Project Scope Management

Information Technology Project Management,

What is Project Scope Management?

- Scope refers to all the work involved in creating the products of the project and the processes used to create them
- A deliverable is a product produced as part of a project, such as hardware or software, planning documents, or meeting minutes
- Project scope management includes the processes involved in defining and controlling what is or is not included in a project

Project Scope Management Processes

- **Scope planning**: deciding how the scope will be defined, verified, and controlled
- Scope definition: reviewing the project charter and preliminary scope statement and adding more information as requirements are developed and change requests are approved
- **Creating the WBS**: subdividing the major project deliverables into smaller, more manageable components
- Scope verification: formalizing acceptance of the project scope
- **Scope control**: controlling changes to project scope

What Determines Success?

Project Success =

Product Success + Project Management Success

These are largely determined by the quality of your processes, and your ability to manage <u>Project</u> and <u>Product</u> **Scope**



Figure 5-1: Project Scope Management Summary

Planning
Process: Scope planning
Output: Project scope management plan
Process: Scope definition
Output: Project scope statement, requested changes to the project, updates to the project scope management plan
Process: Create WBS
Output: WBS, WBS dictionary, scope baseline, requested changes to the project, updates to the project scope statement and project scope management plan

Monitoring and Controlling

Process: Scope verification

Outputs: Accepted deliverables, requested changes, recommended corrective actions

Process: Scope control

Outputs: Requested changes, recommended corrective actions, updates to the project scope statement, WBS and WBS dictionary, scope baseline, project management plan, and organizational process assets

Project Start

Project Finish

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Scope Planning and the Scope Management Plan

- The scope management plan is a document that includes descriptions of how the team will prepare the project scope statement, create the WBS, verify completion of the project deliverables, and control requests for changes to the project scope
- Key inputs include the project charter, preliminary scope statement, and project management plan

Table 5-1: Sample Scope Management

Project Name: Information Technology (IT) Upgrade Project

Introduction

The purpose of this document is to provide suggestions and guidance for preparing several important scope management documents related to this project.

Preparing the Scope Statement

The preliminary scope statement will provide the basis for preparing more detailed scope statements. The scope statement needs to be reviewed with key stakeholders, especially the project sponsor, potential suppliers, and users of the project deliverables. Follow corporate templates when available, and be sure to have expert input in defining the scope. Since the scope statement becomes more detailed and therefore longer as the project progresses, limit the length and complexity of the scope statement by placing details in attachments, such as product descriptions, specifications, corporate standards, etc. Each version of the scope statement must be clearly labeled and dated to ensure that everyone uses the most recent version. Changes and additions will be highlighted and communicated to the appropriate personnel. The scope statement will be available on the password-protected project Web site.

Creating the Work Breakdown Structure (WBS)

The project team will work together to create the WBS. The project sponsor and steering committee will review the WBS to ensure that all of the work required to complete the project is included in the WBS. The project team will review WBSs of similar projects, review the company's corporate guidelines for creating WBSs, and focus on determining all of the deliverables required for the project. The project team will determine the tasks required to complete each deliverable, which will be reviewed and agreed to by the project manager, sponsor, and steering committee. These tasks should include product- and process-related tasks. A general guideline to follow for determining the level of detail is that the lowest level of the WBS should normally take no longer than two weeks to complete. The WBS can be revised as needed, and the sponsor and steering committee must approve these revisions.

Verifying Completion of Project Deliverables

The project manager will work with the sponsor and steering committee to develop a process for verifying successful completion of project deliverables. In general, the project sponsor will be responsible for verifying the completion of major deliverables. The contract administrator will also be involved in verifying successful completion of deliverables received from outside sources. Contracts will include clauses describing the scope verification process.

Managing Requests for Changes to Project Scope

All requests for changes to project scope that may have a significant effect on meetings and project requirements must follow the formal change control procedures specified in Attachment 1. A change request form will be completed and reviewed by the designated group. It is crucial to follow these procedures to prevent scope creep.

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Plan

Table 5-2: Sample Project Charter

Project Title: Information Technology (IT) Upgrade Project

Project Start Date: March 4, 2008 Projected Finish Date: December 4, 2008

Project Manager: Kim Nguyen, 691-2784, knguyen@course.com

Project Objectives:Upgrade hardware and software for all employees (approximately 2,000) within nine months based on new corporate standards. See attached sheet describing the new standards. Upgrades may affect servers, as well as associated network hardware and software. Budgeted \$1,000,000 for hardware and software costs and \$500,000 for labor costs.

