## Software Project Management I

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### Course Schedule

Time	Торіс	Document
18:10~18:55 (45 min)	Project Management Overview Project Scope Management Project Time Management	Project Plan Project Charter Project (Preliminary) Scope Statement
19:00~19:20 (20 min)	Issue Tracking	Statement of Work (SOW) Work Breakdown Structure (WBS) Gantt Chart
19:20~19:35 (15 min)	Mantis	Bug Tracking Report
19:35~20:05 (30 min)	MS Project	
20:15~20:40 (30 min)	Configuration Management	CM Plan
20:40~21:20 (40 min)	SVN	Version Control Process

## **Project Management Overview**

## What Is a Project?

- A **project** is "a <u>temporary</u> endeavor undertaken to create a unique <u>product</u>, <u>service</u>, or <u>result</u>."\*
- A project <u>ends</u> when its <u>objectives</u> have been reached, or the project has been terminated.
- Projects can be large or small and take a short or long time to complete.
- Project managers work with project sponsors, project teams, and other people involved in projects to meet project goals.

\*PMI, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (2004), p. 5.

## Examples of IT Projects

- A help desk or technical worker replaces laptops for a small department.
- A small software development team adds a new feature to an internal software application.
- A college campus upgrades its technology infrastructure to provide wireless Internet access.

## Project Attributes

- A project:
  - Has a unique purpose.
  - Is temporary.
  - Is developed using progressive elaboration.
  - Requires resources, often from various areas.
  - Should have a primary customer or sponsor.
    - The **project sponsor** usually provides the direction and funding for the project.
  - Involves uncertainty.

## The Triple Constraint

- Every project is constrained in different ways by its:
  - **Scope** goals: What work will be done?
  - **Time** goals: How long should it take to complete?
  - **Cost** goals: What should it cost?
- It is the project manager's duty to balance these three often-competing goals.

## What is Project Management?

 Project management is "the application of knowledge, skills, tools and techniques to project activities to meet project requirements."\*

\*PMI, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (2004), p. 8.

## The Role of the Project Manager

- Job descriptions vary, but most include responsibilities such as <u>planning</u>, <u>scheduling</u>, <u>coordinating</u>, and <u>working with</u> people to achieve project goals.
- They should:
  - Be comfortable with change.
  - Understand the organizations they work in and with.
  - Lead teams to accomplish project goals.

## Suggested Skills for Project Managers

- **Communication skills**: Listens, persuades.
- Organizational skills: Plans, sets goals, analyzes.
- **Team-building skills**: Shows empathy, motivates, promotes esprit de corps.
- Leadership skills: Sets examples, provides vision (big picture), delegates, positive, energetic.
- **Coping skills**: Flexible, creative, patient, persistent.
- **Technology skills**: Experience, project knowledge.

## Exercise

- Please identify the Characteristics of effective and ineffective Project Managers?
  - 10 min. of group discussion
  - 5 min. of presentation

## Most Significant Characteristics of Effective and Ineffective Project Managers

Effective Project Managers	<b>Ineffective Project Managers</b>		
• Leadership by example	Sets bad example		
• Visionary	Not self-assured		
<ul> <li>Technically competent</li> </ul>	Lacks technical expertise		
• Decisive	Poor communicator		
Good communicator	Poor motivator		
Good motivator			
• Stands up to upper management when necessary			
• Supports team members			
<ul> <li>Encourages new ideas</li> </ul>	1		

# Project Phases and the Project Life Cycle

- A **project life cycle** is a collection of project phases that defines:
  - What work will be performed in each phase.
  - What deliverables will be produced and when.
  - Who is involved in each phase.
  - How management will control and approve work produced in each phase.
- A **deliverable** is a product or service produced or provided as part of a project.

