

5

SYSTEMS ANALYSIS

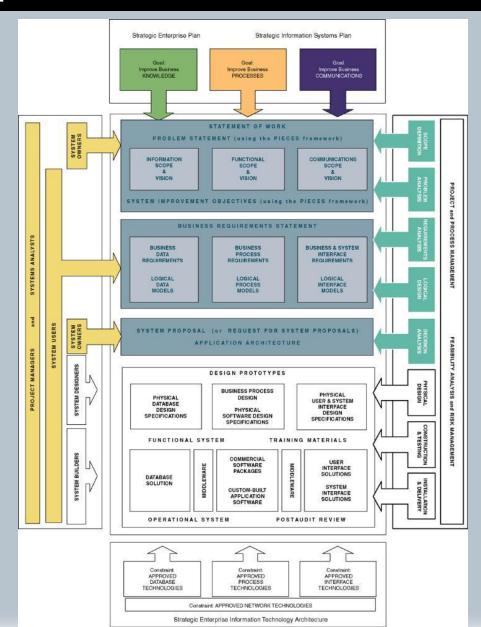


Chapter Five Systems Analysis

- Define systems analysis and relate the term to the scope definition, problem analysis, requirements analysis, logical design, and decision analysis phases of this book's systems development methodology.
- Describe a number of systems analysis approaches for solving business system problems.
- Describe the scope definition, problem analysis, requirements analysis, logical design, and decision analysis phases in terms of your information system building blocks.
- Describe the scope definition, problem analysis, requirements analysis, logical design, and decision analysis phases in terms of purpose, participants, inputs, outputs, techniques, and steps.
- Identify those chapters and modules in this textbook that can help you learn specific systems analysis tools and techniques.



Chapter Map





Systems Analysis vs. Systems Design

Systems analysis – a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose.

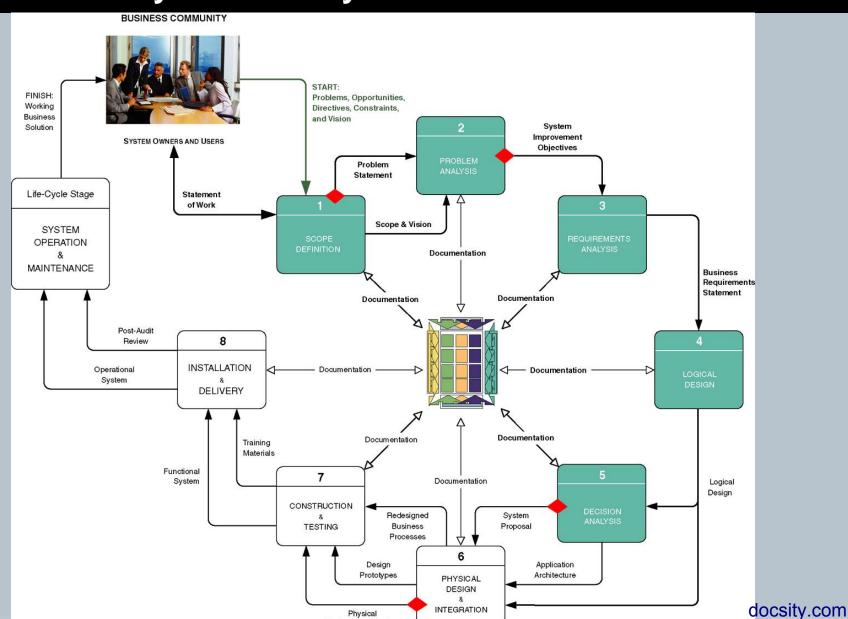
Systems design – a complementary problem-solving technique (to systems analysis) that reassembles a system's component pieces back into a complete system—hopefully, an improved system. This may involves adding, deleting, and changing pieces relative to the original system.

Information systems analysis – those development phases in an information systems development project the primarily focus on the business problem and requirements, independent of any technology that can or will be used to implement a solution to that problem.



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Context of Systems Analysis



Design Specifications



Repository

Repository – a location (or set of locations) where systems analysts, systems designers, and system builders keep all of the documentation associated with one or more systems or projects.

- A network directory of computer-generated files that contain project correspondence, reports, and data
- A CASE tool dictionary or encyclopedia (Chapter 3)
- Printed documentation (binders and system libraries)
- An intranet website interface to the above components



Model-Driven Analysis Methods

Model-driven analysis – a problem-solving approach that emphasizes the drawing of pictorial system models to document and validate both existing and/or proposed systems. Ultimately, the system model becomes the blueprint for designing and constructing an improved system.

Model – a representation of either reality or vision. Since "a picture is worth a thousand words," most models use pictures to represent the reality or vision.



Model-Driven Methods

Structured analysis – a model-driven, process-centered technique used to either analyze an existing system, define business requirements for a new system, or both. The models are pictures that illustrate the system's component pieces: processes and their associated inputs, outputs, and files.

