

Chapter 2: Project Management



Learning Objectives

- Link information systems to business needs
- Learn how to create a system request
- Understand system feasibility
- Learn how to perform a feasibility analysis
- Understand how to select a project
- Become familiar with work breakdown structure, Gantt charts & network diagrams
- Become familiar with use-case driven effort estimation
- Learn how to create an interactive project workplan
- Learn how to manage the scope, refine estimates and manage the risk of a project
- Become familiar with how to staff a project
- Learn how the environment and infrastructure workflows interact with the project management workflow



Introduction

- Project Management is the process of planning and controlling system development within a specified time at a minimum cost with the right functionality
- A project is a set of activities with a specified beginning and end point meant to create a system that brings value to the business
- Project Managers monitor and control all tasks and roles that need to be coordinated
- Inception phase: generate a system request based on a business need or opportunity
- Perform a feasibility analysis; revise the system request
- Approve or decline the project



Project Identification

- Projects are driven by business needs
 - Identified by business people
 - Identified by IT people
 - (better yet) identified jointly by business and IT
- The “project sponsor” is the business unit proposing the system.
- The project sponsor believes in the system and wants to see it succeed
 - Normally this is a business person
 - Should have the authority to move it forward

Business Needs

- Support a new marketing campaign
- To replace inefficient existing processes.
- To deal with new problems or failures
- To utilize emerging technology.



Business Value

- Tangible Value
 - Can be quantified and measured directly
 - Example: 2 percent reduction in operating costs
- Intangible Value
 - We know it will add value & save time, but we may not be able to quantify or measure its benefits
 - Example: improved customer service

The System Request

- A document that describes the reasons for and the value added from building a new system
- Contains 5 elements:
 - Project sponsor: the primary point of contact for the project
 - Business need: the reason prompting the project
 - Business requirements: what the system will do
 - Business value: how will the organization benefit from the project
 - Special issues: Anything else that should be considered



Feasibility Analysis

- Is this project feasible?
 - What are the risks?
 - Can these risks be overcome?
- Major components:
 - Technical feasibility (Can we build it?)
 - Economic feasibility (Should we build it?)
 - Organizational feasibility (Will they use it?)



Technical Feasibility

- Identify risks in the following areas:
 - The functional area: Are analysts familiar with this portion of the business?
 - The technology: Less familiarity generates more risk
 - Project size: Large projects have more risk
 - Compatibility: Difficult integration increases the risk



Economic Feasibility (Cost-Benefit Analysis)

- Identify the costs and the benefits
- Assign values to the costs and benefits
- Determine the cash flow
- Determine the value using one or more methods:
 - Net present value (NPV)
 - Return on investment (ROI)
 - Break-even point



Cost-Benefit Analysis

Benefits^a	
Increased sales	500,000
Improved customer service ^b	70,000
Reduced inventory costs	68,000
Total benefits	638,000
Development costs	
2 servers @ \$125,000	250,000
Printer	100,000
Software licenses	34,825
Server software	10,945
Development labor	1,236,525
Total development costs	1,632,295
Operational costs	
Hardware	54,000
Software	20,000
Operational labor	111,788
Total operational costs	185,788
Total costs	1,818,083

^a An important yet intangible benefit will be the ability to offer services that our competitors currently offer.

^b Customer service numbers have been based on reduced costs for customer complaint phone calls.

Cost-Benefit Analysis

- The previous table gives values for only one year.
- Projects should be evaluated over a longer period.
- Some reasonable period of years is chosen.
- Costs and benefits are expressed in “present value” to adjust for various time frames.



