PROJECT MANAGEMENT TECHNIQUES

Lecture 3

25.10.2014, Saturday

Outline of This Lecture

- Calculating Net Present Value, Payback Period, and Return on Investment

- Understanding PERT/CPM/Gantt Charts

- Building the Project Schedule with Microsoft Project

- Project Management Body of Knowledge (PMBOK)

Learning Objectives

- Calculate net present value, payback period, and return on investment

- Develop a Gantt/PERT/CPM chart

- Be able to set up a project in Microsoft Project

- Explain how Microsoft Project can be used to track an existing project

- Explain the nine areas of the Project Management Body of Knowledge

Overview

- The last lecture focused on project management principles, which are a major portion of each of the first **two core processes**: **Identify the problem and obtain approval**, and **Plan and monitor the project**

- This lecture will extend the coverage of project management principles and will provide additional explanations on several of the **important project management techniques**, including the use of Microsoft Project software

- This lecture will explain cost/benefit analysis in more depth as well as explain two other financial measures: **breakeven point** and **return on investment**

- The final part of this lecture is a more in-depth explanation of the each area of the PMBOK

Calculating Financial Returns
Net Present Value

- The two basic concepts of net present value are that (1) all benefits and costs are calculated in terms of today's dollars (that is, present value) and (2) that benefits and costs are combined to give a net value—hence, the name *net present value*

- Discount rate **–** the annual percentage rate that an amount of money is discounted to bring it to a present value

- Discount factor **–** the accumulation of yearly discounts based on the discount rate

Calculating Financial Returns
Net Present Value

- NPV Formula

$$present\ value = amount\ received\ in\ future/(1 + discount\ interest\ rate)^{number\ of\ years}$$

- NPV Calculation Example

$$F^n = 1/(1 + i)^n \quad and \quad PV = FV * F^n$$

For example, $100 received three years hence at a discount rate of 6 percent is:

$$F^n = 1/[(1 + .06) * (1 + .06) * (1 + .06)] = .8396$$

$$PV = \$100.00 * .8396 = \$83.96$$

- Discount factors F^n are usually looked up in tables rather than calculated

Calculating Financial Returns
Net Present Value

- For RMO CSMS Project:

A	B	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
			RMO Cost/Benefit Analysis for CSMS				
	Category	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1	Value of benefits		$1,046,000	$1,074,000	$1,104,240	$1,136,899	$1,172,171
2	Development costs	-$1,581,000					
3	Annual expenses		-$321,000	-$321,000	-$321,000	-$321,000	-$321,000
4	Net benefit/costs	-$1,581,000	$725,000	$753,000	$783,240	$815,899	$851,171
5	Discount factor	1.0000	0.9434	0.8900	0.8396	0.7921	0.7473
6	Net present value	-$1,581,000	$683,965	$670,170	$657,608	$646,274	$636,080
7	Cumulative NPV	-$1,581,000	-$897,035	-$226,865	$430,743	$1,077,017	$1,713,097
8	Payback period	2 years +	226865 / (226865+430743) = .35			or 2 years + 128 days (.35*365)	

Figure 1

Calculating Financial Returns
Payback Period

- Payback period – the amount of time the system has to operate to repay the costs of building and operating it

- In the example in Figure 1, we use the time value of money (that is, the discount rate) and use net benefits (that is, benefits minus operating costs)

- Some payback methods ignore the time value of money

- The year when the cumulative value becomes positive is the year in which payback occurs.