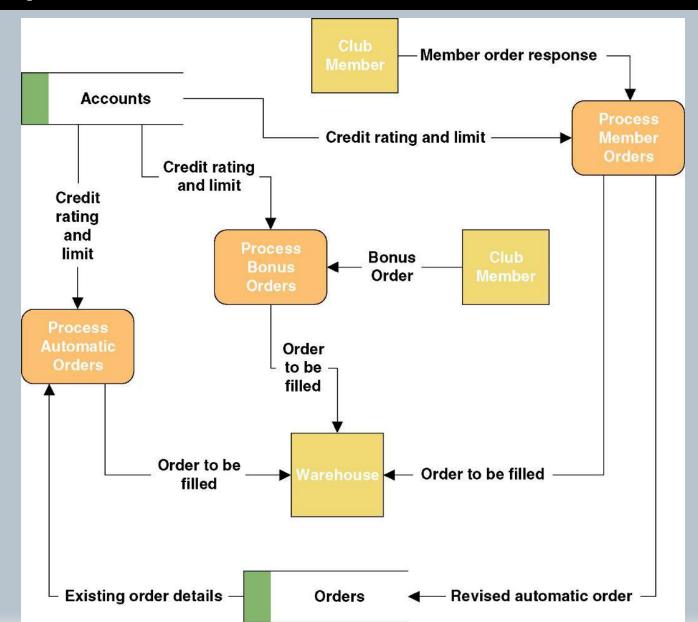
Information engineering (IE) – a model-driven and data-centered, but process-sensitive technique for planning, analyzing, and designing information systems. IE models are pictures that illustrate and synchronize the system's data and processes.

Object-oriented analysis (**OOA**) – a model-driven technique that integrates data and process concerns into constructs called objects. OOA models are pictures that illustrate the system's objects from various perspectives such as structure and behavior, and interactions of the objects.

Object – the encapsulation of the data (called properties) that describes a discrete person, object, place, event, or thing, with all the processes (called methods) that are allowed to use or update the data and properties. The only way to access or update the object's data is to use the object's predefined processes.

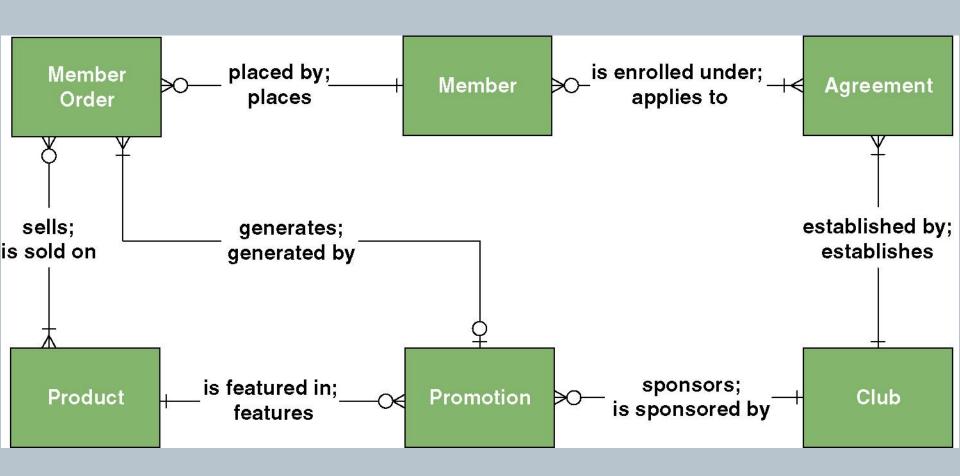


A Simple Process Model



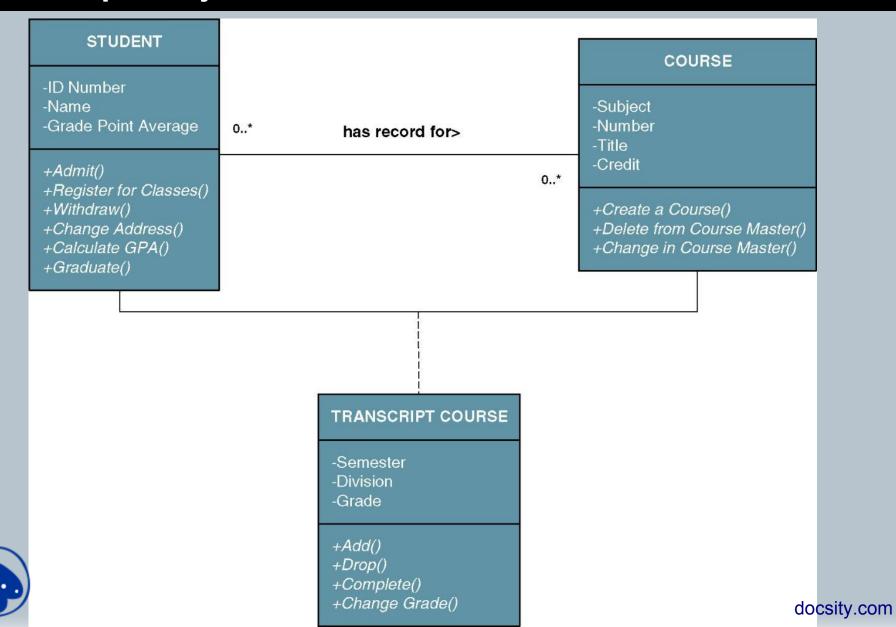


A Simple Data Model





A Simple Object Model



Accelerated Systems Analysis

Accelerated systems analysis approaches emphasize the construction of prototypes to more rapidly identify business and user requirements for a new system.

prototype – a small-scale, incomplete, but working sample of a desired system.

