System Analysis and Design

Eighth Edition

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Chapter 1

The Systems Analyst and Information Systems Development

Objectives

- Explain the role played in IS development by the systems analyst.
- Describe the fundamental systems development life cycle and its four phases.
- Explain how organizations identify IS development projects.
- Explain the importance of linking the IS to business needs.
- Be able to create a system request.
- Describe technical, economic, and organizational feasibility assessment.
- Be able to perform a feasibility analysis.

Introduction

- The systems development life cycle (SDLC) is the process of determining how an information system (IS) can support business needs, designing the system, building it, and delivering it to users

- The systems analyst plays a key role in the SDLC, analyzing the business situation, identifying opportunities for improvements, and designing an IS to implement the improvements

- The primary goal of the system analyst is to create value for the organization, which for most companies means increasing profits

- Systems analysts do things and challenge the current way that an organization works.

Introduction Continued

- Large systems development projects are particularly susceptible to failure

- An analysis of very large development projects conducted by the Standish Group found that for projects that exceed $100 million in labor costs, only 2% are successful
  - Several major factors were delays in decision making and a high workforce turnover during the project

The Systems Analyst

- The systems analyst works closely with all project team members so that the team develops the right system in an effective way

- Systems analysts must understand how to apply technology to solve business problems

- Systems analysts serve as change agents who identify the organizational improvements needed, design systems to implement those changes, and train and motivate others to use the systems

Systems Analyst Skills

1. Analysts must have the ***technical skills*** to understand the organization's existing technical environment, the new system's technology foundation, and the way in which both can be fit into an integrated technical solution

2. ***Business skills*** are required to understand how IT can be applied to business processes and to ensure that IT delivers real business value

3. Analysts are continuous problem solvers at both the project and the organizational level, and they put their ***analytical skills*** to the test regularly
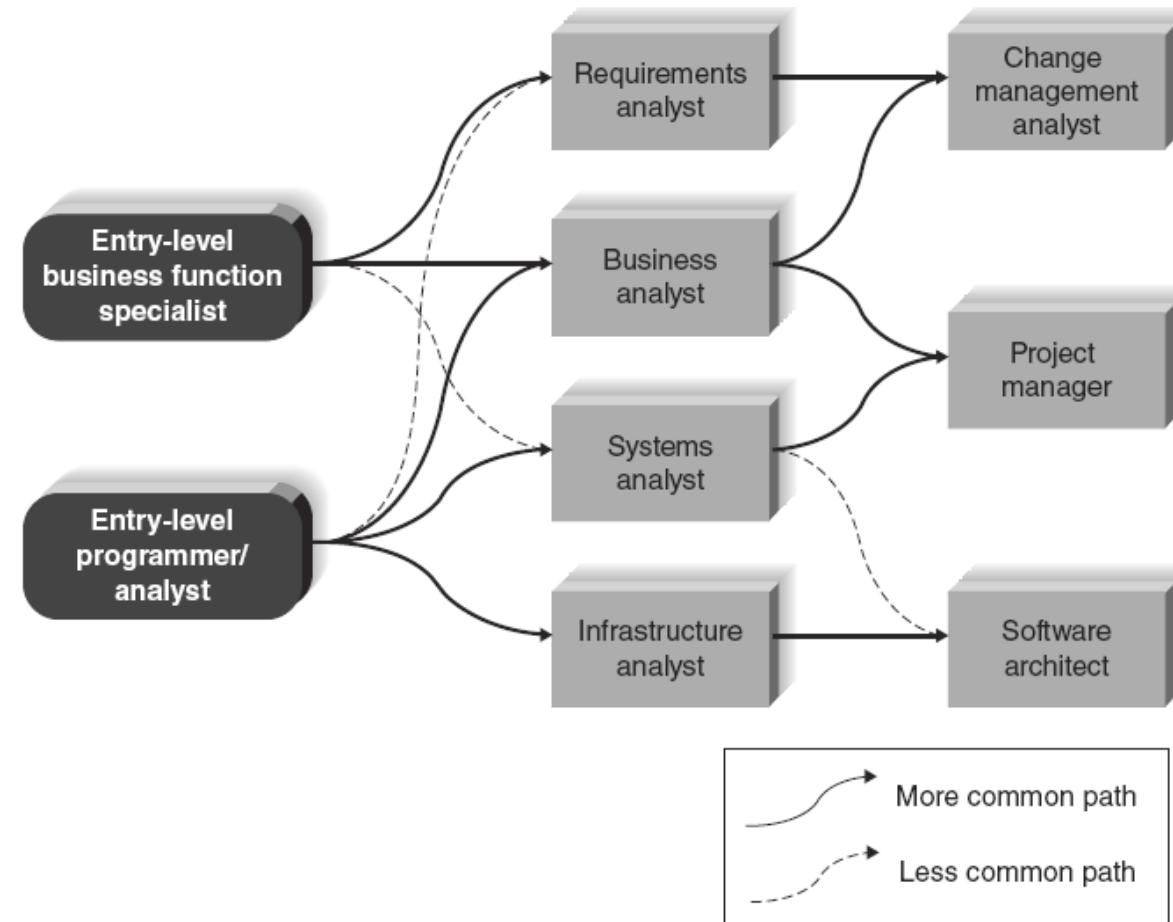
Systems Analyst Skills Continued