Calculating Financial Returns
Return on Investment (ROI)

- Return on investment – calculates a percentage return (like an interest rate) on the initial investment

- Sometimes, ROI calculations are done by using values that include the discount factor

- At other times, ROI is done on purely a cash basis without considering the organization's assigned discount rate

- Figure 2 shows both calculations

Calculating Financial Returns
Return on Investment (ROI)

	A	B	C	D	E	F	G	H	I
1				RMO Cost/Benefit Analysis for CSMS					
2		Category	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	5 Year Total
3	1	Value of benefits		$1,046,000	$1,074,000	$1,104,240	$1,136,899	$1,172,171	
4	2	Development costs	-$1,581,000						-$1,581,000
5	3	Annual expenses		-$321,000	-$321,000	-$321,000	-$321,000	-$321,000	
6	4	Net benefit/costs	-$1,581,000	$725,000	$753,000	$783,240	$815,899	$851,171	$3,928,310
7	5	Discount factor	1.0000	0.9434	0.8900	0.8396	0.7921	0.7473	
8	6	Net present value	-$1,581,000	$683,965	$670,170	$657,608	$646,274	$636,080	$3,294,097
9	7	Cumulative NPV	-$1,581,000	-$897,035	-$226,865	$430,743	$1,077,017	$1,713,097	
10									
11		ROI with discount =	3,294,097 / 1,581,000 = 208 %						
12		ROI without discount =	3,928,310 / 1,581,000 = 248%						

Figure 2

PERT/CPM Charts

- PERT/CPM chart is a network diagram with boxes that represent the tasks or activities of the project and with connecting arrows that represent the sequence and dependencies between tasks

- PERT, which stands for Project Evaluation and Review Technique developed by the U.S. Department of Defense to organize, monitor, and control very large, complex defense projects

- CPM, which stands for Critical Path Method, was developed independently

- In practice, the two techniques are combined

Create Work Breakdown Structure (WBS)

First Iteration of CSMS Project

ID	Description	Predecessor	Duration	Resources
	Analysis tasks			
1	Meet with sales department	—	8 hrs	4 people
2	Meet with marketing department	1	8 hrs	4 people
3	Define required information and data elements	2	8 hrs	4 people
4	Model user activities	2	16 hrs	4 people
	Design tasks			
5	Design database schema	3, 4	32 hrs	1 person (all 4 team members assigned quarter time)
6	Design screen layouts and cross links	3, 4	32 hrs	2 people (all 4 team members assigned half time)
7	Identify program classes and methods	3, 4	32 hrs	1 person (all 4 team members assigned quarter time)
	Build tasks			
8	Build database	5	8 hrs	2 people
9	Write program code	6, 7, 8	32 hrs	4 people
10	Set up user simulated live environment	4	8 hrs	2 people
11	Integrate 3-D imaging code	9	16 hrs	2 people
12	Build test data	10	32 hrs	4 people
13	Perform acceptance test with users	11, 12	16 hrs	4 people
14	Release accepted version	13	4 hrs	4 people
15	Perform team introspection	14	4 hrs	4 people