Approach:

- n Update the information technology inventory database to determine upgrade needs
- n Develop detailed cost estimate for project and report to CIO
- n Issue a request for quote to obtain hardware and software
- n Use internal staff as much as possible for planning, analysis, and installation

Ναμε	Role	Responsibility
Walter Schmidt	CEO	Project sponsor, monitor project
Mike Zwack	CIO	Monitor project, provide staff
Kim Nguyen	Project Manager	Plan and execute project
Jeff Johnson	Director of Information Technology Operations	Mentor Kim
Nancy Reynolds	VP, Human Resources	Provide staff, issue memo to all employees about project
Steve McCann	Director of Purchasing	Assist in purchasing hardware and software

ROLES AND RESPONSIBILITIES:

Sign-off: (Signatures of all the above stakeholders)

Watter Schmidt	Steve McCann	
Mike Zwack	Nancy Reynolds	
Kim Nguyen	Jeff Johnson	

Comments: (Handwritten or typed comments from above stakeholders, if applicable)

" This project must be done within ten months at the absolute latest." Mike Zwack, CIO

"We are assuming that adequate staff will be available and committed to supporting this project. Some work must be done after hours to avoid work disruptions, and overtime will be provided." Jeff Johnson and Kim Nguyen, Information Technology department

- Make a one-page project description
- Key Parts:
 - Project Objective Statement

What will the project accomplish?

- Deliverables List
 - What will the project produce for the customer?
- Primary Benefits

What will the benefits be?

What will the project accomplish?

Setting the Project Objective

- A Good Objective Statement is:
 - Focused on <u>deliverables</u>, not just processes (most objectives tell *how*, best ones tell *why*)
 - Measurable and testable (\$, %, Dates, etc.)
 - Action-oriented
 - Conversational
 - Doable (within your authority)
 - Communicated well

Specific Measurable Attainable Relevant Timebound

What will the project accomplish?

Objective Statement:

- Avoid a long, random list of end items
- Instead, make a hierarchy of:
 - Business objectives:
 - describe the <u>net effect</u> of the end product (but not the end product itself)
 - System or "Ends" objectives:
 - describe physical /discrete characteristics of the end product
 - Project or "Means" objectives:
 - describe characteristics of the project, regardless of the end product
- Use <u>only the top level items</u> in the objective statement ("KISS")

What will the project accomplish?

• Project Objective Statement Test "Verbs"

 Use Is / Is not technique to clear up boundaries

The project Is	The project Is NO	Г

Flexibility Matrix

What are the Trade-off Priorities?

• **A PRIORITIZED** ordering of the three principle elements to manage on a project

	Least Flexible	Moderately Flexible	Most Flexible
Schedule	X		
Scope/Quality			X
Resources		X	

• Used for daily decision making



Scope Definition and the Project Scope Statement

- The preliminary scope statement, project charter, organizational process assets, and approved change requests provide a basis for creating the project scope statement
- As time progresses, the scope of a project should become more clear and specific

Table 5-3: Further Defining Project Scope

Project Charter:

Upgrades may affect servers...

Preliminary Scope Statement:

Servers: If additional servers are required to support this project, they must be compatible with existing servers. If it is more economical to enhance existing servers, a detailed description of enhancements must be submitted to the CIO for approval. See current server specifications provided in Attachment 6. The CEO must approve a detailed plan describing the servers and their location at least two weeks before installation.

Project Scope Statement, Version 1:

Servers: This project will require purchasing 10 new servers to support Web, network, database, application, and printing functions. Two of each type of server will be purchased and dedicated to this project. Detailed descriptions of the servers are provided in a product brochure in Appendix 8 along with a plan describing where they will be located.