4. Analysts need strong ***interpersonal skills*** to communicate effectively, one-on-one with users and business managers, with programmers and other technical specialists, and with people from outsourcing firms and vendor organizations

5. Analysts need to ***manage*** people with whom they work, and they must manage the pressure and risks associated with unclear situations

6. Analysts must deal fairly, honestly, and ***ethically*** with other project team members, managers, and system users

Systems Analyst Roles

- The ***systems analyst*** role focuses on the IS issues surrounding the system

- The ***business analyst*** role focuses on the business issues surrounding the system

- The ***requirements analyst*** role focuses on eliciting the requirements from the stakeholders associated with the new system

- The ***infrastructure analyst*** role focuses on technical issues surrounding the ways the system will interact with the organization's technical infrastructure

Career Paths for System Developers

Systems Analyst Roles Continued

- The **software architect** takes a holistic view of the organization's entire IT environment and guides application design decisions within that context

- The **change management** analyst role focuses on the people and management issues surrounding the system installation

- The **project manager** role ensures that the project is completed on time and within budget and that the system delivers the expected value to the organization

The Systems Development Life Cycle
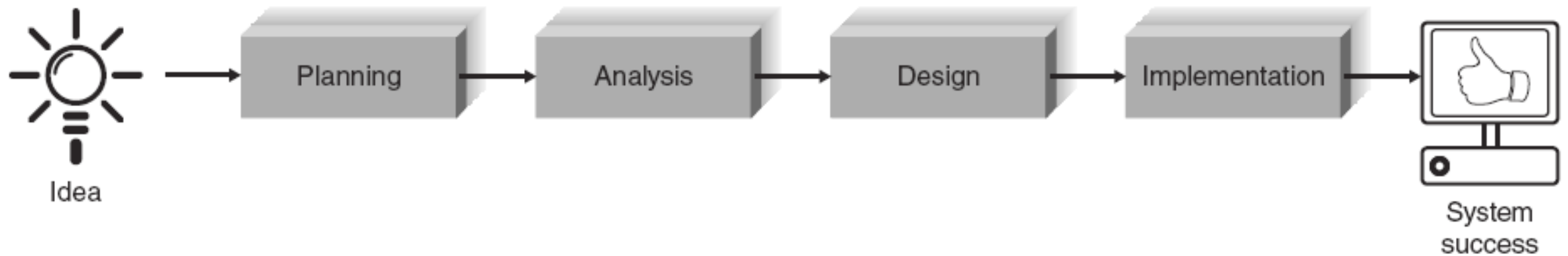
Planning Phase

- Project initiation
  - Prepare system request
  - Perform preliminary feasibility analysis

- Set up the project
  - Project plan, including work plan and staffing plan

Analysis Phase

- Determine analysis strategy
  - Study existing system and its problems
- Collect and analyze requirements
  - Develop new system concept
  - Describe new system with analysis models
- Prepare and present system proposal
  - Summarize results of the Analysis Phase
  - Go/No Go decision made by sponsor and steering committee

Design Phase

- Determine design strategy
  - Build / buy / outsource

- Design system components
  - Architecture, interface, database, programs
  - Assemble design elements into system specification

- Present to steering committee
  - Go /no go decision before entering final phase

Implementation Phase

- System construction
  - Programming and testing
- System installation
  - Training
  - Conversion to new system
- On-going system support

Project Identification and Initiation

- Fulfill a business need
  - Enable a business initiative or strategy
  - Support a merger/acquisition
  - Fix a "point of pain"
  - Utilize a new technology

- Outgrowth of business process management (BPM)

What is BPM?