PERT/CPM chart
After identifying task dependencies
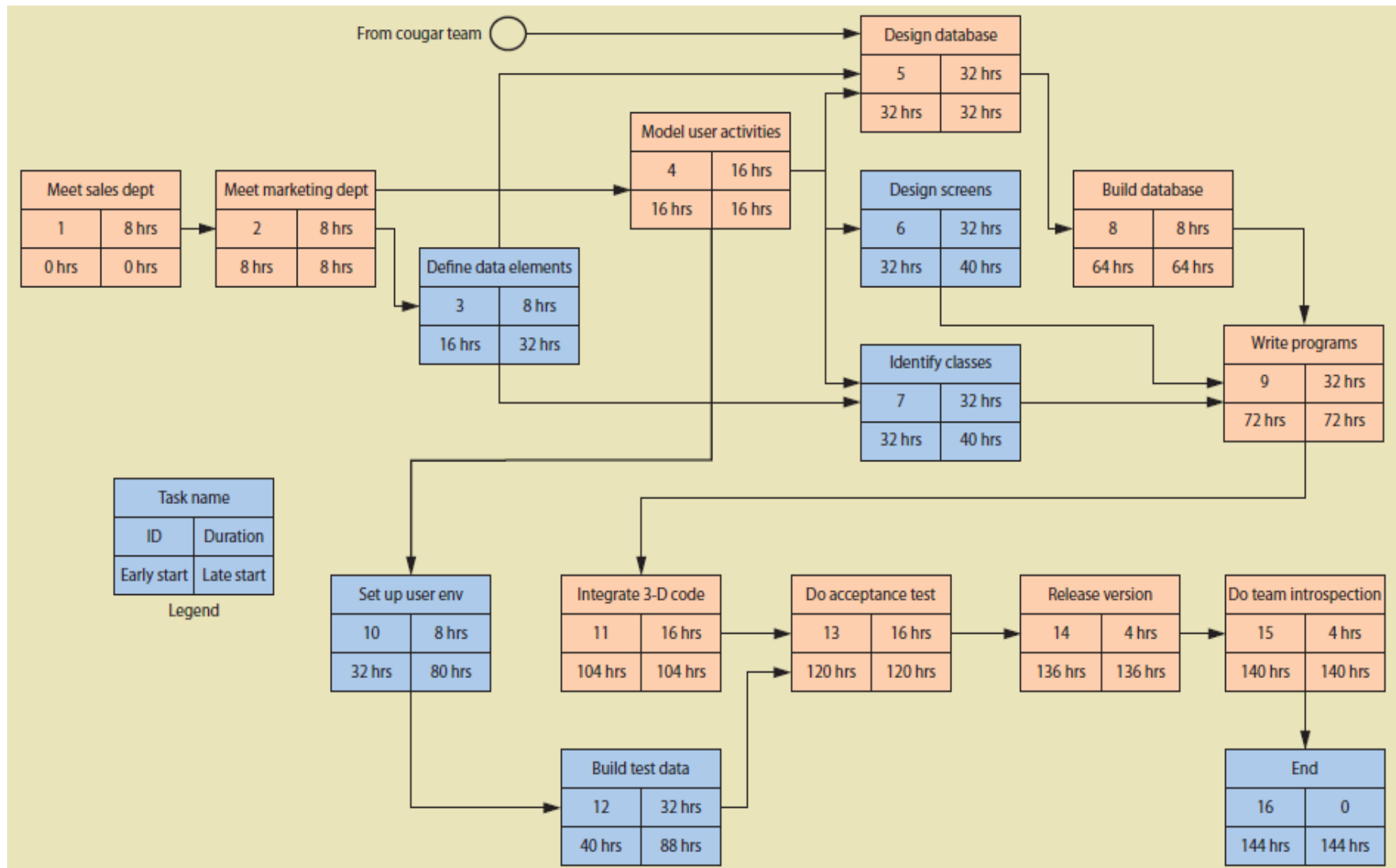
PERT/CPM chart
Critical Path

- Early start time **–** the earliest time that a task can begin due to predecessor durations
- Late start time **–** the latest time that a task can start to maintain the schedule
- Slack time – the amount of time a task or leg of sequential tasks can be delayed without impacting the project schedule

Task name	
ID	Duration
Early start	Late start

- On Critical Path

Model user activities	
4	16 hrs
16 hrs	16 hrs

- Not On Critical Path

Define data elements	
3	8 hrs
16 hrs	32 hrs

Project Schedule
Microsoft Project

- Resource Information for Project (People)