Project Management Plans



<u>**High-Level and broad</u>**: Identifies Sponsor & Project Manager; authorizes detailed project planning (<u>Authority</u>)</u>

> **<u>PRODUCT</u>** scope definition: <u>Features & functions</u> (<u>Specs</u>) characterizing a product, service, or result

<u>Detailed</u>: <u>Work (Steps) done</u> to deliver the product, service, or result with specified features & functions

<u>Summary or Detailed</u>: narrative defining how the project will be <u>executed</u>, <u>monitored</u> & <u>controlled</u>; how you'll handle issues, risks, & changes (<u>Control Processes</u>) Understanding Requirements

Good Scope Starts with Good Requirements.

How Do I Get the Requirements Right?



Understanding Requirements

Some questions to ask:

- 1. What is the Problem? (symptoms)
- 2. What is the (REAL) Problem? (core)
- 3. Where does the problem come from? (source and cause)
- 3. 4. Whose problem is it?



Ρ

IS

Internal Stakeholders - People/orgs <u>directly involved</u> Direct Stakeholders - People/orgs <u>directly affected</u> by Penumbra ("Customer's Customer") - People/orgs <u>peripherally</u> <u>affected</u>

5. (Why) Do we really care to solve it?

(bottom line - business case)

Source: Are Your Lights On?, Don Gauss & Gerry Weinberg, Dorset House, 1990

Understanding Requirements

Some things to consider:

 What do you do when <u>not even the customer</u> knows what they want?

• How do you estimate a fuzzy requirement?

Read the fable of the Vasa

Requirements Gathering Techniques

Joint Requirements Definition Meeting

- Workshop approach
- Follow-up to a feasibility study
- Deliverables:
 - Statement of Work (SOW), or
 - Statement of Requirements (SOR)

Requirements Kick-Off Meeting

- Involve all stakeholders (if possible)
- Driven by brainstorming checklist



Requirements Gathering Techniques

Structured Interviews

- Generally done one-on-one
- Checklist approach
- Used to get specific user requirements

Focus Groups

- Small group dynamics
- Used to examine a particular area in depth
- Often uses storyboarding techniques or prototypes





These techniques usually lead to a long list of requirements that need prioritization.

Develop a Requirements Grid

- Try to divide requirements into categories
- Use Pareto analysis on needs assessment



Requirements Grid



 Use Quality Function Deployment (QFD) where appropriate



Quality Function Deployment

4-Phase Model:

- Collects "Voice of the Customer"
- Translates through Intermediate Steps to End Product/Process Requirements



Build a Requirements Document

Scope Stmt or SOW or SOR



- Use a good requirements gathering and analysis process
- Should address all areas of Requirements Checklist
- Put the document under change control
- Provide access to all project members

Requirements Process

- The requirements analysis activity is a process of
 - discovery
 - elicitation, gathering, problem recognition
 - refinement
 - analyze, evaluation, synthesis
 - modeling
 - paper, prototype
 - specification
 - packaging, SRS
 - review
 - inspection, gate
- And, it is a <u>team</u> effort

Some Characteristics of Good Requirements

- Unambiguous
 Complete
 Verifiable
 Consistent
 Modifiable
 Traceable
 Usable
- Not always achievable at first, but these are good criteria to shoot for.
- Sometimes, both you and the customer must iteratively refine the detail requirements during the project.
- Consider issues of development for problems that are:
 - Open ended (inventing new products) vs.
 - Closed-ended (repairing old products)

Validate the Requirements

- Once drafted, go back to the source(s) and verify all requirements, and interpretations
- The <u>author</u> bears the responsibility for misinterpretations
- Some techniques:
 - detailed specs/drawings
 - prototype/model
 - storyboard the process
 - role play

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Requirements Summary

- Some questions to ask ...
- Requirements gathering techniques
 - Joint Requirements Definition Meeting
 - Requirements Kick-Off Meeting
 - Structured Interviews
 - Focus Groups
 - Requirements Grid
 - Pareto Analysis
 - Quality Function Deployment (QFD)
- Requirements Validation
- Characteristics of Good Requirements
 - Unambiguous
- Verifiable

Complete

- Consistent
- Modifiable

- Traceable
- Usable

Creating the Work Breakdown Structure (WBS)

- A WBS is a deliverable-oriented grouping of the work involved in a project that defines the total scope of the project
- WBS is a foundation document that provides the basis for planning and managing project schedules, costs, resources, and changes
- **Decomposition** is subdividing project deliverables into smaller pieces
- A work package is a task at the lowest level of the WBS

What is a WBS?