- ***Business process management***: A methodology used by organizations to continuously improve end-to-end business processes

- Internal and cross-organizational processes

- Benefits include:
  - Enhanced process agility
  - Process alignment with industry "best practices"
  - Increased process efficiencies

- Four-step continuous cycle:
  1. Define and map the steps in a business process
  2. Create ways to improve on steps in the process that add value
  3. Find ways to eliminate or consolidate steps in the process that do not add value
  4. Create or adjust electronic workflows to match the improved process maps

BPM Identifies Business Needs

- Business process automation
  - "Create or adjust electronic workflows to match the improved process maps"

- Business process improvement
  - Study the business processes
  - Create new, redesigned processes to improve the process workflows, and/or
  - Utilize new technologies enabling new process structures

- Business process reengineering
  - Total overhaul of work processes

Project Sponsor

- Driving force behind project

- Specifies overall business requirements

- Determines business value

- Formally requests a project via the system request

Business Value

- The project sponsor has the insights needed to determine the business value that will be gained from the system, in both tangible and intangible ways

- ***Tangible value*** can be quantified and measured easily

- ***Intangible value*** results from an intuitive belief that the system provides important, but hard-to-measure, benefits to the organization

System Request

- Describes business reasons for project

- Defines system's expected value
  - Force the sponsor to formalize his/her ideas
  - Provide a framework for collecting initial project information
  - Standardize information to be used by steering (approval) committee

- Lists project's key elements

Elements of the Systems Request

Element	Description	Examples
Project Sponsor	The person who initiates the project and who serves as the primary point of contact for the project on the business side	Several members of the finance department Vice president of marketing CIO CEO
Business Need	The business-related reason for initiating the system	Reach a new market segment Offer a capability to keep up with competitors Improve access to information Decrease product defects Streamline supply acquisition processes
Business Requirements	The new or enhanced business capabilities that the system will provide	Provide online access to information Capture customer demographic information Include product search capabilities Produce performance reports Enhance online user support

Elements of the Systems Request Continued

Element	Description	Examples
Business Value	The benefits that the system will create for the organization	3% increase in sales 1% increase in market share Reduction in headcount by 5 FTEs $200,000 cost savings from decreased supply costs $150,000 savings from removal of outdated technology
Special Issues or Constraints	Issues that pertain to the approval committee's decision	Government-mandated deadline for May 30 System needed in time for the Christmas holiday season Top-level security clearance needed by project team to work with data

- ***System Request***—Client Services Project

- ***Project Sponsor***: Carmella Herrera, General Manager, Client Services Business Unit

- ***Business Need***: This project has been initiated to create the capability of clients requesting drone flight service and data analysis through the company website. The capability is an essential element in the business model of the newly formed Client Services business unit.

Systems Request for DrōnTeq Client Services System

- ***Business Requirements***: Using this system from our company website, clients will be able to request specific drone flight services and data analysis. A request will be offered to any contracted DrōnTeq drone pilots in the vicinity, who can submit bids during the bidding window. Once the bidding window closes, the pilot with the "winning" bid will be assigned the request.

- ***Business Value***: The Client Services business unit has been formed to enable clients who do not have a need for actual drone ownership to receive drone flight service and data analysis promptly and cost effectively. As a new business unit, we must estimate additional revenue from two streams: additional drone pilots who contract with DrōnTeq and lease a drone; and clients who contract for specific drone flight service and data analysis.

Systems Request for DrōnTeq Client Services System

- Conservative estimates of tangible value to the business unit include
  - $357,500 in revenue from new pilot contracts and drone leases
  - $565,000 in revenue from drone flight service and data analysis

- ***Special Issues or Constraints***: The capabilities described in the Business Requirements are essential to the business model for the Client Services Business Unit. This project is necessary for the new business unit's operations.

Estimating Business Value for DrōnTeq

- Identify sources such as:
  - o Increased sales
  - o Decreased costs
  - o Reduced headcount
  - o Lower turnover
- Assign values as initial estimates

Estimating Business Value (2 of 2)

	Revenue Projections of Pilot Contracts and Drone Leases	Revenue Projections of Client Requests for Drone Flight Service and Data Analysis
High-level estimate (prob. = 25%)	$500,000	$700,000
Medium-level estimate (prob. = 60%)	$350,000	$550,000
Low-level estimate (prob. = 15%)	$150,000	$400,000
Weighted average expected revenue	$357,500	$565,000

Feasibility Analysis

- Feasibility analysis guides the organization in determining whether to proceed with the project

- Also identifies the important risks associated with the project that must be managed if the project is approved

- Each organization has its own process and format for the feasibility analysis

- Most include techniques to assess three areas: technical feasibility, economic feasibility, and organizational feasibility

Technical Feasibility: Can We Build It?