Project Schedule
Microsoft Project

- Information about Tasks

Project Schedule
Microsoft Project

- Assign Resources to Tasks

Project Schedule
Microsoft Project

- First Cut Gantt Chart
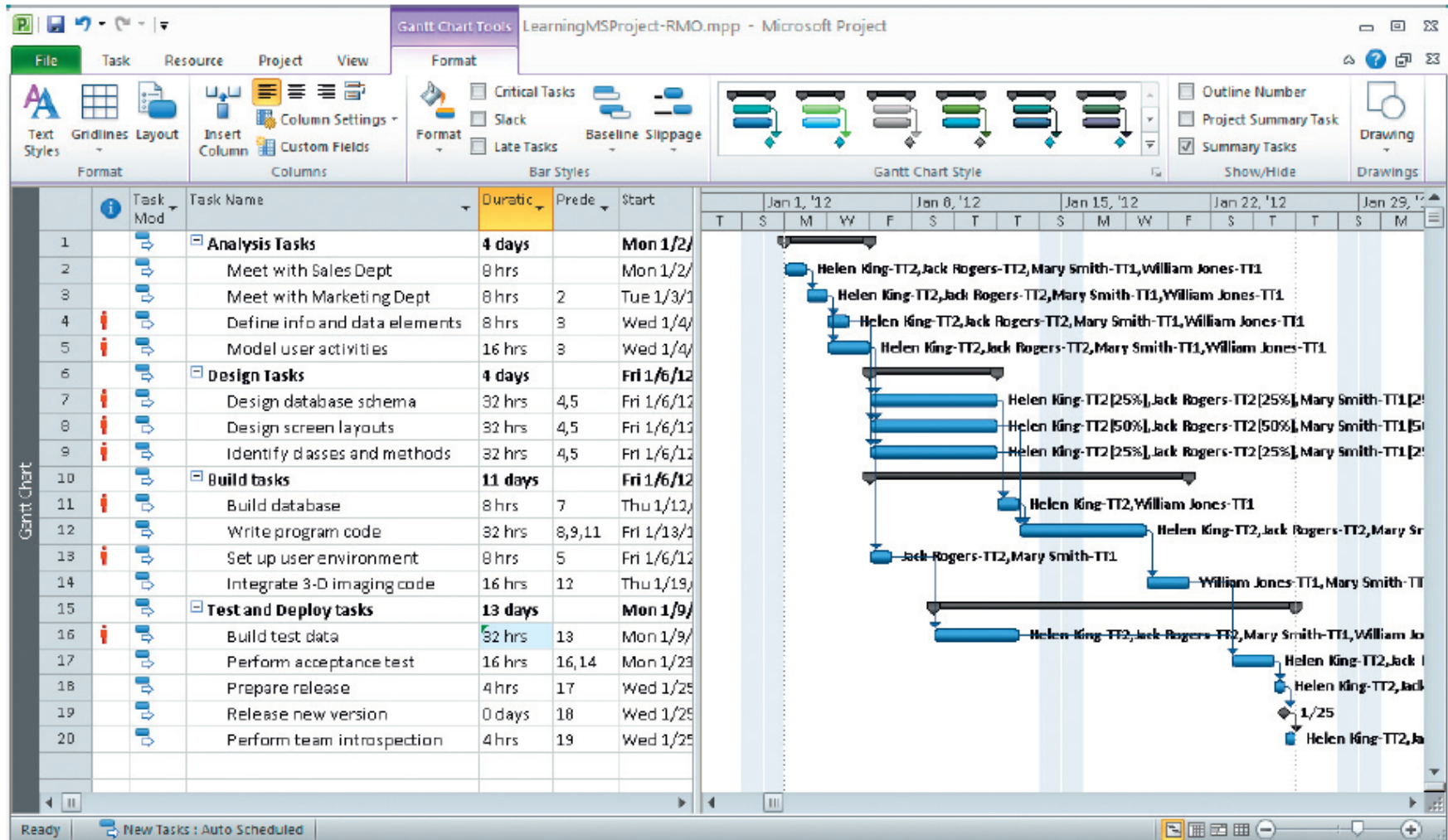
Project Schedule
Microsoft Project