- As the organization hierarchically structures the people who perform work, the WBS hierarchically structures the products to be produced and on which the people work.
- PMI (PMBOK 2000):
 - A Work Breakdown Structure is a <u>deliverable-oriented</u> grouping of project elements that organizes and defines the <u>total work scope</u> of the project. Each descending level represents an increasingly detailed definition of the project work.



What is a WBS?

- Should be built around a hierarchy of deliverables or tangible outcomes
- Each deliverable or outcome should have a set of related activities, and one individual will be responsible for each activity
- A WBS should <u>not</u> be just a To-Do list of every possible thing that needs to be done in the project
- Rather, it is an organized <u>collection of assignments</u> that members of the project team will be responsible for delivering



Work Products? Deliverables? Milestones?



- Work Products:
 - Anything tangible produced by the project
 - Includes Deliverables



- Deliverables:
 - Specific, defined, and tangible outputs from the project, that the <u>customer cares about</u>





Collections of Major Work Products or Deliverables that indicate the project's progress



Deliverables or Activities?

- Top Level WBS items should <u>not</u> include elements that are not Deliverables
 - A signal processor, for example, is clearly a product deliverable, as are prototypes and Computer Software Items (drivers, diagnostics, etc.)
 - But, things like design engineering, requirements analysis, test engineering, aluminum stock, and direct costs, are probably not product deliverables.
 - Design engineering, test engineering, and requirements analysis are all engineering functional efforts (activities)
 - Aluminum is a material resource
 - **Direct cost** is an accounting classification
- Thus none of these elements are appropriate work breakdown structure elements at the top level

Naming Conventions

- Name all deliverables as noun or adjective/noun deliverables
 - Examples: "Project Plan" "Functional Specification"
- Name activities with active verb/adjective/noun
 - Examples: "Create Project Plan" "Update Functional Specification"
- Active verbs communicate better to the assigned team member:
 - What the outcome is (the deliverable)
 - What kind of work the assigned person is going to perform (create or update)
- Avoid weak verbs like do, execute or perform
 - Don't clearly communicate what result should be

From Geoff Choo, project manager for Invisible Site, an Italian interactive media agency, and a freelance business and technology writer.

How Deep to Go?

- No hard & fast rules, except:
 - "Plan only to the lowest level you are willing to manage to."
- Avoid too much detail makes for very fragile plans
 - It is difficult to organize and manage work more than 3-4 levels deep in a WBS
 - A skilled team requires fewer levels of detail
- Try to divide the work into <u>natural groupings</u> corresponding to <u>organizational units</u> (stages)
 - These have a leadership hierarchy already established
 - Arrange so that <u>whole organizational units</u> have <u>responsibility to execute lowest levels</u> of the WBS

Figure 5-2: Sample Intranet WBS Organized by Product



Figure 5-3: Sample Intranet WBS Organized by Phase



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Table 5-4: Intranet WBS in Tabular Form

1.0 Concept

1.1 Evaluate current systems

1.2 Define Requirements

1.2.1 Define user requirements

1.2.2 Define content requirements

1.2.3 Define system requirements

1.2.4 Define server owner requirements

1.3 Define specific functionality

1.4 Define risks and risk management approach

1.5 Develop project plan

1.6 Brief Web development team

2.0 Web Site Design

3.0 Web Site Development

4.0 Roll Out

5.0 Support

Figure 5-4: Intranet WBS and Gantt Chart in Microsoft Project



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Figure 5-5: Intranet Gantt Chart Organized by Project Management Process Groups



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Table 5-5: Executing Tasks for JWD Consulting's WBS

3.0 Executing

- 3.1 Survey
- 3.2 User inputs
- 3.3 Intranet site content
 - 3.3.1 Templates and Tools
 - 3.3.2 Articles
 - 3.3.3 Links
 - 3.3.4 Ask the Expert
 - 3.3.5 User requests feature
- 3.4 Intranet site design
- 3.5 Intranet site construction
- 3.6 Site testing
- 3.7 Site promotion
- 3.8 Site roll out
- 3.9 Project benefits measurement

Approaches to Developing WBSs

- Using guidelines: some organizations, like the DOD, provide guidelines for preparing WBSs
- The analogy approach: review WBSs of similar projects and tailor to your project
- The top-down approach: start with the largest items of the project and break them down
- The bottom-up approach: start with the specific tasks and roll them up
- Mind-mapping approach: mind mapping is a technique that uses branches radiating out from a core idea to structure thoughts and ideas

How Can I Make a WBS?

