.4 | Read/write head | | 200 |
| Testing | | 220 | |
| 1.1.3.2 | Circuit board | | 120 |
| 1.1.3.4 | Read/write head | | 100 |
| Purchasing | | 10 | |
| 1.1.3.1 | Motor | | 10 |
| Software | | 180 | |
| 1.1.3.2 | Circuit board | | 180 |
| Total | | 1,660 | |

22

## Step 5: Coding the WBS for the Information System

1. 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

23

| ID | Task Name |
|---|---|
| 1 | **1 Computer project** |
| 2 | **1.1 Disk Storage units** |
| 3 | 1.1.1 Floppy |
| 4 | 1.1.2 Optical |
| 5 | **1.1.3 Hard** |
| 6 | **1.1.3.1 Motor** |
| 7 | 1.1.3.1.1 Sourcing work package |
| 8 | 1.1.3.1.2* |
| 9 | 1.1.3.1.3* |
| 10 | 1.1.3.1.4* |
| 11 | **1.1.3.2 Read/write head** |
| 12 | 1.1.3.2.1 Cost account |
| 13 | 1.1.3.2.2 Cost account |
| 14 | 1.1.3.2.3 WP |
| 15 | 1.1.3.2.4 WP |
| 16 | 1.1.3.2.5 WP |
| 17 | 1.1.3.2.6 Cost account |
| 18 | 1.1.3.2.7* |
| 19 | 1.1.3.2.8* |
| 20 | 1.1.3.2.9* |

## WBS Coding

24

# Responsibility Matrices

1. 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.

25

## 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

**26**

## Responsibility Matrix for the Conveyor Belt Project

| | Organization | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Deliverables | Design | Development | Documentation | Assembly | Testing | Purchasing | Quality Assur. | Manufacturing |
| Architechural design | 1 | 2 | | | 2 | | 3 | 3 |
| Hardware specifications | 2 | 1 | | | | 2 | 3 | |
| Kernel specifications | 1 | 3 | | | | | | 3 |
| Utilities specification | 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

27

# ESTIMATING PROJECT TIMES AND COSTS

28

# Estimating Projects

1. Estimating
   - The process of forecasting or approximating the time and cost of completing project deliverables.
   - The task of balancing the expectations of stakeholders and the need for control while the project is implemented
2. 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

29

## Why Estimating Time and Cost Are Important

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

30

## 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. Don't make allowances for contingencies.
7. Adding a risk assessment helps avoid surprises to stakeholders.

31

## Macro versus Micro Estimating

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

| Condition | Macro Estimates | Micro 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 | |

32

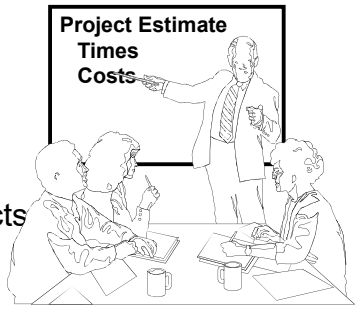
## Estimating Projects: Preferred Approach

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

33

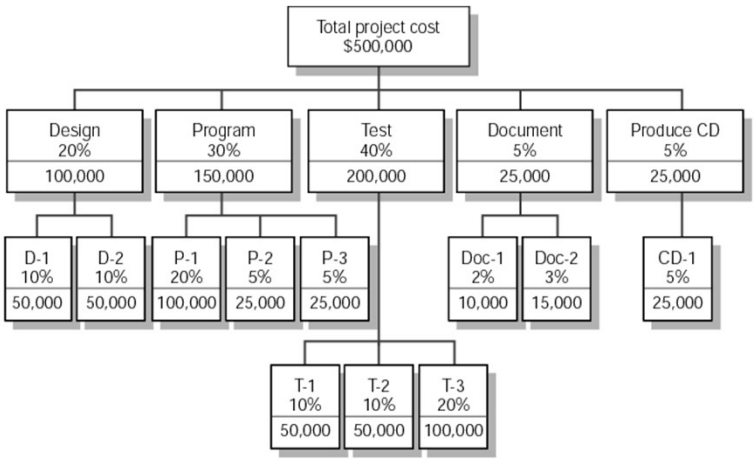
## Methods for Estimating Project Times and Costs