### Phases of the Traditional Project Life Cycle

	Project	Feasibility	Project Acquisition	
	Concept	Development	Implementation	Close-out
	Management plan	Project plan	Last work package	Completed work
Sample deliverables for each phase	Preliminary cost estimate	Budgetary cost estimate	Definitive cost estimate	Lessons learned
-	3-level WBS	6+-level WBS	Performance reports	Customer acceptance

#### Level of Activity and Overlap of Process Groups Over Time (F3-1)



## Project Integration Management Processes

- **Develop the project charter**: Work with stakeholders to create the document that formally authorizes a project—the charter.
- Develop the preliminary project scope statement:
   Work with stakeholders, especially users of the project's products, services, or results, to develop the high-level scope requirements and create a preliminary project scope statement.
- **Develop the project management plan**: Coordinate all planning efforts to create a consistent, coherent document—the project management plan.

## Project Charters

- After deciding what project to work on, it is important to let the rest of the organization know.
- A **project charter** is a document that formally recognizes the existence of a project and provides direction on the project's objectives and management.
- Key project stakeholders should sign a project charter to acknowledge agreement on the need and intent of the project; a signed charter is a key output of project integration management.

#### Sample Project Charter

Project Title: Information Technology (IT) Upgrade Project

#### Project Start Date: March 4, 2007 Projected Finish Date: December 4, 2007

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:

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

NAME	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:**

## Sample Project Charter (cont'd)

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

## Project Integration Management Processes (cont'd)

- Direct and manage project execution: Carry out the project management plan by performing the activities included in it.
- Monitor and control the project work: Oversee project work to meet the performance objectives of the project.
- Perform integrated change control: Coordinate changes that affect the project's deliverables and organizational process assets.
- **Close the project**: Finalize all project activities to formally close the project.

## Project Management Plans

- A **project management plan** is a document used to coordinate all project planning documents and help guide a project's execution and control.
- Plans created in the other knowledge areas are subsidiary parts of the overall project management plan.

#### Sample Contents for a Software Project Management Plan

MAJOR PROJECT MANAGEMENT PLAN SECTIONS					
	Overview	Project Organization	Managerial Process Plans	Technical Process Plans	SUPPORTING PROCESS PLANS
Section Topics	Purpose, scope, and objectives; assumptions and constraints; project deliver- ables; schedule and budget summary; evolution of the plan	External interfaces; internal structure; roles and responsibilities	Start-up plans (estimation, staffing, resource acquisition, and project staff training plans); work plan (work activities, schedule, resource, and budget alloca- tion); control plan; risk man- agement plan; closeout plan	Process model; methods, tools, and techniques; infrastructure plan; product acceptance plan	Configuration management plan; verifica- tion and vali- dation plan; documentation plan; quality assurance plan; reviews and audits; problem reso- lution plan; subcontractor management plan; process improvement plan

#### IEEE Standard 1058-1998.

## Project Plan 1

- 1. 專案概述 (Project Profile)
- 1.1 專案目標(Project Purpose) [說明此專案的目標]
- 1.2 專案範圍(Project Scope) [說明此專案的範圍,包含WBS]
- 1.3 專案參考文件(Project Reference Document) [說明此專案 參考的文件]
- 2. 專案規劃(Planning)
- 2.1 資源需求(Resource Requirement) [定義此專案需求資源]
- 2.1.1 開發環境(Development Environment)
- 2.1.2 軟體開發人力(Manpower Requirement)
- 2.1.3 人員所需資歷(Skill Requirement)
- 2.1.4 採購計畫(Purchase Plan)
- 2.2 專案組織(Project Organization) [定義專案組織架構、人員分工]
- 2.2.1 角色及責任(Role & Responsibilities
- 2.2.2 教育訓練計畫(Training Plan)

## Project Plan 2

- 2.3 專案生命週期(Project Life Cycle) [定義專案採用的軟體 開發生命週期
- 2.4 專案時程規劃(Project Schedule)
- 2.5 專案里程碑(Project Milestone)
- 2.6 關鍵事項(Critical Path)
- 2.7 相依事項(Dependency)
- 2.8 交付項目(Deliverables)
- 3. 專案控管(Project Control) [專案進行控管的相關事項]
- 3.1 進度管理(Progress Management)
- 3.2 溝通管理(Communication Management)
- 3.3 品質保證控管(Quality Assurance Control)
- 3.4 變更管理(Change Management)
- 3.5 問題管理(Problem Management)