Example Cost-Benefit Analysis

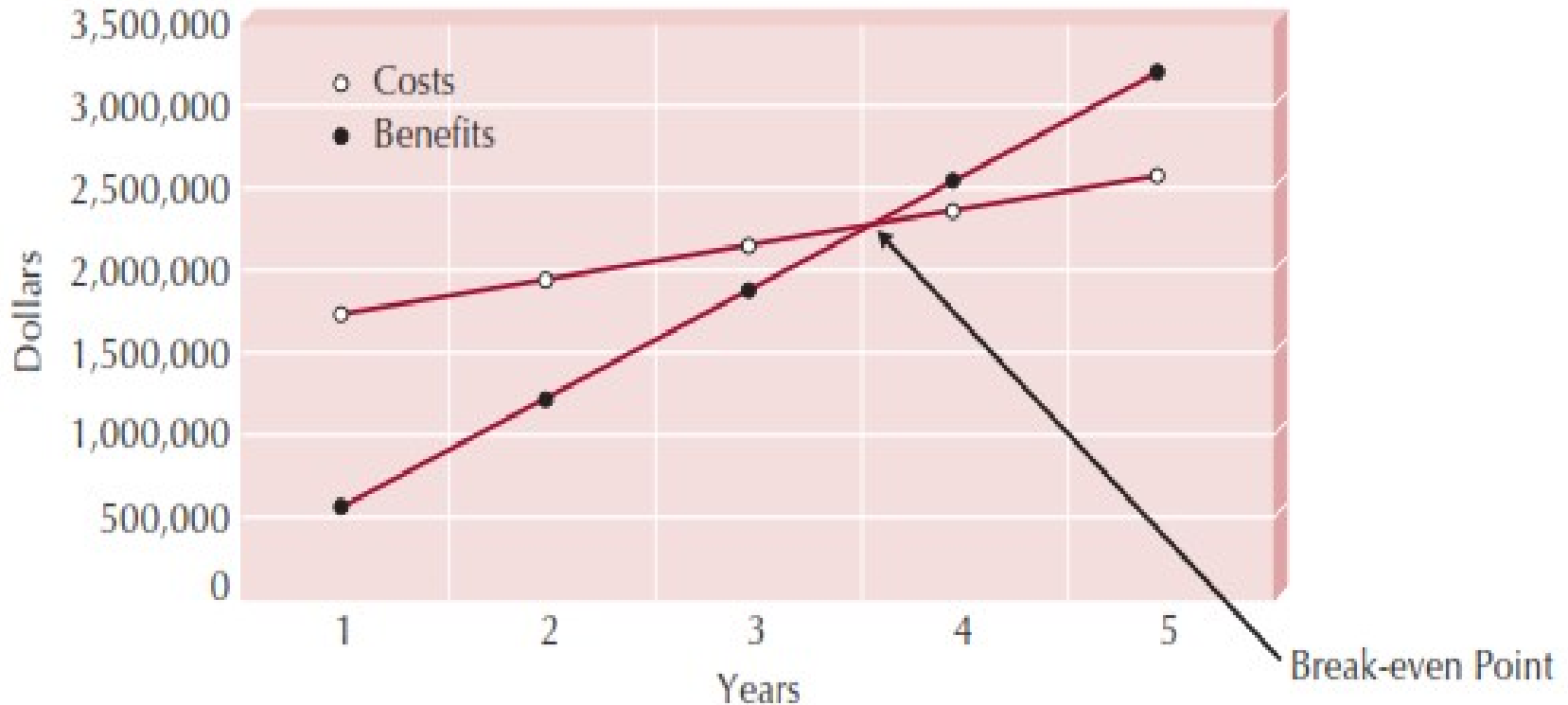
	2008	2009	2010	2011	2012	Total
Increased sales	500,000	530,000	561,800	595,508	631,238	
Reduction in customer complaint calls	70,000	70,000	70,000	70,000	70,000	
Reduced inventory costs	68,000	68,000	68,000	68,000	68,000	
TOTAL BENEFITS:	<u>638,000</u>	<u>668,000</u>	<u>699,800</u>	<u>733,508</u>	<u>769,238</u>	
PV OF BENEFITS:	<u>619,417</u>	<u>629,654</u>	<u>640,416</u>	<u>651,712</u>	<u>663,552</u>	<u>3,204,752</u>
PV OF ALL BENEFITS:	<u>619,417</u>	<u>1,249,072</u>	<u>1,889,488</u>	<u>2,541,200</u>	<u>3,204,752</u>	
2 Servers @ \$125,000	250,000	0	0	0	0	
Printer	100,000	0	0	0	0	
Software licenses	34,825	0	0	0	0	
Server software	10,945	0	0	0	0	
Development labor	1,236,525	0	0	0	0	
TOTAL DEVELOPMENT COSTS:	<u>1,632,295</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	
Hardware	54,000	81,261	81,261	81,261	81,261	
Software	20,000	20,000	20,000	20,000	20,000	
Operational labor	111,788	116,260	120,910	125,746	130,776	