- Reuse from a past project of similar nature
 - Template Library (or buy) contains work breakdowns, plus dependencies and effort estimates
 - Tailor to current situation, available resources, and calendar
- Build construct your own
 - Use a brainstorming process to construct a WBS from scratch (that's covered in a separate session that combines WBS and scheduling)

Building a WBS Top Down

Top Down

- Start with Project Objective
- Decompose into Stages
- Determine Milestones in each Stage
- Identify activities necessary to to get results
- Usually done only in early Selection and Definition phases



Best for *initial rough order of magnitude* estimation

5 Steps to Build a WBS Top Down

- 1. Create the WBS in iterative cycles and constantly reevaluate the hierarchy of deliverables, activities, and subactivities
- 2. Validate that you have broken down every deliverable into all the high-level activities required to complete it
- 3. Decompose every activity into more granular activities in iterative cycles.
- 4. Validate that you've included every subactivity required to complete each higher-level activity.
- 5. At the end of every cycle, ask these three questions of yourself and your team members:
 - 1. If I had all these deliverables, would I achieve the planned objectives for the project?
 - 2. If I do all these activities, will I complete that deliverable?
 - 3. If I do all these subactivities, will I complete that activity?

If the answer is no, retrace your steps and fill in the missing elements.

Building a WBS Bottom Up

Bottom Up

- Brainstorm a list of detailed activities
- Group by
 - deliverables
 - skills
 - responsibilities
 - chronology
- Consolidate activities into Phases with Milestones
- Summarize to Project Objective
- Often done while building a <u>Precedence</u> <u>Diagram</u> using the "Stickie" exercise (separate session)



Figure 5-6: Sample Mind-Mapping Approach for Creating a WBS



Figure 5-7: Resulting WBS in Chart Form



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Typical WBS Life Cycle Templates for SW



Tips for Building a WBS

- Make sure you <u>understand the project justification</u> (Selection)
- Try to get a good handle on requirements <u>first</u> (WHAT)
 - Don't lay out a complete WBS and schedule too soon
 - Develop it during the Planning phases
- Use a logical theme to organize the work. Use whatever works for you. The logical theme could be:
 - project phases, functional areas, or major end-products

Source: Bill Duncan - Former Director of Standards, PMI. Primary author of PMBOK 1996.

Tips for Building a WBS

- Don't try to <u>micromanage the team</u> with a <u>mile-long list</u> of things to do
 - Instead, give them <u>clear and measurable</u> <u>objectives and results</u>
 - Then <u>let each team member define</u> the activities to reach those goals
 - This means that while you may define the deliverables and high-level activities, <u>your team will fill in the blanks</u> with the lower-level activities
 - Work with them to <u>write down</u> the lowest-level activities that you will use to <u>track their progress</u>

Tips for Building a WBS

- It <u>requires practice</u> to develop a deliverable-oriented grouping of project elements describing the entire project scope
 - Intuitively, we tend to start out with an activity-oriented approach
 - This is OK for very small projects where extensive project management controls will not be used
 - The activity-oriented approach is easy to understand, because we can easily think of projects as collection of activities
 - An activity-oriented WBS can be developed by beginning with a simple "to-do" list and then clustering the items in a logical way

The WBS Dictionary and Scope Baseline

- Many WBS tasks are vague and must be explained more so people know what to do and can estimate how long it will take and what it will cost to do the work
- A **WBS dictionary** is a document that describes detailed information about each WBS item
- The approved project scope statement and its WBS and WBS dictionary form the scope baseline, which is used to measure performance in meeting project scope goals



What's a Work Package?

 Originally a DOD requirement meaning the <u>work order at the</u> <u>activity level</u>, many plans have no explicit work packages defined.
 MSP Task Notes



- PMI defines a Work Package as a <u>deliverable at the lowest</u> <u>level of the WBS</u>, where a large activity is assigned to a subproject.
- Work Package:
 - includes <u>all info</u> necessary to carry out the activity
 - Could be another project plan (for large efforts)

Typical Work Package Contents

<u>Defines</u> the work product(s)

- Work Package
- Is <u>clearly distinguished</u> from other work packages
- Identifies <u>staffing requirements</u>
- <u>Names</u> responsible individual(s)
- Has scheduled start and completion dates
- Has budget assigned (\$, hours, other unit)
- Defines acceptance criteria for the work

Sounds just like a project plan!