- Accelerated systems analysis approaches
 - Discovery Prototyping
 - Rapid Architected Analysis



Discovery Prototyping

Discovery prototyping – a technique used to identify the users' business requirements by having them react to a quick-and-dirty implementation of those requirements.

Advantages

• Prototypes cater to the "I'll know what I want when I see it" way of thinking that is characteristic of many users and managers.

Disadvantages

- Can become preoccupied with final "look and feel" prematurely
- Can encourage a premature focus on, and commitment to, design
- Users can be misled to believe that the completed system can be built rapidly using prototyping tools



Rapid Architected Analysis

Rapid architected analysis – an approach that attempts to derive system models (as described earlier in this section) from existing systems or discovery prototypes.

• Reverse engineering – the use of technology that reads the program code for an existing database, application program, and/or user interface and automatically generates the equivalent system model.



Requirements Discovery Methods

- **Requirements discovery** the process, used by systems analysts of identifying or extracting system problems and solution requirements from the user community. Approaches include:
 - Fact-finding the process of collecting information about system problems, opportunities, solution requirements, and priorities.
 - Sampling of existing documentation, reports, forms, databases, etc.
 - Research of relevant literature
 - Observation of the current system
 - Questionnaires and surveys
 - Interviews
 - Joint requirements planning (JRP) the use of facilitated workshops to bring together all of the system owners, users, and analysts, and some systems designer and builders to jointly perform systems analysis.



 JRP is generally considered a part of a larger method called joint application development (JAD), a more comprehensive application of the JRP techniques to the entire systems development process.

Business Process Redesign

Business process redesign (BPR) – the application of systems analysis methods to the goal of dramatically changing and improving the fundamental business processes of an organization, independent of information technology.



Systems Analysis Methods and Agile Methods

Agile method – the integration of various approaches of systems analysis and design for applications as deemed appropriate to the problem being solved and the system being developed.

- Most commercial methodologies do not impose a single approach (structured analysis, IE, OOA) on systems analysts.
- Instead, they integrate all popular approaches into a collection of agile methods.
- System developers are given the flexibility to select from a variety of tools and techniques to best accomplish the tasks at hand,



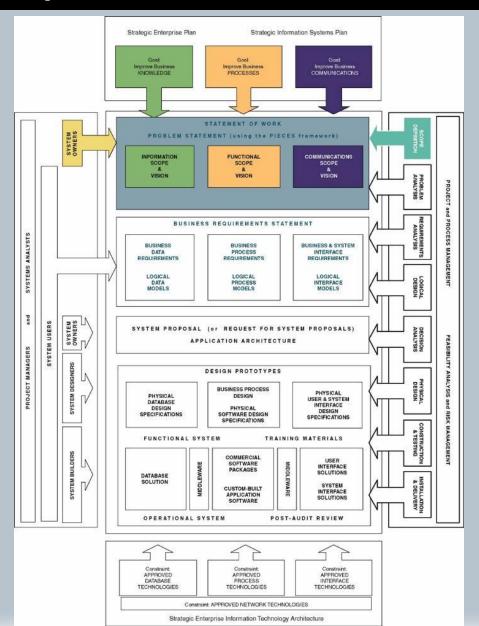
The hypothetical FAST methodology operates this way.

FAST Systems Analysis Phases

- Scope Definition Phase
 - Is the project worth looking at?
- Problem Analysis Phase
 - Is a new system worth building?
- Requirements Analysis Phase
 - What do the users need and want from the new system?
- Logical Design Phase
 - What must the new system do?
- Decision Analysis Phase
 - What is the best solution?