TOTAL OPERATIONAL COSTS:	<u>185,788</u>	<u>217,521</u>	<u>222,171</u>	<u>227,007</u>	<u>232,037</u>	
TOTAL COSTS:	<u>1,818,083</u>	<u>217,521</u>	<u>222,171</u>	<u>227,007</u>	<u>232,037</u>	
PV OF COSTS:	<u>1,765,129</u>	<u>205,034</u>	<u>203,318</u>	<u>201,693</u>	<u>200,157</u>	<u>2,575,331</u>
PV OF ALL COSTS:	<u>1,765,129</u>	<u>1,970,163</u>	<u>2,173,481</u>	<u>2,375,174</u>	<u>2,575,331</u>	
TOTAL PROJECT BENEFITS – COSTS:	<u>(1,180,083)</u>	<u>450,479</u>	<u>477,629</u>	<u>506,501</u>	<u>537,201</u>	
YEARLY NPV:	<u>(1,145,712)</u>	<u>424,620</u>	<u>437,098</u>	<u>450,019</u>	<u>463,395</u>	<u>629,421</u>
CUMULATIVE NPV:	<u>(1,145,712)</u>	<u>(721,091)</u>	<u>(283,993)</u>	<u>166,026</u>	<u>629,421</u>	
RETURN ON INVESTMENT:	<u>24.44%</u>	(629,421/2,575,331)				
BREAK-EVEN POINT:	<u>3.63 years</u>	[break-even occurs in year 4; (450,019 – 166,026)/450,019 = 0.63]				
INTANGIBLE BENEFITS:	This service is currently provided by competitors Improved customer satisfaction					