- Resource Usage Chart
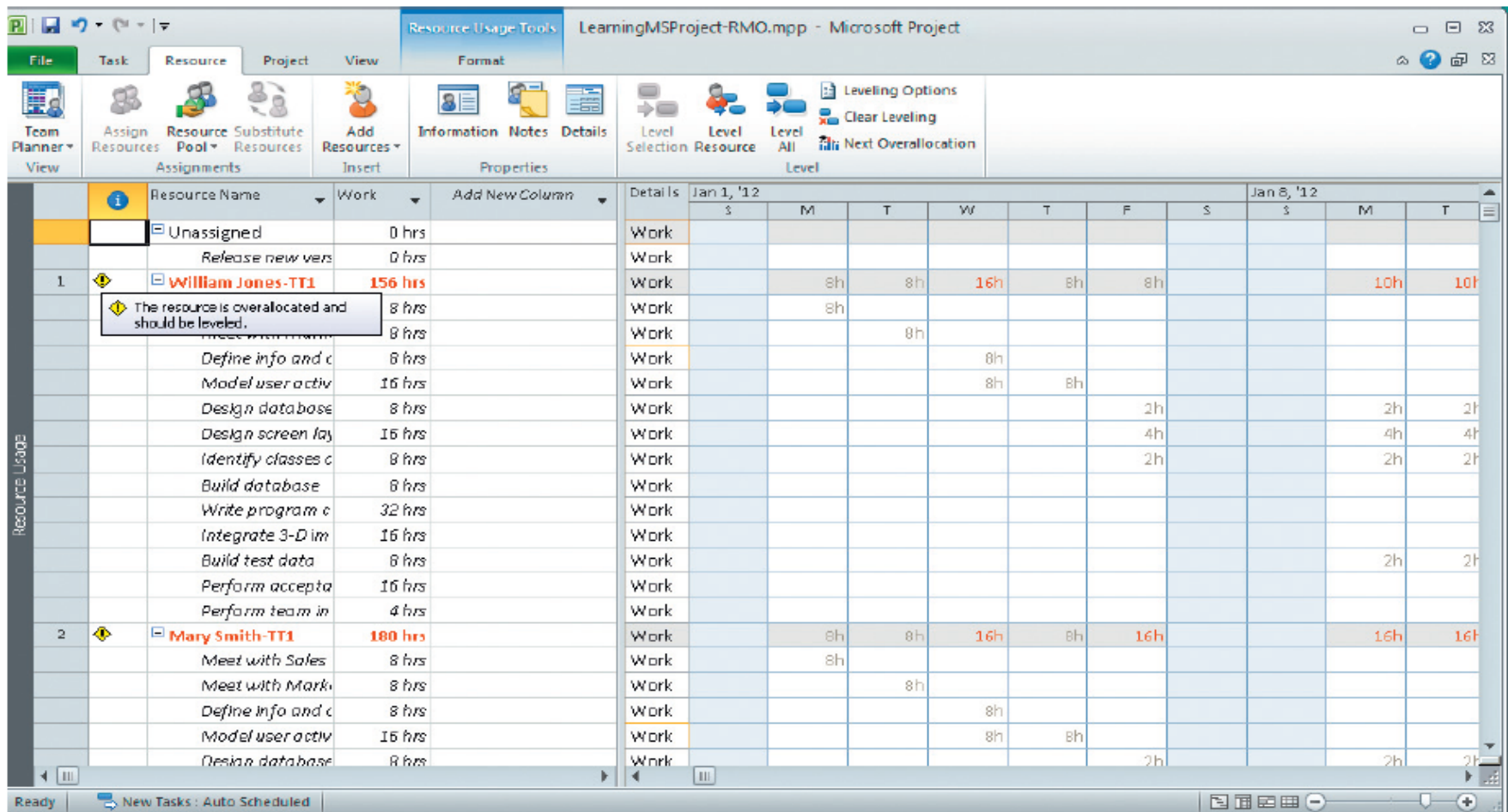
Project Schedule
Microsoft Project