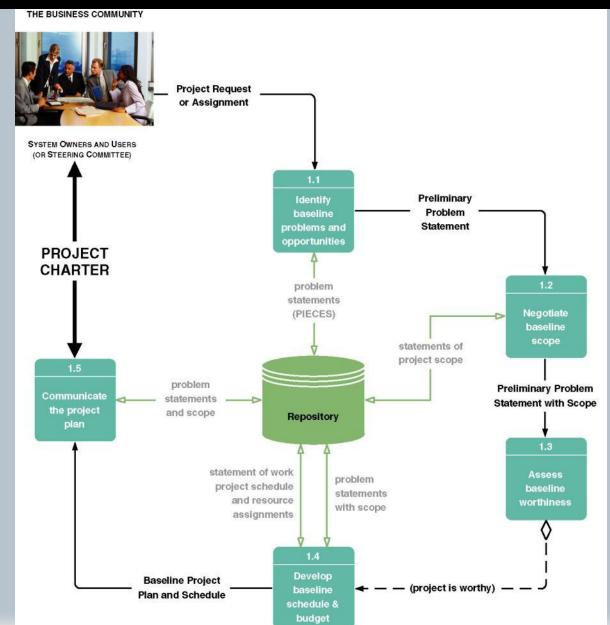


Context of Scope Definition Phase Context





Tasks for the Scope Definition Phase of Systems Analysis





Sample Request for System Services



SoundStage Entertainment Club

Pho Inte	ne: 494-0666 Fax: 494-0 rnet: http://www.sound anet: http://www.sound	0999 Istage.com		REQUEST FOR INFORMATION SYSTEM SERVICES
DATE OF REQUEST		SERVICE REQUES	STED FOR D	DEPARTMENT(S)
January 9, 2003	Member Services	, Warehouse, Shi	ipping	
SUBMITTED BY (key user continuation Name Sarah Hartman Business Analyst Office B035 Phone 494-0867	act) t, Member Services	EXECUTIVE Name Title Office Phone	Galen Kir	(funding authority) khoff ident, Member Services
TYPE OF SERVICE REQUESTED ☐ Information Strategy PI ☒ Business Process Analy ☒ New Application Develo	anning rsis and Redesign		Application	Enhancement Maintenance (problem fix)
BRIEF STATEMENT OF PROBLE The information strategy planni of shipping) for business proces information systems, these area current systems are not adaptal exist for similar products and se products and services. There als One example includes Internet the warehouse must fully intero	ng group has targeted r is redesign and integrate is are not well integrate ole to our rapidly chang irvices. Some of these s so exist several marketic commerce services. Fina	member services, sed application de d to maximize eff ing products and systems were inhous agoportunities ally, the automati	marketing, velopment. ficient order services. In erited throut to increase o	and order fulfillment (inclusive Currently serviced by separate services to our members. The some cases, separate systems gh mergers that expanded our
	d streamlined business s. An order shall not be id provide for expanded extends to the desktop of the network, consisten	considered fulfill I club and membe computers of both It with the ISS dis	ed until it ha er flexibility n employees tributed arc	s been received by the
ACTION (ISS Office Use Only)				
☐ Feasibility assessment appro	oved As	signed to Sandr	a Shepherd	
	ed Ap	proved Budget	450,0	00
•	St	art Date ASA	NP.	Deadline ASAP
☐ Request delayed				
☐ Request rejected	Re	ason:	.	
Authorized Signatures: Rebecca J. To Chair, ISS Executive Steering Br		Galen Project Exe	Kirkho cutive Spor	g sor



Sample Problem Statements

Problem Statements				
Project:	Member services information system	Project manager: Sandra Shepherd		
Created by:	Sandra Shepherd	Last updated by: Robert Martinez		
Date created:	January 9, 2003	Date last updated: January 15, 2003		

	Brief Statements of Problem, Opportunity, or Directive	Urgency	Visibility	Annual Benefits	Priority or Rank	Proposed Solution
1.	Order response time as measured from time of order receipt to time of cus- tomer delivery has increased to an average of 15 days.	ASAP	High	\$175,000	2	New development
2.	The recent acquisitions of Private Screenings Video Club and Game- Screen will further stress the through- put requirements for the current system.	6 months	Med	75,000	2	New development
3.	Currently, three different order entry systems service the audio, video, and game divisions. Each system is designed to interface with a different warehousing system; therefore, the intent to merge inventory into a single warehouse has been delayed.	6 months	Med	515,000	٧	New development
4.	There is a general lack of access to management and decision-making information. This will become exasperated by the acquisition of two additional order processing systems (from Private Screenings and Game-Screen)	12 months	Low	15,000	3	After new system is developed, provide users with easy-to-learn and -use reporting tools.
5.	There currently exist data incon- sistencies in the member and order files.	3 months	High	35,000	1	Quick fix; then new development
6.	The Private Screenings and GameScreen file systems are incompatible with the SoundStage equivalents. Business data problems include data inconsistencies and lack of input edit controls.	6 months	Med	unknown	۷	New development. Additional quantification of benefit might increase urgency.
7.	There is an opportunity to open order systems to the Internet, but security and control are an issue.	12 months	Low	unknown	4	Future version of newly developed system
8.	The current order entry system is incompatible with the forthcoming automatic identification (bar-coding) system being developed for the warehouse.	3 months	High	65,000	1	Quick fix; then new development



Scope Definition Phase

Steering body – a committee of executive business and system managers that studies and prioritizes competing project proposals to determine which projects will return the most value to the organization and thus should be approved for continues systems development.

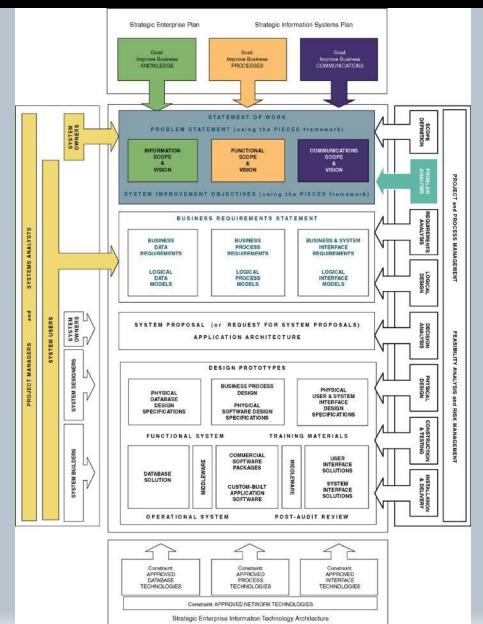
Also called a steering committee.