## Project Plan 3

- 4.需求管理(Requirement Management)
- 5.建構管理計畫(Configuration Management Plan)
- 6.專案風險(Project Risk) [定義專案的風險、priority與對應 的解決事項]
- 7.度量標準計畫(Metrics Plan)[定義專案的度量計畫,包含資訊的需求和目的、需進行的basic and derived measures與對應的metric]
- 8.其他計畫 (Others Plan)
- 8.1 測試計畫(Test Plan)
- 8.2 上線計畫(On Production Plan)
- 8.3 維護計畫(Maintenance Plan)
- 9. 附註說明(Annotation)

## Coordinating Planning and Execution

- Project planning and execution are intertwined and inseparable activities.
- Those who will do the work should help to plan the work.
- Project managers must solicit input from the team to develop realistic plans.

## Monitoring and Controlling Project Work

- Changes are inevitable on most projects, so it's important to develop and follow a process to monitor and control changes.
- Monitoring project work includes collecting, measuring, and disseminating performance information.
- Two important outputs of monitoring and controlling project work include recommended corrective and preventive actions.

## Sample Template for a Monthly Progress Report

#### I. Accomplishments for Month of January (or appropriate month):

- Describe most important accomplishments. Relate to project's Gantt chart.
- Describe other important accomplishments, one bullet for each. If any issues were
  resolved from the previous month, list them as accomplishments.

#### II. Plans for February (or following month):

- Describe most important items to be accomplished in the next month. Again, relate to the project's Gantt chart.
- Describe other important items to accomplish, one bullet for each.
- III. Issues: Briefly list important issues that surfaced or are still important. Managers hate surprises and want to help the project succeed, so be sure to list issues.
- IV. Project Changes (Date and Description): List any approved or requested changes to the project. Include the date of the change and a brief description.

## Closing Projects

- To close a project, you must finalize all activities and transfer the completed or cancelled work to the appropriate people.
- Main outputs include:
  - Administrative closure procedures.
  - Contract closure procedures.
  - Final products, services, or results.
  - Organizational process asset updates.

#### Final Project Documentation Items

I. Project description

- II. Project proposal and backup data (request for proposal, statement of work, proposal correspondence, and so on)
- III. Original and revised contract information and client acceptance documents
- **IV.** Original and revised project plans and schedules (WBS, Gantt charts and network diagrams, cost estimates, communications management plan, etc.)
- V. Design documents
- VI. Final project report
- VII. Deliverables, as appropriate
- VIII. Audit reports
- IX. Lessons-learned reports
- **X.** Copies of all status reports, meeting minutes, change notices, and other written and electronic communications

## Lessons Learned Reports

- The project manager and project team members should each prepare a **lessons-learned report**.
  - A <u>reflective statement</u> that documents important things an individual learned from working on the project.
- The project manager often combines information from all of the lessons-learned reports into a project summary report.

### **Project Scope 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.

# 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.

#### Preliminary Scope Statements

- A scope statement is a document used to develop and confirm a common understanding of the project scope.
- It is an important tool for preventing **scope creep**:
  - The tendency for project scope to keep getting bigger.
- A good practice is to develop a preliminary or initial scope statement during project initiation and a more detailed scope statement as the project progresses.
## Contents of a Preliminary Scope Statement

- Project objectives
- Product or service requirements and characteristics
- Project boundaries
- Deliverables
- Product acceptance criteria
- Project assumptions and constraints
- Organizational structure for the project

- Initial list of defined risks
- Summary of schedule milestones
- Rough order of magnitude cost estimate
- Configuration management requirements
- Description of approval requirements

Scope Definition and the Project Scope Statement

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

### 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 Atch 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 ten 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.

# 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.
- A 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.

# Approaches to Developing WBSs

- Guidelines: Some organizations, such as the DOD, provide guidelines for preparing WBSs.
- Analogy approach: Review WBSs of similar projects and tailor to your project.
- **Top-down approach**: Start with the largest items of the project and break them down.
- **Bottom-up approach**: Start with the specific tasks and roll them up.
- **Mind-mapping approach**: Write tasks in a non-linear, branching format and then create the WBS structure.