Formulas for Determining Value

Calculation	Definition	Formula
Present Value (PV)	The amount of an investment today compared to that same amount in the future, taking into account inflation and time.	$\frac{\text{Amount}}{(1 + \text{interest rate})^n}$ <p>n = number of years in future</p>
Net Present Value (NPV)	The present value of benefit less the present value of costs.	PV Benefits – PV Costs
Return on Investment (ROI)	The amount of revenues or cost savings results from a given investment.	$\frac{\text{Total benefits} - \text{Total costs}}{\text{Total costs}}$
Break-Even Point	The point in time at which the costs of the project equal the value it has delivered.	$\frac{\text{Yearly NPV}^* - \text{Cumulative NPV}}{\text{Yearly NPV}^*}$

*Use the Yearly NPV amount from the first year in which the project has a positive cash flow.
Add the above amount to the year in which the project has a positive cash flow.

Example Break-Even Point



Organizational Feasibility

- Will the users accept the system?
- Is the project strategically aligned with the business?
- Conduct a stakeholder analysis
 - Project champion(s)
 - Organizational management
 - System users
 - Others



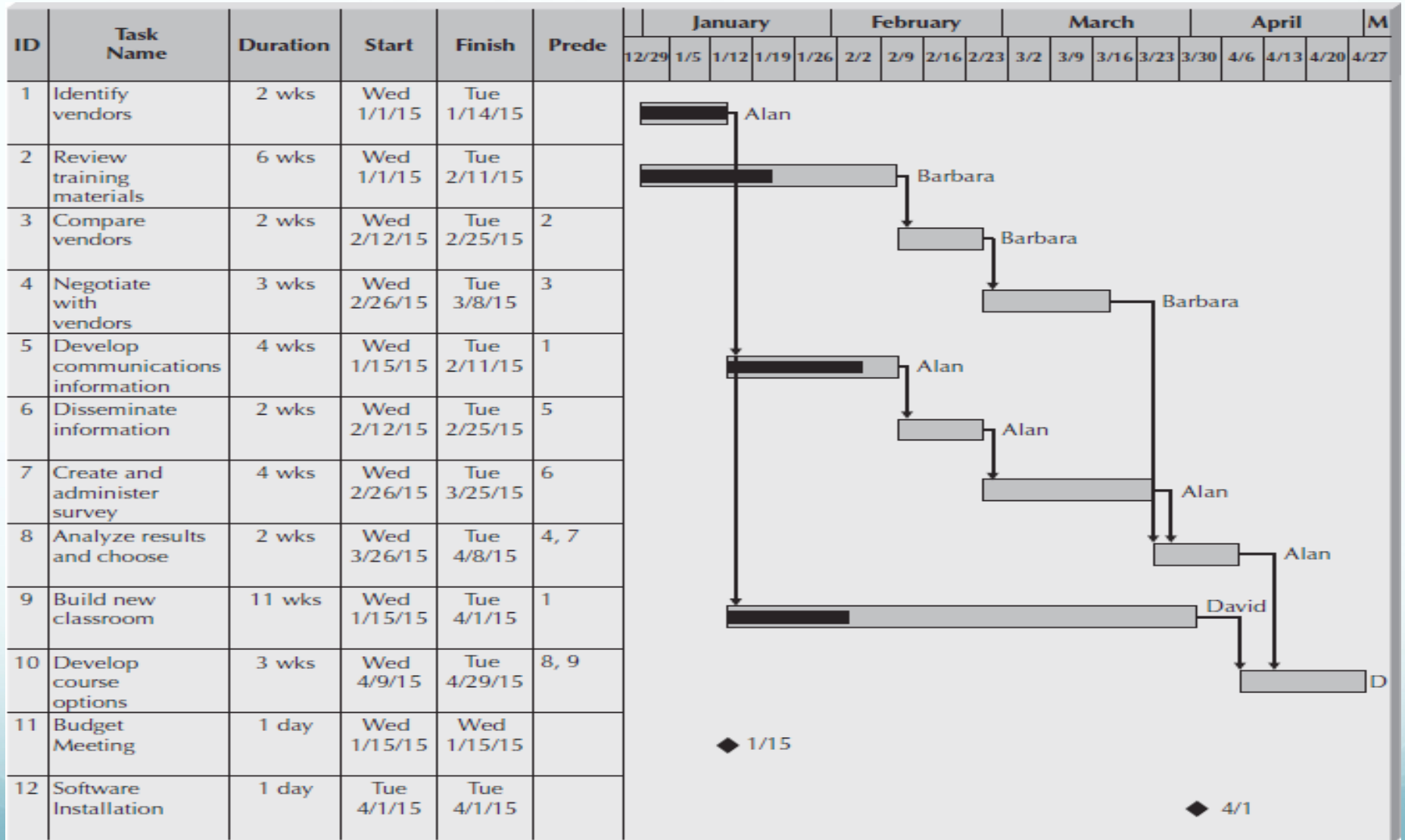
Project Selection

- Projects are approved, declined or delayed based on value added vs. risks
- Project portfolio management
 - Goals:
 - Maximize cost/benefit ratio
 - Maintain an optimal mix of projects based on:
 - Risk
 - Size, cost & length of time to complete
 - Purpose, scope & business value
 - Limited resources require trade-offs
- Selected projects enter the project management process