Project charter – the final deliverable for the preliminary investigation phase. A project charter defines the project scope, plan, methodology, standards, and so on.

- Preliminary master plan includes preliminary schedule and resource assignments (also called a baseline plan).
- Detailed plan and schedule for completing the next phase of the project.

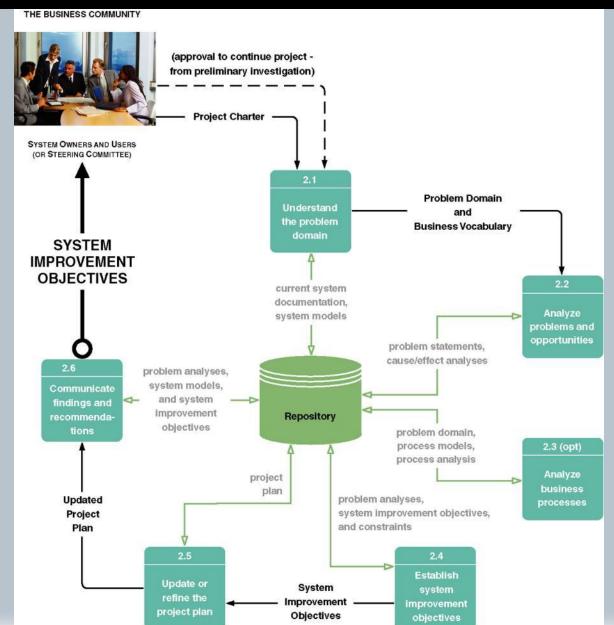


Context of Problem Analysis Phase of Systems Analysis





Tasks for Problem Analysis Phase of Systems Analysis





Cause-and-Effect Analysis

Cause-and-effect analysis – a technique in which problems are studied to determine their causes and effects.

In practice, effects can be symptomatic of more deeply rooted or basic problems which, in turn, must be analyzed for causes and effects until such a time as the causes and effects do not yield symptoms of other problems.



System Improvement Objectives

Objective – a measure of success. It is something that you expect to achieve, if given sufficient resources.

- Reduce the number of uncollectible customer accounts by 50 percent within the next year.
- Increase by 25 percent the number of loan applications that can be processed during an eight-hour shift.
- Decrease by 50 percent the time required to reschedule a production lot when a workstation malfunctions.

Constraint – something that will limit your flexibility in defining a solution to your objectives. Essentially, constraints cannot be changed.

- The new system must be operational by April 15.
- The new system cannot cost more than \$350,000.
- The new system must be web-enabled.
- The new system must bill customers every 15 days.



Sample Cause-and-Effect Analysis

PROBLEMS, OPPORTUNITIES, OBJECTIVES, AND CONSTRAINTS MATRIX

Project:	Member Services Information System	Project Manager:	Sandra Shepherd
Created by:	Robert Martinez	Last Updated by:	Robert Martinez
Date Created:	January 21, 2003	Date Last Updated:	January 31, 2003

CAUSE-AND-EFFECT ANALYSIS		SYSTEM IMPROVEMENT OBJECTIVES			
Problem or Opportunity	Causes and Effects	System Objective	System Constraint		
Order response time is unacceptable.	1. Throughput has increased while number of order clerks was downsized. Time to process a single order has remained relatively constant. 2. System is too keyboard-dependent. Many of the same values are keyed for most orders. Net result is (with the current system) each order takes longer to process than is ideal. 3. Data editing is performed by the AS/400. As that computer has approached its capacity, order edit responses have slowed. Because order clerks are trying to work faster to keep up with the volume, the number of errors has increased. 4. Warehouse picking tickets for orders were never designed to maximize the efficiency of order fillers. As warehouse operations grew, order filling delays were inevitable.	 Decrease the time required to process a single order by 30%. Eliminate keyboard data entry for as much as 50% of all orders. For remaining orders, reduce as many keystrokes as possible by replacing keystrokes with point-and-click objects on the computer display screen. Move data editing from a shared computer to the desktop. Replace existing picking tickets with a paperless communication system between member services and the warehouse. 	 There will be no increase in the order processing workforce. Any system developed must be compatible with the existing Windows 95 desktop standard. New system must be compatible with the already approved automatic identification system (for bar coding). 		