- Final Gantt Chart with Critical Path and Slack
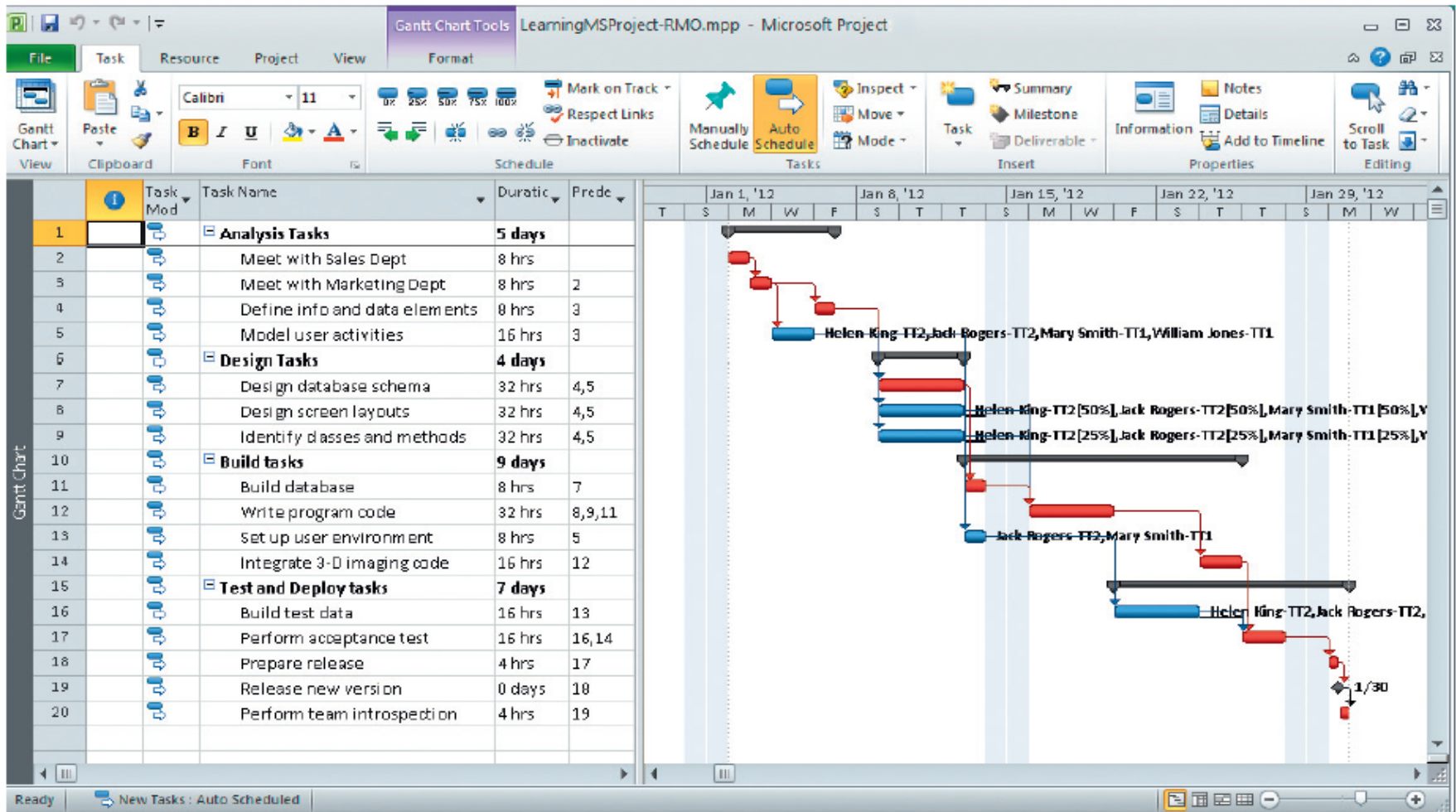
Project Schedule
Microsoft Project