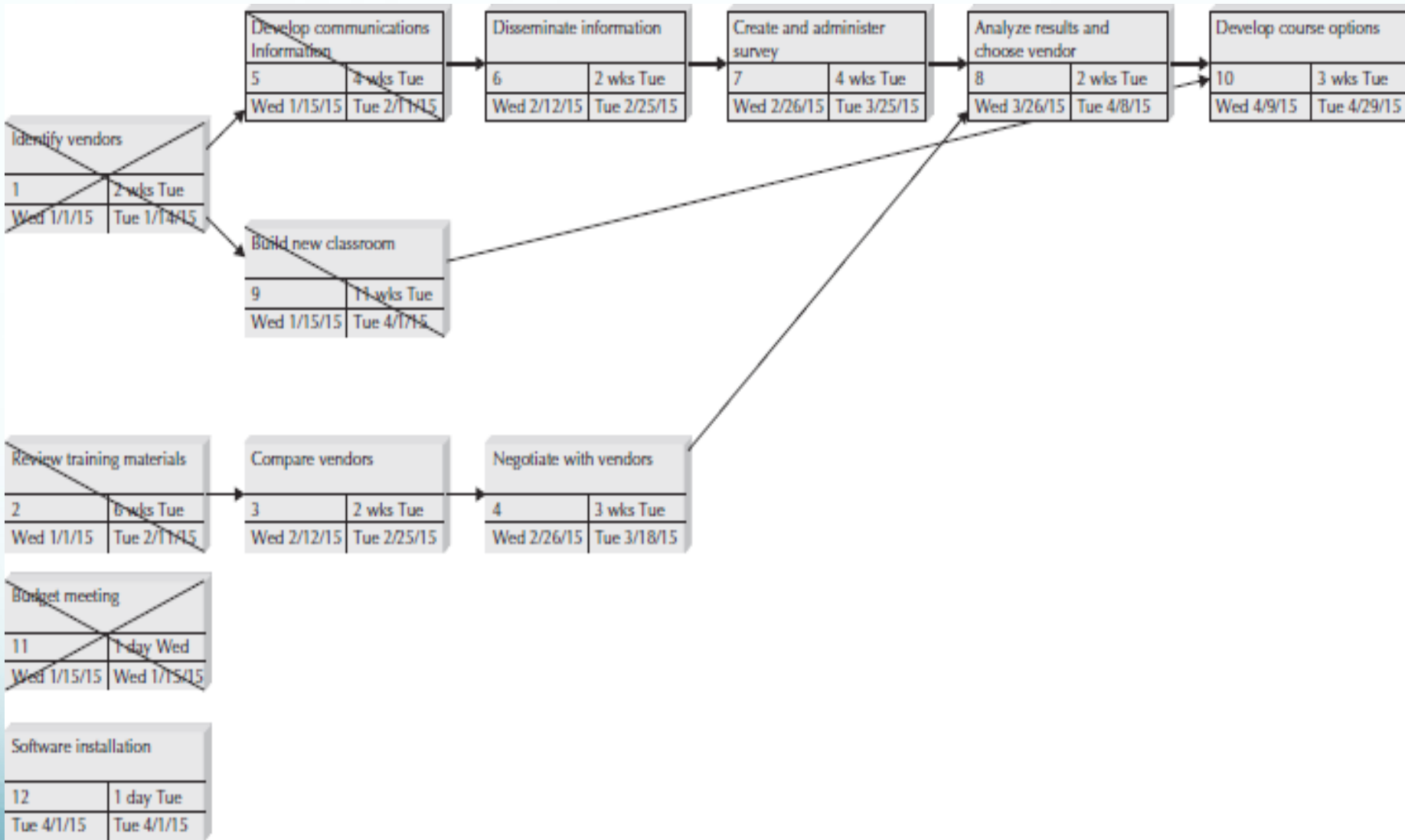
Project Management Tools

- Aids in creating workplans
- Identify all tasks, their sequence and estimate the time to complete each one
- Work breakdown structures (WBS): a hierarchy of tasks to identify:
 - Duration of each task
 - Current status of each task
 - Task dependencies (shows which tasks must be completed before others can begin)
- Gantt charts: horizontal bar chart that shows the WBS graphically
- Network diagrams: PERT and CPM