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Outline for System Improvement Report

A. Any detailed system models

B. Other documents as appropriate

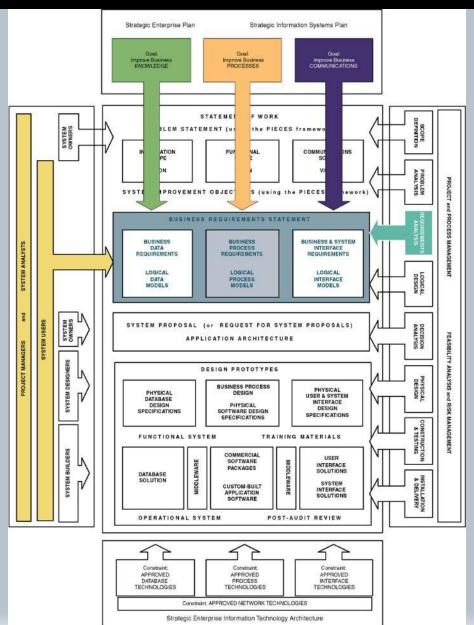
Figure 5.12

An Outline for a System Improvement Objectives and Recommendations Report

	Recommendations Report	
	Analysis of the Current	_ System
I.	Executive summary (approximately 2 pages)	
	A. Summary of recommendation	
	B. Summary of problems, opportunities, and directives	
	C. Brief statement of system improvement objectives	
	D. Brief explanation of report contents	
Ⅱ.	Background information (approximately 2 pages)	
	A. List of interviews and facilitated group meetings conducted	
	B. List of other sources of information that were exploited	
	C. Description of analytical techniques used	
III.	Overview of the current system (approximately 5 pages)	
	A. Strategic implications (if the project is part of or impacts an existing	information systems strategic plan)
	B. Models of the current system	
	Interface model (showing project scope)	
	2. Data model (showing project scope)	
	3. Geographic models (showing project scope)	
	4. Process model (showing functional decomposition only)	
IV.	Analysis of the current system (approximately 5—10 pages)	
	A. Performance problems, opportunities, and cause-effect analysis	
	B. Information problems, opportunities, and cause-effect analysis	
	C. Economic problems, opportunities, and cause-effect analysis	
	D. Control problems, opportunities, and cause-effect analysis	
	E. Efficiency problems, opportunities, and cause-effect analysis	
V	F. Service problems, opportunities, and cause-effect analysis	
٧.	Detailed recommendations (approximately 5–10 pages)	
	A. System improvement objectives and priorities B. Constraints	
	C. Project plan	
	Scope reassessment and refinement	
	Scope reassessment and remembers Revised master plan	
	Detailed plan for the definition phase	
VI	Annendives	

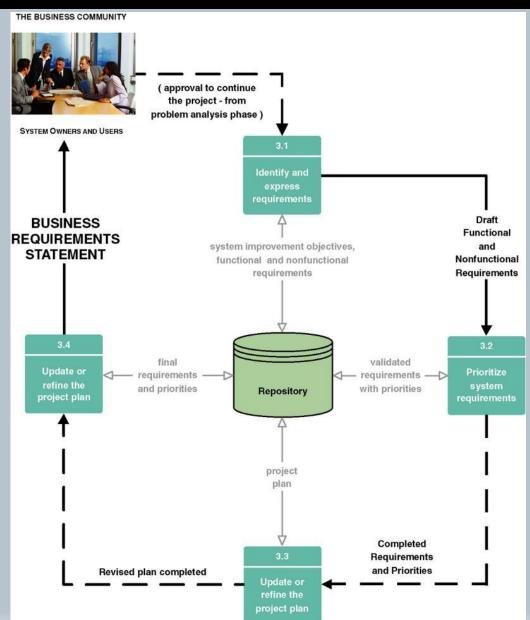


Context of Requirements Analysis Phase





Tasks for Requirements Analysis Phase





Functional vs. Nonfunctional Requirements

Functional requirement – a description of activities and services a system must provide.

• inputs, outputs, processes, stored data

Nonfunctional requirement – a description of other features, characteristics, and constraints that define a satisfactory system.

 Performance, ease of learning and use, budgets, deadlines, documentation, security, internal auditing controls



Expressing System Requirements

- Draft Functional and Nonfunctional Requirements
 - Could use simple list of system improvement objectives
 - Increasingly systems analysts express functional requirements using Use Cases

Use case – a business scenario or event for which the system must provide a defined response. Use cases evolved out of object-oriented analysis; however, their use has become common in many other methodologies for systems analysis and design.



Prioritize System Requirements

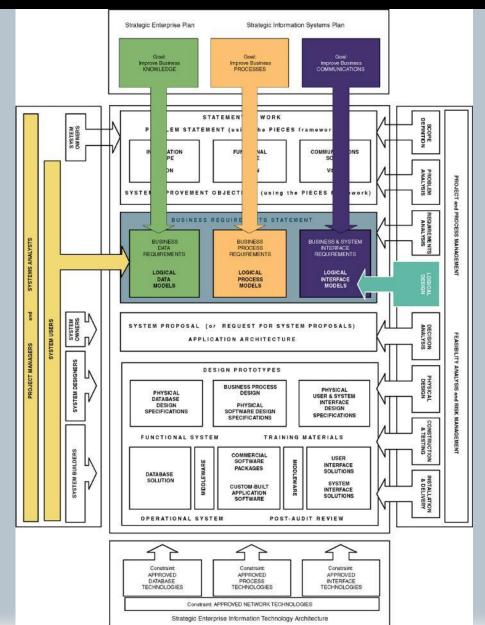
Prioritization of requirements can be facilitated using timeboxing.