1. Macro (Top-down) Approaches
   - Consensus methods
   - Ratio methods
   - Apportion method
   - Function point methods for software and system projects




34

## Apportion Method of Allocating Project Costs Using the Work Breakdown Structure




35

## 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

36

## 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) |

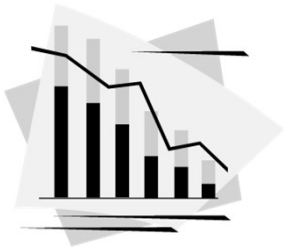
**Application of Complexity Factor**

| 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 |

37

## Methods for Estimating Project Times and Costs

1. Micro (Bottom-up) Approaches
   - Template method
   - Parametric Procedures Applied to Specific Tasks
   - Detailed Estimates for the WBS Work Packages
   - Phase Estimating: A Hybrid



38

## SB45 Support Cost Estimate Worksheet

**Project Number:** *17* | **Project Manager:** *Kathleen Walling*

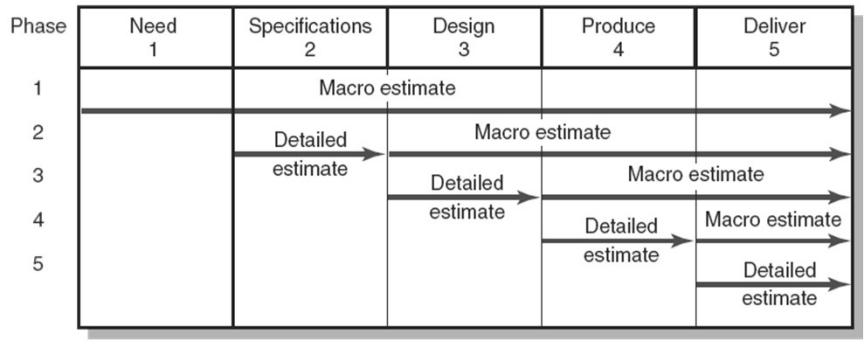
**Project Description:** *Road Diversion Project* | **Date:** 5 - 07

| WBS ID | Description | Estimator 1 Low Est. Days | Estimator 1 Aver. Est. Days | Estimator 1 High Est. Days | Estimator 2 Low Est. Days | Estimator 2 Aver. Est. Days | Estimator 2 High Est. Days | Estimator 3 Low Est. Days | Estimator 3 Aver. Est. Days | Estimator 3 High Est. Days | Estimator Averages Aver. Low Days | Estimator Averages Aver. Days | Estimator Averages Aver. High Days | Ratio* Range/ Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 102 | Engineering | 95 | 100 | 105 | 97 | 100 | 103 | 93 | 96 | 100 | 95.0 | 98.7 | 102.7 | 0.08 |
| 103 | Project Management | 14 | 15 | 17 | 14 | 16 | 18 | 13 | 14 | 15 | 13.7 | 15.0 | 16.7 | 0.20 |
| 104 | R/W Property Acceptances | 44 | 48 | 52 | 45 | 50 | 52 | 43 | 46 | 49 | 44.0 | 48.0 | 51.0 | 0.15 |
| 105 | Base Maps | 36 | 38 | 40 | 36 | 37 | 39 | 35 | 36 | 37 | 35.7 | 37.0 | 38.7 | 0.08 |
| 106 | Coordinate Utilities | 7 | 8 | 9 | 7 | 8 | 9 | 8 | 9 | 10 | 7.3 | 8.3 | 9.3 | 0.24 |
| 107 | EPA Acceptance | 13 | 14 | 15 | 14 | 15 | 16 | 13 | 15 | 17 | 13.3 | 14.7 | 16.0 | 0.18 |
| 108 | Alignment Surveys | 32 | 35 | 38 | 32 | 35 | 37 | 32 | 34 | 35 | 32.0 | 34.7 | 36.7 | 0.13 |

* Note: = ABS (Average Low - Average High)/Average
This ratio indicates the degree of variability in the estimates

39

## Phase Estimating over Product Life Cycle




40

## Types of Costs

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

41

## Contract Bid Summary Costs

| | |
|---|---|
| Direct costs | $80,000 |
| Direct overhead | $20,000 |
| G&A overhead (20%) | $20,000 |
| Profit (20%) | $24,000 |
| Total bid | $144,000 |

42