GANTT



Network



Project Effort Estimation

- Estimation involves trade-offs between functionality, time and cost
- It is the process of assigning projected values for time and effort
- Most accurate estimates come from experience
- Use-case point method; based on:
 - Technical complexity factors (13)
 - Environmental factors (8)



Project Effort Estimation

- Actors are persons or external systems which interact with ours.
- Use cases are major business processes to be performed.
- Points are assigned for each based on complexity and summed.
- Point total adjusted (up) by complexity factors, and (down) by helpful environmental factors.
- Converted to person-hours by a factor depending on environmental factor settings.



Use-case Estimation Example

- Actors & Use-cases:

Unadjusted Actor Weighting Table:				
Actor Type	Description	Weighting Factor	Number	Result
Simple	External system with well-defined API	1	0	0
Average	External system using a protocol-based interface, e.g., HTTP, TCT/IP, or a database	2	0	0
Complex	Human	3	4	12
<i>Unadjusted Actor Weight Total (UAW)</i>				12
Unadjusted Use-Case Weighting Table:				
Use Case Type	Description	Weighting Factor	Number	Result
Simple	1-3 transactions	5	3	15
Average	4-7 transactions	10	4	40
Complex	>7 transactions	15	1	15
<i>Unadjusted Use Case Weight Total (UUCW)</i>				70
<i>Unadjusted Use-Case Points (UUCP) = UAW + UUCW 82 = 12 + 70</i>				

Use-case Estimation Example

- Technical complexity factors:

Technical Complexity Factors:					
Factor Number	Description	Weight	Assigned Value (0 – 5)	Weighted Value	Notes
T1	Distributed system	2.0	0	0	
T2	Response time or throughput performance objectives	1.0	5	5	
T3	End-user online efficiency	1.0	3	3	
T4	Complex internal processing	1.0	1	1	
T5	Reusability of code	1.0	1	1	
T6	Ease of installation	0.5	2	1	
T7	Ease of use	0.5	4	2	
T8	Portability	2.0	0	0	
T9	Ease of change	1.0	2	2	
T10	Concurrency	1.0	0	0	
T11	Special security objectives included	1.0	0	0	
T12	Direct access for third parties	1.0	0	0	
T13	Special user training required	1.0	0	0	
Technical Factor Value (TFactor)				15	
Technical Complexity Factor (TCF) = 0.6 + (0.01 * TFactor) 0.75 = 0.6 + (0.01 * 15)					

Use-case Estimation Example

- Environmental factors & final estimate:

Environmental Factors:						
Factor Number	Description	Weight	Assigned Value (0 – 5)	Weighted Value	Notes	
E1	Familiarity with system development process being used	1.5	4	6		
E2	Application experience	0.5	4	2		
E3	Object-oriented experience	1.0	4	4		
E4	Lead analyst capability	0.5	5	2.5		
E5	Motivation	1.0	5	5		
E6	Requirements stability	2.0	5	10		
E7	Part-time staff	-1.0	0	0		
E8	Difficulty of programming language	-1.0	4	-4.0		
				Environmental Factor Value (EFactor)	25.5	
<p>Environmental Factor (EF) = 1.4 + (-0.03 * EFactor) 0.635 = 1.4 + (-0.03 * 25.5)</p> <p>Adjusted Use Case Points (UCP) = UUCP * TCF * ECF 33.3375 = 70 * 0.75 * 0.635</p> <p>Effort in person-hours = UCP * PHM 666.75 = 20 * 33.3375</p>						

Creating & Managing the Workplan

- Workplan: a dynamic and sequential list of all tasks needed to complete a project
- Work plan should be iterative and incremental
- The work plan needs to evolve as the project design does
- Not enough is known at the start to plan in full detail