Timeboxing – a technique that delivers information systems functionality and requirements through versioning.

- 1. The development team selects the smallest subset of the system that, if fully implemented, will return immediate value to the systems owners and users.
- 2. That subset is developed, ideally with a time frame of six to nine months or less.
- 3. Subsequently, value-added versions of the system are developed in similar time frames.
- A mandatory requirement is one that must be fulfilled by the minimal system, version 1.0
- A desirable requirement is one that is not absolutely essential to version 1.0. It may be essential to the vision of a future version.

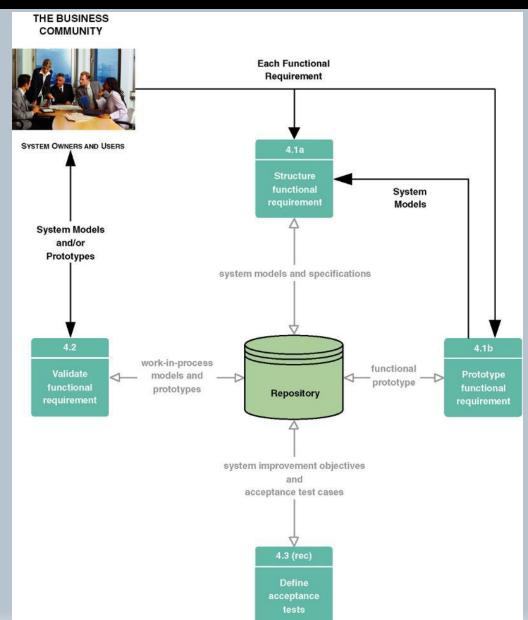


Context of Logical Design Phase of Systems Analysis



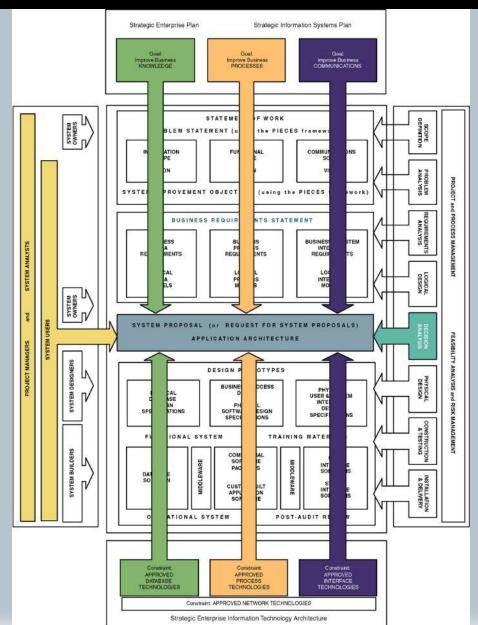


Tasks for Logical Design Phase of Systems Analysis



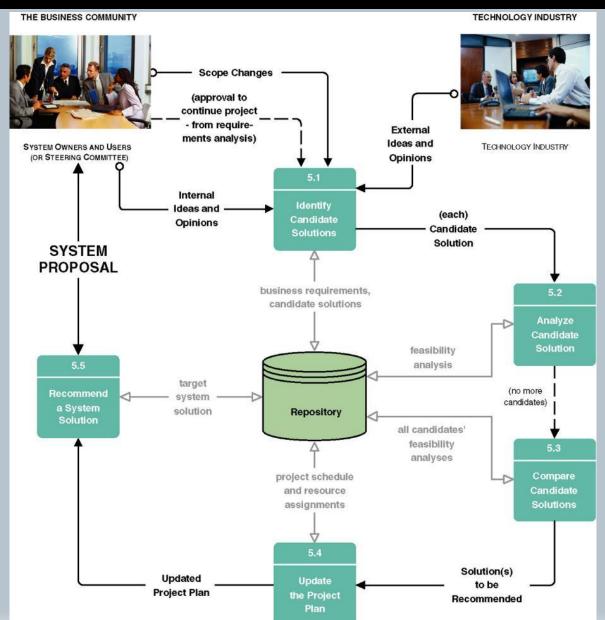


Context of Decision Analysis Phase of Systems Analysis





Tasks for Decision Analysis Phase of Systems Analysis





Feasibility

- **Technical feasibility** Is the solution technically practical? Does our staff have the technical expertise to design and build this solution?
- Operational feasibility Will the solution fulfill the users' requirements? To what degree? How will the solution change the users' work environment? How do users feel about such a solution?
- **Economic feasibility** Is the solution cost-effective?
- Schedule feasibility Can the solution be designed and implemented within an acceptable time period?

