COMP6115
Object Oriented Analysis and Design

Session #2

Project Management

Learning Outcomes

LO1: Identify the basic concept of advance topic in Object Oriented Analysis and Design

LO2 : Use the knowledge to develop documentation for object oriented software analysis and design using Unified Modelling Language

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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 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 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

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.	$$\frac{\text{Amount}}{(1 + \text{interest rate})^n}$$ n = number of years in future
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 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:	638,000	668,000	699,800	733,508	769,238	
PV OF BENEFITS:	619,417	629,654	640,416	651,712	663,552	3,204,752
PV OF ALL BENEFITS:	619,417	1,249,072	1,889,488	2,541,200	3,204,752	
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:	1,632,295	0	0	0	0	
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:	185,788	217,521	222,171	227,007	232,037	
TOTAL COSTS:	1,818,083	217,521	222,171	227,007	232,037	
PV OF COSTS:	1,765,129	205,034	203,318	201,693	200,157	2,575,331
PV OF ALL COSTS:	1,765,129	1,970,163	2,173,481	2,375,174	2,575,331	
TOTAL PROJECT BENEFITS – COSTS:	(1,180,083)	450,479	477,629	506,501	537,201	
YEARLY NPV:	(1,145,712)	424,620	437,098	450,019	463,395	629,421
CUMULATIVE NPV:	(1,145,712)	(721,091)	(283,993)	166,026	629,421	
RETURN ON INVESTMENT:	24.44%	(629,421/2,575,331)				
BREAK-EVEN POINT:	3.63 years	[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					

Example Break-Even Point
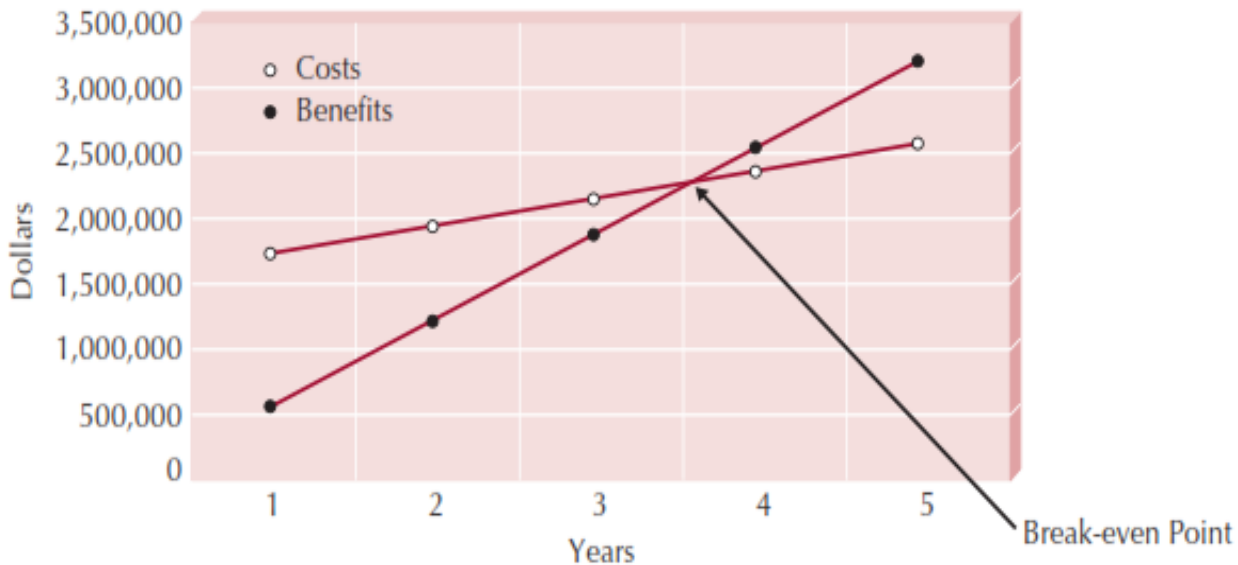
Organizational Feasibility

- 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

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)

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Use-case Estimation Example

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
		Unadjusted Actor Weight Total (UAW)		**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
		Unadjusted Use Case Weight Total (UUCW)		**70**

Unadjusted Use-Case Points (UUCP) = UAW + UUCW   82 = 12 + 70

Use-case Estimation Example

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:

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	

Environmental Factor (EF) = 1.4 + (−0.03 * EFactor) $0.635 = 1.4 + (−0.03 * 25.5)$
Adjusted Use Case Points (UCP) = UUCP * TCF * ECF $33.3375 = 70 * 0.75 * 0.635$
Effort in person-hours = UCP * PHM $666.75 = 20 * 33.3375$

Creating & Managing the Workplan

- Workplan: a dynamic and sequential list of all tasks needed to complete a project
- 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
  - 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

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

The Staffing Plan

- Calculate the number of people needed:

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

- 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

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Motivating People

- Motivation is the greatest influence on performance
- Monetary rewards usually do not motivate
- Suggested motivating techniques:
    - 20% time rule
    - 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

References

Denis, Wixom,Tegarden. (2015). Systems Analysis and Design: An Object-Oriented Approach with UML. 5th edition. ISBN: 978-1-118-80467-4, John Wiley & Sons, Inc, Denver (USA)

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