Creating & Managing the Workplan

- Approaches:
 - Modify existing or completed projects
 - Derive the tasks from the methodology being used
- Unified Process:
 - Iterative & incremental
 - Workplan is also iterative & incremental
 - Tasks and time intervals follow the phases
 - Different tasks executed for each workflow



Evolutionary Work Breakdown Structures

- Organized in a standard manner across all projects
- Created in an incremental & iterative manner
- Generality supports learning from past mistakes and successes
- Unified Process:
 - Workflows are the major divisions
 - Workflows are decomposed along the phases
 - Phases are decomposed along the required tasks
 - Tasks are added as each iteration is completed



Scope Management

- Scope “creep”
 - Occurs after the project is underway
 - Results from adding new requirements to the project
 - *Client, developer, or manager gets hooked on some new feature.*
 - Can have a deleterious effect on the schedule
- Techniques to manage the project scope:
 - Identify all requirements at the outset
 - Allow only those changes deemed absolutely necessary
 - Carefully examine the impact of suggested changes
 - Delay some changes for “future enhancements”
 - Time boxing: fix a deadline, deliver what's done

Refining Estimates

- Early effort estimates will probably be incorrect
- Update as you go: hurricane model
- When something comes in early, move up intermediate deadlines, but not delivery
- When something is late, don't expect to make up the time



Staffing the Project

- Goals:
 - Determine how many people are required
 - Match skill sets to required activities
 - Motivate the team to meet the objectives
 - Minimize conflicts
- Deliverable—The staffing plan, which includes:
 - Number & kind of people assigned
 - Overall reporting structure
 - The project charter (describes the project's objectives and rules)

Creating a “Jelled” Team

- A team of people so strongly knit that the whole is greater than the sum of its parts
- Characteristics of a jelled team:
 - Very low turnover rate
 - Strong sense of identity
 - A feeling of eliteness
 - Team vs. individual ownership of the project
 - Team members enjoy their work
 - Love the challenge, proud of meeting it

Jelled Team

- Members willing to admit what they don't know and ask for help
- Do not fear conflict
- Individuals accept responsibility
- More interested in team performance than own



The Staffing Plan

- Calculate the number of people needed:

$$\text{number of people} = \frac{\text{person-months}}{\text{time to complete (in months)}}$$

- Lines of communication increase exponentially as people are added to a project
- Create a reporting structure for projects with large numbers of people assigned
- Form sub-teams as necessary
- Assign the Project Manager, Functional lead & Technical lead
- Pay attention to technical and interpersonal skills

Motivating People

- Motivation is the greatest influence on performance
- Monetary rewards usually do not motivate
- Suggested motivating techniques:
 - 20% time rule: work on what you believe in
 - Peer-to-peer recognition awards
 - Team ownership (refer to the team as “we”)
 - Allow members to focus on what interests them
 - Utilize equitable compensation
 - Encourage group ownership
 - Provide for autonomy, but trust the team to deliver

Handling Conflict

- Preventing or mitigating conflict:
 - Cohesiveness has the greatest effect
 - Clearly defining roles and holding team members accountable
 - Establish work & communications rules in the project charter
- Additional techniques:
 - Clearly define plans for the project
 - Make sure the team understands the importance of the project
 - Develop detailed operating procedures
 - Develop a project charter
 - Develop a schedule of commitments in advance
 - Forecast other priorities and their impact on the project

Environment & Infrastructure Management

- Environment—Choose the right set of tools
 - Use appropriate CASE tools to:
 - Increase productivity and centralize information (repository)
 - Utilize diagrams—more easily understood
 - Establish standards to reduce complexity
- Infrastructure—Document the project appropriately
 - Store deliverables & communications in a project binder
 - Use Unified Process standard documents
 - Don't put off documentation to the last minute



Summary

- Project Initiation
- Feasibility Analysis
- Project Selection
- Traditional Project Management Tools
- Estimating Project Effort
- Create and manage the workplan
- Staff the project
- Manage the environment and infrastructure work flows of the project