Dependencies? WBS vs. Network Diagram

Don't confuse a WBS with a PDM network diagram:



- WBS Work Breakdown Structure: hierarchical, deliverable-oriented breakdown of the work to be done [does not include dependencies]
- PDM Precedence Diagramming Method: precedence ordering of work activities from a WBS (a.k.a Logic, Network Diagram)
 [is all about dependencies]

Advice for Creating a WBS and WBS Dictionary*

- A unit of work should appear at only one place in the WBS
- The work content of a WBS item is the sum of the WBS items below it
- A WBS item is the responsibility of only one individual, even though many people may be working on it
- The WBS must be consistent with the way in which work is actually going to be performed; it should serve the project team first, and other purposes only if practical

*Cleland, David I. Project Management: Strategic Design and Implementation, 1994

Advice for Creating a WBS and WBS Dictionary (continued)*

- Project team members should be involved in developing the WBS to ensure consistency and buy-in
- Each WBS item must be documented in a WBS dictionary to ensure accurate understanding of the scope of work included and not included in that item
- The WBS must be a flexible tool to accommodate inevitable changes while properly maintaining control of the work content in the project according to the scope statement

*Cleland, David I. Project Management: Strategic Design and Implementation, 1994

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Scope Verification

- It is very difficult to create a good scope statement and WBS for a project
- It is even more difficult to verify project scope and minimize scope changes
- Scope verification involves formal acceptance of the completed project scope by the stakeholders
- Acceptance is often achieved by a customer inspection and then sign-off on key deliverables

Scope Control

- Scope control involves controlling changes to the project scope
- Goals of scope control are to:
 - Influence the factors that cause scope changes
 - Assure changes are processed according to procedures developed as part of integrated change control
 - Manage changes when they occur
- Variance is the difference between planned and actual performance

Best Practices for Avoiding Scope Problems

- 1. Keep the scope realistic: Don't make projects so large that they can't be completed; break large projects down into a series of smaller ones
- 2. Involve users in project scope management: Assign key users to the project team and give them ownership of requirements definition and scope verification
- 3. Use off-the-shelf hardware and software whenever **possible**: Many IT people enjoy using the latest and greatest technology, but business needs, not technology trends, must take priority
- 4. Follow good project management processes: As described in this chapter and others, there are well-defined processes for managing project scope and others aspects of ₆₉ projects

Suggestions for Improving User Input

- Develop a good project selection process and insist that sponsors are from the user organization
- Have users on the project team in important roles
- Have regular meetings with defined agendas, and have users sign off on key deliverables presented at meetings
- Deliver something to users and sponsors on a regular basis
- Don't promise to deliver when you know you can't
- Co-locate users with developers

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Suggestions for Reducing Incomplete and Changing Requirements

- Develop and follow a requirements management process
- Use techniques such as prototyping, use case modeling, and JAD to get more user involvement
- Put requirements in writing and keep them current
- Create a requirements management database for documenting and controlling requirements

Suggestions for Reducing Incomplete and Changing Requirements (continued)

- Provide adequate testing and conduct testing throughout the project life cycle
- Review changes from a systems perspective
- Emphasize completion dates to help focus on what's most important
- Allocate resources specifically for handling change requests/enhancements like NWA did with ResNet

Using Software to Assist in Project Scope Management

- Word-processing software helps create several scope-related documents
- Spreadsheets help to perform financial calculations and weighed scoring models, and develop charts and graphs
- Communication software like e-mail and the Web help clarify and communicate scope information
- Project management software helps in creating a WBS, the basis for tasks on a Gantt chart
- Specialized software is available to assist in project scope management

Chapter Summary

- Project scope management includes the processes required to ensure that the project addresses all the work required, and only the work required, to complete the project successfully
- Main processes include:
 - Scope planning
 - Scope definition
 - Creating the WBS
 - Scope verification
 - Scope control