## Resulting WBS in Chart Form



# Sample Intranet WBS Organized by Product



# Sample Intranet WBS Organized by Phase



### 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

#### Intranet WBS and Gantt Chart in Project

WBS

Schedule

_	_					
		Task Name	January	February	March	April Ma 🔺
			4 11 18 25	1 8 15 22	1 8 15 22 29	5 12 19 26 3 10
	1	E 1 Concept		•		
	2	1.1 Evaluate current systems				
	3	1.2 Define Requirements				
	4	1.2.1 Define user requirements	<b>p</b> _1			
	5	1.2.2 Define content requirements	μ Φ Ι			
	6	1.2.3 Define system requirements	• •			
	7	1.2.4 Define server owner requirements	l i l			
ŧ	8	1.3 Define specific functionality	1 Š			
ŝ	9	1.4 Define risks and risk management approach	μ μ μ			
antt	10	1.5 Develop project plan	Ì	1		
Q	11	1.6 Brief web development team	Brief web development team			
	12	2 Web Site Design		-	-	
	30	3 Web Site Development	<b>→</b> → → → →	•		
	50	4 Roll Out				-
	57	5 Support			-	-

#### Intranet Gantt Chart Organized by Project Management Process Groups



## The WBS Dictionary and Scope Baseline

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

## Advice for Creating a WBS and WBS Dictionary\*

- A unit of work should appear in 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*, 2<sup>nd</sup> edition (New York: McGraw-Hill 1994).

## Advice for Creating a WBS and WBS Dictionary (cont'd)\*

- 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 that is 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*, 2<sup>nd</sup> edition (New York: McGraw-Hill 1994).

## Scope Control

- Scope control involves controlling changes to the project scope.
- Goals of scope control are to:
  - Influence the factors that cause scope changes.
  - Ensure 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.

#### **Project Time Management**

# Project Time Management Processes

- Activity definition: Identifying the specific activities that the project team members and stakeholders must perform to produce the project deliverables.
- Activity sequencing: Identifying and documenting the relationships between project activities.
- Activity resource estimating: Estimating how many resources a project team should use to perform project activities.
- Activity duration estimating: Estimating the number of work periods that are needed to complete individual activities.
- Schedule development: Analyzing activity sequences, activity resource estimates, and activity duration estimates to create the project schedule.
- Schedule control: Controlling and managing changes to the project schedule.

## Activity Definition

- An activity or task is an element of work normally found on the WBS that has an expected duration, a cost, and resource requirements.
- Project schedules grow out of the basic documents that initiate a project.
  - The project charter includes start and end dates and budget information.
  - The scope statement and WBS help define what will be done.
- Activity definition involves developing a more detailed WBS and supporting explanations to understand all the work to be done, so you can develop realistic cost and duration estimates.

## Activity Lists and Attributes

- An **activity list** is a tabulation of activities to be included on a project schedule. The list should include:
  - The activity name
  - An activity identifier or number
  - A brief description of the activity
- Activity attributes provide more information about each activity, such as predecessors, successors, logical relationships, leads and lags, resource requirements, constraints, imposed dates, and assumptions related to the activity.

### Milestones

- A **milestone** is a significant event that normally has no duration.
- It often takes several activities and a lot of work to complete a milestone.
- Milestones are useful tools for setting schedule goals and monitoring progress.
- Examples include completion and customer sign-off on key documents and completion of specific products.

## Activity Sequencing

- Involves reviewing activities and determining dependencies.
- A **dependency** or **relationship** relates to the sequencing of project activities or tasks.
- You *must* determine dependencies in order to use critical path analysis.

# Three Types of Dependencies

- Mandatory dependencies: Inherent in <u>the nature of</u> <u>the work</u> being performed on a project; sometimes referred to as hard logic.
- Discretionary dependencies: Defined by the project team; sometimes referred to as soft logic and should be used with care because they may limit later scheduling options.
- External dependencies: Involve relationships between project and non-project activities.

## Network Diagrams

- Network diagrams are the preferred technique for showing activity sequencing.
- A network diagram is a schematic display of the logical relationships among, or sequencing of, project activities.
- Two main formats are the arrow and precedence diagramming methods.

#### Sample Activity-on-Arrow (AOA) Network Diagram for Project X



Note: Assume all durations are in days; A=1 means Activity A has a duration of 1 day.