- Familiarity with application: Less familiarity generates more risk

- Familiarity with technology: Less familiarity generates more risk

- Project size: Large projects have more risk

- Compatibility: The harder it is to integrate the system with the company's existing technology, the higher the risk will be

Economic Feasibility: Should We Build It?

- Development costs

- Annual operating costs

- Annual benefits (cost savings and/or increased revenues)

- Intangible benefits and costs

Organizational Feasibility: If We Build It, Will They Come?

- Is the project strategically aligned with the business?
- Project champion
- Senior management
- Users
- Other stakeholders

Cash Flow Analysis and Measures

- IT projects commonly involve an initial investment that produces a stream of benefits over time, along with some ongoing support costs

- The value of the project must be measured over time

- $ROI = \frac{Total\ Benefits - Total\ Costs}{Total\ Costs} = \frac{14,000}{138,000} = 10.14\%$

  o A high ROI suggests that the project's benefits far outweigh the project's cost

- $BEP = \frac{Number\ of\ years\ of}{negative\ cash\ flow} + \frac{That\ Year's\ Net\ Cash\ Flow - That\ Year's\ Cumulative\ Cash\ Flow}{That\ Year's\ Net\ Cash\ Flow}$

- $BEP = 2 + \frac{41,000 - 14,000}{41,000} = 2.68\ Years$

Discounted Cash Flow Technique

- Simple cash flow projection and the return on investment and break-even point calculations all share the weakness of not recognizing the time value of money

- A dollar in Year 3 of the project is considered to be exactly equivalent to a dollar received in Year 1

- Discounted cash flows are used to compare the present value of all cash inflows and outflows for the project in today's dollar terms

- $PV = \dfrac{Cash\ flow\ amount}{(1+Rate\ of\ return)^n}$

  o The rate of return is sometimes called the required rate of return, or the cost of obtaining the capital needed to fund the project

Discounted Cash Flow Projection

	Year 0	Year 1	Year 2	Year 3	Total
Total Benefits		45,000	50,000	57,000	
PV of Total Benefits		40,909	41,322	42,825	125,056
Total Costs	100,000	10,000	12,000	16,000	
PV of Total Costs	100,000	9,091	9,917	12,021	131,029

Net Present Value (NPV)

- NPV is the difference between the total present value of the benefits and the total present value of the costs

- $NPV = \sum PV \ of \ Total \ Benefits - \sum PV \ of \ Total \ Costs$

- $NPV = \$125{,}056 - \$131{,}029 = (\$5{,}973)$

- As long as the NPV is greater than zero, the project is considered economically acceptable

- Here, the NPV is less than zero, indicating that for a required rate of return of 10%, this project should not be accepted

Steps Involved in Performing an Economic Feasibility Analysis

1. Identify costs and benefits

2. Assign values to costs and benefits

3. Determine cash flow

4. Assess projects economic value
   - Return on investment (ROI)
   - Break-even point (BEP)
   - Net present value (NPV)

Development and Operational Costs

Development Costs	Operational Costs
Development team salaries	Software upgrades
Consultant fees	Software licensing fees
Development training	Hardware repair and upgrades
Hardware and software	Cloud storage fees
Vendor installation	Operational team salaries
Office space and equipment	Communications charges
Data conversion costs	User training

Tangible and Intangible Benefits

Tangible Benefits	Intangible Benefits
Increased sales	Increased market share
Reductions in staff	Increased brand recognition
Reductions in inventory	Higher-quality products
Reductions in IT costs	Improved customer service
Better supplier prices	Better supplier relations

Cost-Benefit Analysis (1 of 2)