Candidate Systems Matrix

Characteristics	Candidate 1	Candidate 2	Candidate 3	Candidate			
Portion of System Computerized Brief description of that portion of the system that would be computerized in this candidate.	COTS package Platinum Plus from Entertainment Software Solutions would be purchased and customized to satisfy Member Services required functionality.	Member Services and warehouse operations in relation to order fulfillment.	Same as candidate 2.				
Brief description of the business benefits that would be realized for this candidate.	This solution can be implemented quickly because it's a purchased solution.	Fully supports user required business processes for SoundStage Inc. Plus more efficient interaction with member accounts.	Same as candidate 2.				
A description of the servers and workstations needed to support this candidate.	Technically architecture dictates Pentium Pro, MS Windows NT class servers and Pentium, MS Windows NT 4.0 workstations (clients).	Same as candidate 1.	Same as candidate 1.				
Software Tools Needed Software tools needed to design and build the candidate (e.g., database management system, emulators, operating systems, languages, etc.). Not generally applicable if applications software packages are to be purchased.	MS Visual C++ and MS Access for customization of package to provide report writing and integration.	MS Visual Basic 5.0 System Architect 3.1 Internet Explorer	MS Visual Basic 5.0 System Architect 3.1 Internet Explorer				
Application Software A description of the software to be put and built, accessed, or some come on of these techniques.	Package Solution	Custom Solution	Same as candidate 2.	dagaitu			
	(Continued) docsity.com						

Candidate Systems Matrix (concluded)

		'		
Method of Data Processing Generally some combination of: on- line, batch, deferred batch, remote batch, and real-time.	Client/Server	Same as candidate 1.	Same as candidate 1.	
Output Devices and Implications A description of output devices that would be used, special output requirements (e.g., network, preprinted forms, etc.), and output considerations (e.g., timing constraints).	(2) HP4MV department laser printers (2) HP5SI LAN laser printers	(2) HP4MV department laser printers (2) HP5SI LAN laser printers (1) PRINTRONIX barcode printer (includes software & drivers) Web pages must be designed to VGA resolution. All internal screens will be designed for SVGA resolution.	Same as candidate 2.	
Input Devices and Implications A description of input methods to be used, input devices (e.g., keyboard, mouse, etc.), special input requirements (e.g., new or revised forms from which data would be input), and input considerations (e.g., timing of actual inputs).	Keyboard & mouse	Apple "Quick Take" digital camera and software (15) PSC Quickscan laser bar-code scanners (1) HP Scanjet 4C Flatbed Scanner Keyboard & mouse	Same as candidate 2.	
Storage Devices and Implications Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be needed, and how data would be organized.	MS SQL Server DBMS with 100GB arrayed capability.	Same as candidate 1.	Same as candidate 1.	docsity.com

Feasibility Matrix

					~
Feasibility Criteria	Weight	Candidate 1	Candidate 2	Candidate 3	Candidate
Operational Feasibility Functionality. A description of to what degree the candidate would benefit the organization and how well the system would work. Political. A description of how well received this solution would be from both user management, user, and organization perspective. Technical Feasibility Technology. An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate. Expertise. An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.	30% 30%	Only supports Member Services requirements and current business processes would have to be modified to take advantage of software functionality Score: 60 Current production release of Platinum Plus package is version 1.0 and has only been on the market for 6 weeks. Maturity of product is a risk and company charges an additional monthly fee for technical support. Required to hire or train C++ expertise to perform modifications for integration requirements.	Score: 100 Although current technical staff has only Powerbuilder experience, the senior analysts who saw the MS Visual Basic demonstration and presentation have agreed the transition will be simple and finding experienced VB programmers will be easier than finding Powerbuilder programmers and at a much cheaper cost. MS Visual Basic 5.0 is a mature technology based on version number.	Score: 100 Although current technical staff is comfortable with Powerbuilder, management is concerned with recent acquisition of Powerbuilder by Sybase Inc. MS SQL Server is a current company standard and competes with SYBASE in the Client/Server DBMS market. Because of this we have no guarantee future versions of Powerbuilder will "play well" with our current version SQL Server.	Candidate
		Score: 50	Score: 95	Score: 60	
Economic Feasibility	30%				
Cost to develop:		Approximately \$350,000.	Approximately \$418,040.	Approximately \$400,000.	
Payback period (discounted):		Approximately 4.5 years.	Approximately 3.5 years.	Approximately 3.3 years.	
Net present value:		Approximately \$210,000.	Approximately \$306,748.	Approximately \$325,500.	
Detailed calculations:		See Attachment A.	See Attachment A.	See Attachment A.	
		Score: 60	Score: 85	Score: 90	
Schedule Feasibility	10%	Less than 3 months.	9–12 months	9 months	
An assessment of how long the solution will take to design and implement.		Score: 95	Score: 80	Score: 85	daa
Ranking	100%	60.5	92	83.5	doc



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Outline for a Typical System Proposal

Outline for a Typical System Proposal

- Introduction
 - A. Purpose of the report
 - B. Background of the project leading to this report
 - C. Scope of the report
 - D. Structure of the report
- II. Tools and techniques used
 - A. Solution generated
 - B. Feasibility analysis (cost-benefit)
- III. Information systems requirements
- IV. Alternative solutions and feasibility analysis
- V. Recommendations
- VI. Appendices