# Arrow Diagramming Method (ADM)

- Also called activity-on-arrow (AOA) network diagram.
- Activities are represented by arrows.
- Nodes or circles are the starting and ending points of activities.
- Can only show finish-to-start dependencies.

## Process for Creating AOA Diagrams

- Find all of the activities that start at node 1. Draw their finish nodes and draw arrows between node 1 and those finish nodes. Put the activity letter or name and duration estimate on the associated arrow.
- 2. Continuing drawing the network diagram, working from left to right. Look for bursts and merges. A **burst** occurs when a single node is followed by two or more activities. A **merge** occurs when two or more nodes precede a single node.
- 3. Continue drawing the project network diagram until all activities that have dependencies are included in the diagram.
- 4. As a rule of thumb, all arrowheads should face toward the right, and no arrows should cross in an AOA network diagram.

### Precedence Diagramming Method (PDM)

- Activities are represented by boxes.
- Arrows show relationships between activities.
- More popular than ADM method and used by project management software.
- Better at showing different types of dependencies.

#### Task Dependency Types

#### Task dependencies

The nature of the dependencies between linked tasks. You link tasks by defining a dependency between their finish and start dates. For example, the "Contact caterers" task must finish before the start of the "Determine" menus" task. There are four kinds of task dependencies in Microsoft Project.

Task dependency	Example	Description
Finish-to-start (FS)		Task (B) cannot start until task (A) finishes.
Start-to-start (SS)		Task (B) cannot start until task (A) starts
Finish-to-finish (FF)		Task (B) cannot finish until task (A) finishes.
Start-to-finish (SF)		Task (B) cannot finish until task (A) starts:

### Sample PDM Network Diagram



## Activity Resource Estimating

- Before estimating activity durations, you must have a good idea of the quantity and type of resources that will be assigned to each activity.
- Consider important issues in estimating resources:
  - How difficult will it be to complete specific activities on this project?
  - What is the organization's history in doing similar activities?
  - Are the required resources available?

Activity Duration Estimating

- Duration includes the actual amount of time worked on an activity *plus* the elapsed time.
- **Effort** is the number of workdays or work hours required to complete a task.
- Effort does not normally equal duration.
- People doing the work should help create estimates, and an expert should review them.

### Three-Point Estimates

- Instead of providing activity estimates as a discrete number, such as four weeks, it's often helpful to create a three-point estimate:
  - An estimate that includes an optimistic, most likely, and pessimistic estimate, such as three weeks for the optimistic, four weeks for the most likely, and five weeks for the pessimistic estimate.
- Three-point estimates are needed for PERT estimates and Monte Carlo simulations.

## Schedule Development

- Uses results of the other time management processes to determine the start and end dates of the project.
- Ultimate goal is to create a realistic project schedule that provides a basis for monitoring project progress for the time dimension of the project.
- Important tools and techniques include Gantt charts, critical path analysis, critical chain scheduling, and PERT analysis.

### Gantt Charts

- Gantt charts provide a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format.
- Symbols include:
  - Black diamonds: Milestones
  - Thick black bars: Summary tasks
  - Lighter horizontal bars: Durations of tasks
  - Arrows: Dependencies between tasks

## Gantt Chart for Project X



Note: In Project 2003 darker bars are red to represent critical tasks.

#### Gantt Chart for Software Launch Project


# Adding Milestones to Gantt Charts

- Many people like to focus on meeting milestones, especially for large projects.
- Milestones emphasize important events or accomplishments in projects.
- You typically create milestone by entering tasks that have a zero duration, or you can mark any task as a milestone.

#### SMART Criteria

- Milestones should be:
  - Specific
  - Measurable
  - Assignable
  - Realistic
  - Time-framed

# Sample Tracking Gantt Chart

Planned dates



#### Schedule Control

- Perform reality checks on schedules.
- Allow for contingencies.
- Don't plan for everyone to work at 100 percent capacity all the time.
- Hold progress meetings with stakeholders and be clear and honest in communicating schedule issues.