	2022	2023	2024	2022	2025	Total
Benefits						
Increased sales		500,000	530,000	561,800	595,508	
Reduction in customer complaint calls[a]		70,000	70,000	70,000	70,000	
Reduced inventory costs		68,000	68,000	68,000	68,000	
Total Benefits[b]		**638,000**	**668,000**	**699,800**	**733,508**	
Present Value Total Benefits		**601,887**	**594,518**	**587,566**	**581,007**	**2,364,978**
Development Costs						
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**	
Operational Costs						
Hardware		50,000	50,000	50,000	50,000	
Software		20,000	20,000	20,000	20,000	
Operational labor		115,000	119,600	124,384	129,359	
Total Operational Costs		**185,000**	**189,600**	**194,384**	**199,359**	

Cost-Benefit Analysis (2 of 2)

	2022	2023	2024	2022	2025	Total
Total Costs	1,632,295	185,000	189,600	194,384	199,359	
Present Value Total Costs	1,632,295	174,528	168,743	163,209	157,911	2,296,686
NPV (PV Total Benefits – PV Total Costs)						68,292

Organizational Feasibility

- The organizational feasibility of the system: concerns how well the system ultimately will be accepted by its users and incorporated into the ongoing operations of the organization

- Strategic alignment is the fit between the project and business strategy—the greater the alignment, the less risky the project will be, from an organizational feasibility perspective

- A second way to assess organizational feasibility is to conduct a stakeholder analysis
  - A stakeholder is a person, group, or organization that can affect (or can be affected by) a new system

Important Stakeholders for Organizational Feasibility

	Role	To Enhance Feasibility
Champion	• Initiates the project • Promotes the project • Allocates his or her time to the project • Provides resources	• Make a presentation about the objectives of the project • Create a prototype of the system
Organizational management	• Know about the project • Budget enough money for the project • Encourage users to accept and use the system	• Make a presentation about the objectives and benefits of the project • Market the benefits of the systems • Encourage the champion to talk about the project
System users	• Make decisions that influence the project • Perform hands-on activities for the project • Ultimately determine whether the project is successful using or not using the system	• Assign users official roles on the project team • Assign users specific tasks to perform • Ask for feedback from users

Organizational Feasibility Continued

- The champion is a high-level executive and is usually the project sponsor who created the system request
  - Supports the project by providing time and resources by giving political support to the project

- Organizational management also needs to support the project
  - This support conveys to the rest of the organization the belief that the system will make a valuable contribution and that necessary resources will be made available

- A third important set of stakeholders is the system users who ultimately will use the system once it has been installed in the organization

Chapter Review

- Explain the role of the systems analyst in the process of developing IS

- Discuss the skills needed to be a successful systems analyst

- List and explain the four primary phases of the SDLC

- Explain the ways that projects are identified and initiated

- Explain why it is important to ensure that a proposed IS will add value to the organization

- Describe the purpose of the systems request and explain the contents of its four main sections

Chapter Review Continued

- Be able to create a systems request for a proposed project

- Discuss the purpose of the feasibility study

- Describe the issues that are considered when evaluating a project's technical feasibility

- Be able to develop an economic feasibility assessment for a project

- Understand and evaluate the organizational feasibility of a project

Key Terms

- Analysis models
- Analysis phase
- Analysis strategy
- Approval committee
- Architecture design
- As-is system
- Break-even point
- Business analyst

- Business need
- Business process automation (BPA)
- Business process improvement (BPI)
- Business process management (BPM)
- Business process reengineering (BPR)

- Business requirements
- Business value
- Cash flow analysis
- Champion
- Change management analyst
- Compatibility
- Construction
- Cost–benefit analysis

Key Terms Continued

- Database and file specifications
- Deliverable
- Design phase
- Design strategy
- Development costs
- Economic feasibility
- Emerging technology
- Familiarity with technology
- Familiarity with the application

- Feasibility analysis
- Feasibility study
- First mover
- Gradual refinement
- Implementation phase
- Infrastructure analyst
- Installation
- Intangible benefits
- Intangible costs
- Intangible value
- Interface design

- Net present value (NPV)
- Operational costs
- Organizational feasibility
- Organizational management
- Payback method
- Phase
- Planning phase
- Program design
- Project initiation
- Project management

Key Terms Continued

- Project manager
- Project plan
- Project size
- Project sponsor
- Requirements analyst
- Software architect
- Special issues
- Stakeholder
- Stakeholder analysis
- Steering committee

- Step
- Strategic alignment
- Support plan
- System proposal
- System request
- System specification
- System users
- Systems analyst
- Systems development life cycle (SDLC)

- Tangible benefits
- Tangible value
- Technical feasibility
- Technique
- To-be system
- Training
- Total cost of ownership (TCO)
- Workplan