- Network Diagram (The PERT/CPM Chart)
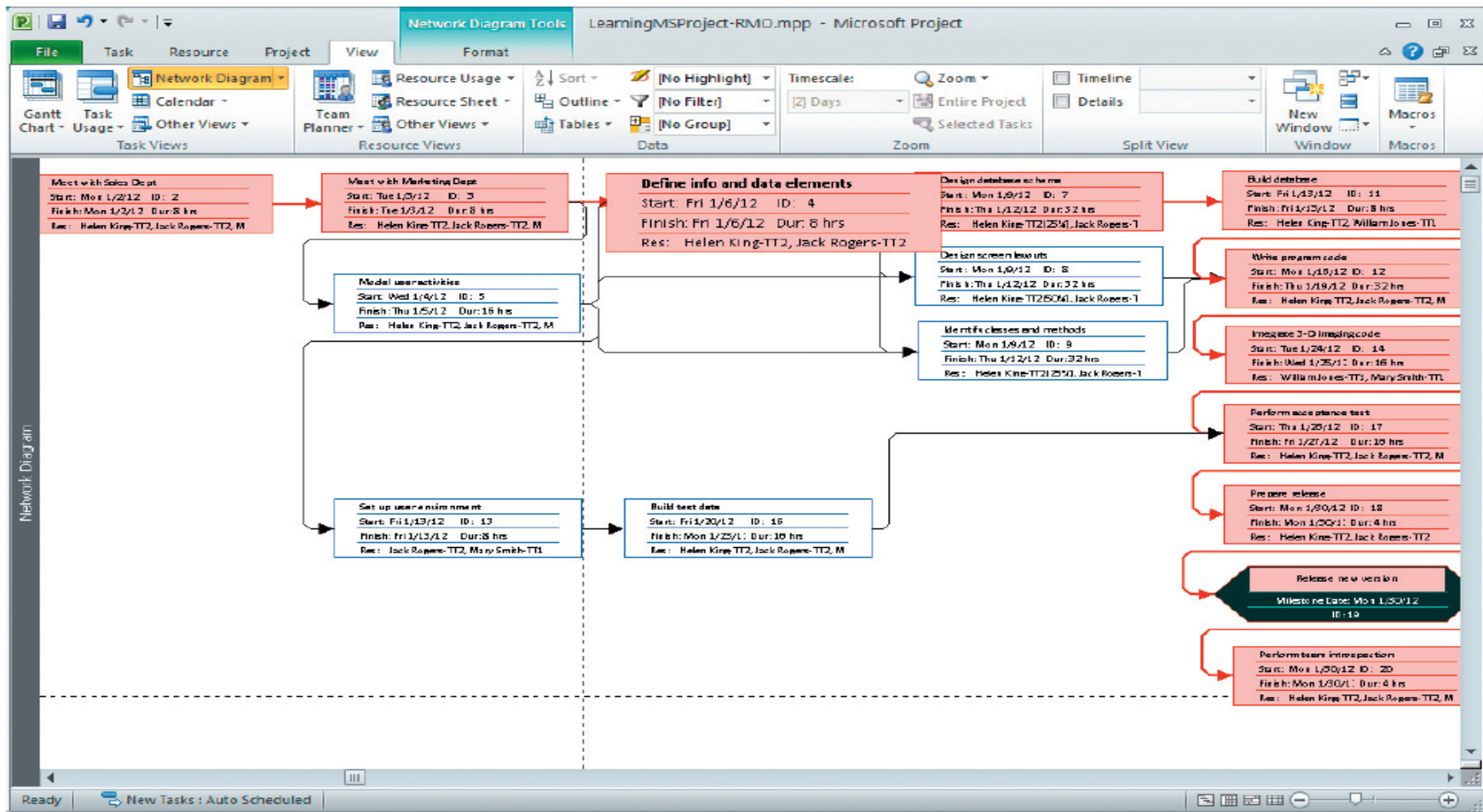
Project Management Body of Knowledge (PMBOK)

- This section is based on the Project Management Body of Knowledge (PMBOK) that has been developed by the Project Management Institute (PMI)