#### Schedule Control

- Goals are to know the status of the schedule, influence factors that cause schedule changes, determine that the schedule has changed, and manage changes when they occur.
- Tools and techniques include:
  - Progress reports.
  - A schedule change control system.
  - Project management software, including schedule comparison charts, such as the tracking Gantt chart.
  - Variance analysis, such as analyzing float or slack.
  - Performance management, such as earned value (see Chapter 7).

# Reality Checks on Scheduling

- Review the draft schedule or estimated completion date in the project charter.
- Prepare a more detailed schedule with the project team.
- Make sure the schedule is realistic and followed.
- Alert top management well in advance if there are schedule problems.

# Using Software to Assist in Time Management

- Software for facilitating communication helps people exchange schedule-related information.
- Decision support models help analyze trade-offs that can be made.
- Project management software can help in various time management areas.

#### Project 2003 Features Related to Project Time Management

Reports	VIEWS AND TABLE VIEWS	Filters
Overview reports: critical tasks and milestones	Gantt chart, network diagram, Tracking Gantt chart, schedule, tracking, variance, constraint dates, and delay	All tasks, completed critical tasks, incomplete tasks, and milestone tasks
Current activities reports: unstarted tasks, tasks starting soon, tasks in progress, completed tasks, should have started tasks, and slipping tasks		
Assignment reports: who does what and when		

### **Configuration Management**

# CMMI Level 2 Configuration Management

#### Where Does CM Stand?

Process Area Category Maturity Level	Process	Project	Engineering	Support	
ML 5: Optimizing	OID			CAR	
ML 4: Quantitatively Managed	ОРР	QPM Ma inte	nage changes to rface definitions	analyze the impa change requests, evaluate chang	ict of , and ges
ML 3: Defined	OPF, OPD, OT	IPM (for IPPD), IT, ISM, RSKM	RD, TS, PI, VER, VAL	DAR, OEI	
item ML 2: Managed	is based on plan WBS	and Controlli PP, PMC, SAM performa	ing changes REQM	CM, MA, PPQA	

# Why Is CM Important

- To establish and maintain the integrity of work products using
  - configuration identification,
  - configuration control,
  - <u>configuration status accounting</u>, and
  - configuration audits.
- To support control of the continuous evolution of products and services
- To prevent a chaotic work environment and uncontrolled change

#### CM Context



# Specific Goals 1

- Establish Baselines
  - <u>Baselines</u> of identified <u>work products</u> are <u>established</u> and maintained

- Identify Configuration Items
  - Identify the <u>configuration items</u>, components, and related work
  - products that will be placed under configuration management.
- Subpractices
  - Select the <u>configuration items</u> and the <u>work products</u> that compose them based on <u>documented criteria</u>
  - Assign unique identifiers to configuration items
  - Specify the <u>important characteristics</u> of each configuration item
  - Specify <u>when each configuration item</u> is placed under configuration management
  - Identify the owner responsible for each configuration item

- Typical Work Product
  - Identified configuration items

#### Establish a Configuration Management System

- Establish and maintain a configuration management and change management system for controlling work products.
- Subpractices
  - Establish a mechanism to manage <u>multiple control</u> <u>levels</u> of configuration management.
  - Store and retrieve configuration items in the configuration management system.
  - Share and transfer configuration items between <u>control</u> <u>levels</u> within the configuration management system.

- Subpractices
  - Store and recover archived versions of configuration items.
  - Store, update, and retrieve configuration management records.
  - Create configuration management reports from the configuration management system.
  - Preserve the contents of the configuration management system. (Recovery, Backup, ..)
  - Revise the configuration management structure as necessary.

- Typical Work Product
  - Configuration management system with controlled work product
  - Configuration management system access control procedures
  - Change request database

- Create or Release Baselines
  - Create or release baselines for internal use and for delivery to the customer.
- Subpractices
  - Obtain authorization from the <u>configuration control</u> <u>board (CCB)</u> before creating or releasing baselines of configuration items.
  - Create or <u>release baselines</u> only from configuration items in the configuration management system.
  - Document the set of configuration items that are contained in a baseline.
  - Make the current set of baselines readily available.

- Typical Work Product
  - Baselines
  - Description of baselines

# Specific Goals 2

- Track and Control Changes
  - Change to the work products under configuration management are tracked and controlled

- Track Change Requests
  - Track change requests for the configuration items.
- Subpractices
  - Initiate and record change requests in the change request database.
  - Analyze the impact of changes and fixes proposed in the change requests.
    - Changes are evaluated through activities that ensure that they are consistent with all technical and project requirements.
    - Changes are evaluated for their impact beyond immediate project or contract requirements. Changes to an item used in multiple products can resolve an immediate issue while causing a problem in other applications.

#### Subpractices

- Review change requests that will be addressed in the next baseline with those who will be affected by the changes and get their agreement.
  - Record the disposition of each change request and the rationale for the decision, including success criteria, a brief action plan if appropriate, and needs met or unmet by the change. Perform the actions required in the disposition, and report the results to relevant stakeholders.
- Track the status of change requests to closure.

- Typical Work Product
  - Change requests

- Control Configuration Items
  - Control changes to the configuration items, includes
    - tracking the configuration of each of the configuration items,
    - approving a new configuration if necessary, and updating the baseline.
- Subpractices
  - Control changes to configuration items throughout the life of the product.
  - Obtain appropriate authorization before changed configuration items are entered into the configuration management system.
    - authorization may come from the CCB, the project manager, or the customer.

#### Subpractices

- Check in and check out configuration items from the configuration management system for incorporation of changes in a manner that maintains the correctness and integrity of the configuration items.
  - Examples of check-in and check-out steps
  - Confirming that the revisions are authorized
  - Updating the configuration items
  - Archiving the replaced baseline and retrieving the new baseline

#### Subpractices

- Perform reviews to ensure that changes have not caused unintended effects on the baselines (e.g., ensure that the changes have not compromised the safety and/or security of the system).
- Record changes to configuration items and the reasons for the changes as appropriate.
  - Changed configuration items are released after review and approval of
  - configuration changes. Changes are not official until they are released.

- Typical Work Product
  - Revision history of configuration items throughout the life of the product
  - Obtain appropriate authorization before changed configuration items are entered into configuration management system

# Specific Goals 3

Establish Integrity

Integrity of baselines is established and maintained

- Establish Configuration Management Records
  - Establish and maintain records describing configuration items.
- Subpractices
  - Record configuration management actions in sufficient detail so the content and status of each configuration item is known and previous versions can be recovered.
  - Ensure that <u>relevant stakeholders</u> have access to and knowledge of the <u>configuration status</u> of the configuration items.
  - Specify the latest version of the baselines.

#### Subpractices

- Identify the version of configuration items that constitute a particular baseline.
- Describe the differences between successive baselines.
- Revise the status and history (i.e., changes and other actions) of each configuration item as necessary.

- Typical Work Product
  - Revision history of configuration items
  - Change log
  - Copy of the change requests
  - Status of configuration items
  - Different between baselines

- Perform Configuration Audits
  - Perform configuration audits to maintain integrity of the configuration baselines.
- Subpractices
  - Assess the integrity of the baselines.
  - Confirm that the configuration records correctly identify the configuration of the configuration items.
  - Review the structure and integrity of the items in the configuration management system.

#### Subpractices

- Confirm the completeness and correctness of the items in the configuration management system.
  Completeness and correctness of the content is based on the requirements as stated in the plan and the disposition of approved change requests.
- Confirm compliance with applicable configuration management standards and procedures.
- Track action items from the audit to closure.

- Typical Work Product
  - Action items
  - Configuration audits results
    - 配置庫結構和相關說明
    - 開發起始 baseline 的構成
    - 當前 baseline 位置及狀態
    - 各 baseline 配置項集成分支的情況
    - 各私有開發分支類型的分佈情況
    - 關鍵元素的版本演進記錄
## Summary of Specific Goals/Practices1

<b>SG 1</b>	Establish Baselines
SP1.1	Identify Configuration Items
SP1.2	Establish a Configuration Management System
SP1.3	Create or Release Baselines
SG 2	Track and Control Changes
SP2.1	Track Change Requests
SP2.2	Control Configuration Items

## Summary of Specific Goals/Practices2

<b>SG 3</b>	Establish Integrity
SP3.1	Establish Configuration Management Records
SP3.2	Perform Configuration Audits

## CM Process