- PMI is a nonprofit professional organization with members from every industry and large organization in the United States as well as major international organizations

- With 500,000 members, it sponsors various conferences and workshops around the globe on project management

Project Management Body of Knowledge (PMBOK)

- PMBOK Has 9 Major Categories
  - Project scope management
  - Project time management
  - Project cost management
  - Project quality management
  - Project human resources management
  - Project communications management
  - Project risk management
  - Project procurement management
  - Project integration management

Project Scope Management

- Objectives
  - To precisely define the functions and capabilities to be included in the new system
  - To verify that the identified capabilities are necessary and are important priorities for the project at hand
  - To control the set of functions so it doesn't grow inappropriately
- Techniques
  - Defining the scope
  - Verifying the scope
  - Controlling the scope

Project Time Management

- Objectives
  - To ensure that the project schedule accurately accommodates the work to be done
  - To effectively use resources and techniques to accelerate the overall time to completion
  - To accurately measure completed work to correctly assess the percentage completed
- Techniques
  - Building the schedule
  - Modifying the schedule
  - Optimizing the schedule

Project Cost Management

- Objectives
  - To accurately estimate the anticipated project costs
  - To accurately predict the cash flow and timing of expenditures
  - To confine actual project expenditures to those that are included within the plan
  - To capture and record actual project expenditures correctly
- Techniques
  - Estimating costs
  - Controlling expenditures

Project Quality Management

- Objectives
  - Easy to use
  - Fit for its intended purpose
  - Robust
  - Reliable
  - Secure
  - Maintainable
- Techniques
  - Quality assurance (QA) planning
  - Quality reviews

Project Human Resources Management

- Objectives
  - To ensure that the project team is staffed at the right time with people who have adequate skills in the right mix
  - To provide appropriate training and development opportunities for members of the team
  - To organize the project team and sub-teams for effective work
  - To encourage work teams to become effective working units
  - To provide the leadership and vision necessary to encourage and motivate members of the team
  - To ensure that the working environment, including facilities, tools, and support, is conducive to accomplishing work

Project Communications Management

- Objectives
  - To ensure that the necessary information is gathered in a timely manner and is complete and accurate
  - To ensure that project information is disseminated frequently and is an accurate representation of the project
  - To ensure that members of the project team have current information
  - To capture and record important project information in a central information repository
- Techniques
  - Planning for gathering information, internal communications, and dissemination of project information

Project Risk Management

- Objectives
  - To determine the potential areas of high risk for the project
  - To develop strategies and plans of actions to reduce the identified risks
  - To carry out the plans of action to monitor and control the project risks
- Techniques
  - Risk identification
  - Risk management

Project Procurement Management

- Objectives
  - To plan the procurement process
  - To ensure that solicitation documents are complete and accurate
  - To evaluate and select alternative providers
  - To ensure that contracts are adequate, with sufficient performance controls and metrics
  - To monitor and control deliverables
- Techniques
  - Planning procurement requirements, development of solicitation documents, evaluating providers and alternatives, developing contracts, and monitoring and controlling deliveries

Project Integration Management

- Objectives
  - To see that the work of the project is completed successfully
  - Project integration management focuses on the specific tasks that ensure the project is coordinated, executed, and controlled properly
  - The skills from all the other knowledge areas are included in the project processes of integration management

Summary

- This online chapter supplements and enhances the printed chapters on project management

- First, it explained in detail the underlying concepts related to calculating the net present value and other financial measurement techniques

- The second theme explained the foundation concepts of PERT/CPM charts and how they are developed

- The third theme was more of a tutorial explanation about how to use Microsoft Project to build a project schedule

Summary (continued)

- The Project Management Body of Knowledge (PMBOK) includes nine specific knowledge areas that are important to project management

- In this lecture, each knowledge area is discussed, with an explanation given for the primary objectives of each knowledge area