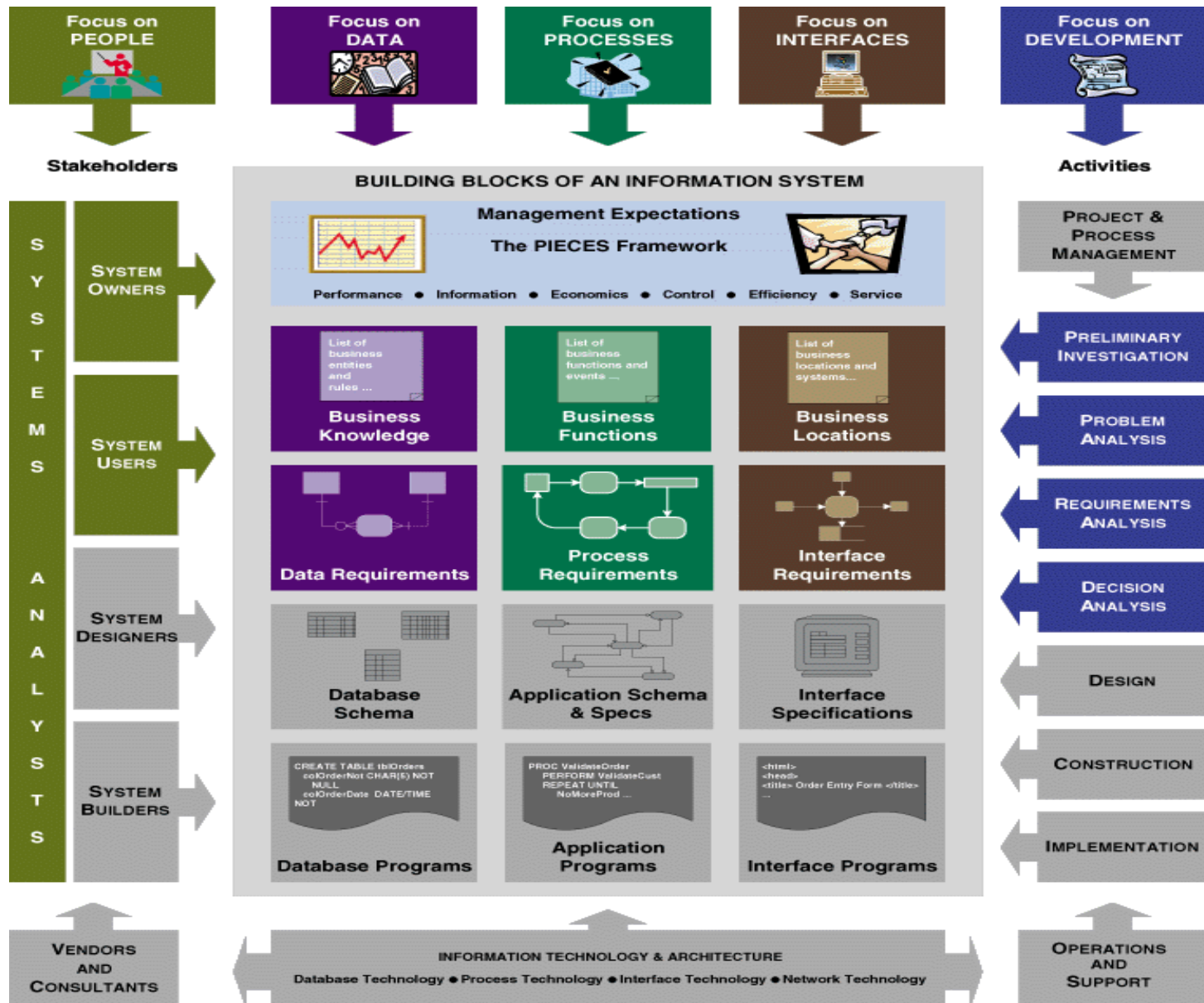


# INFORMATION SYSTEMS ANALYSIS AND DESIGN

Mr. JACKSON ALUNGA

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# Systems Analysis vs. Systems Design

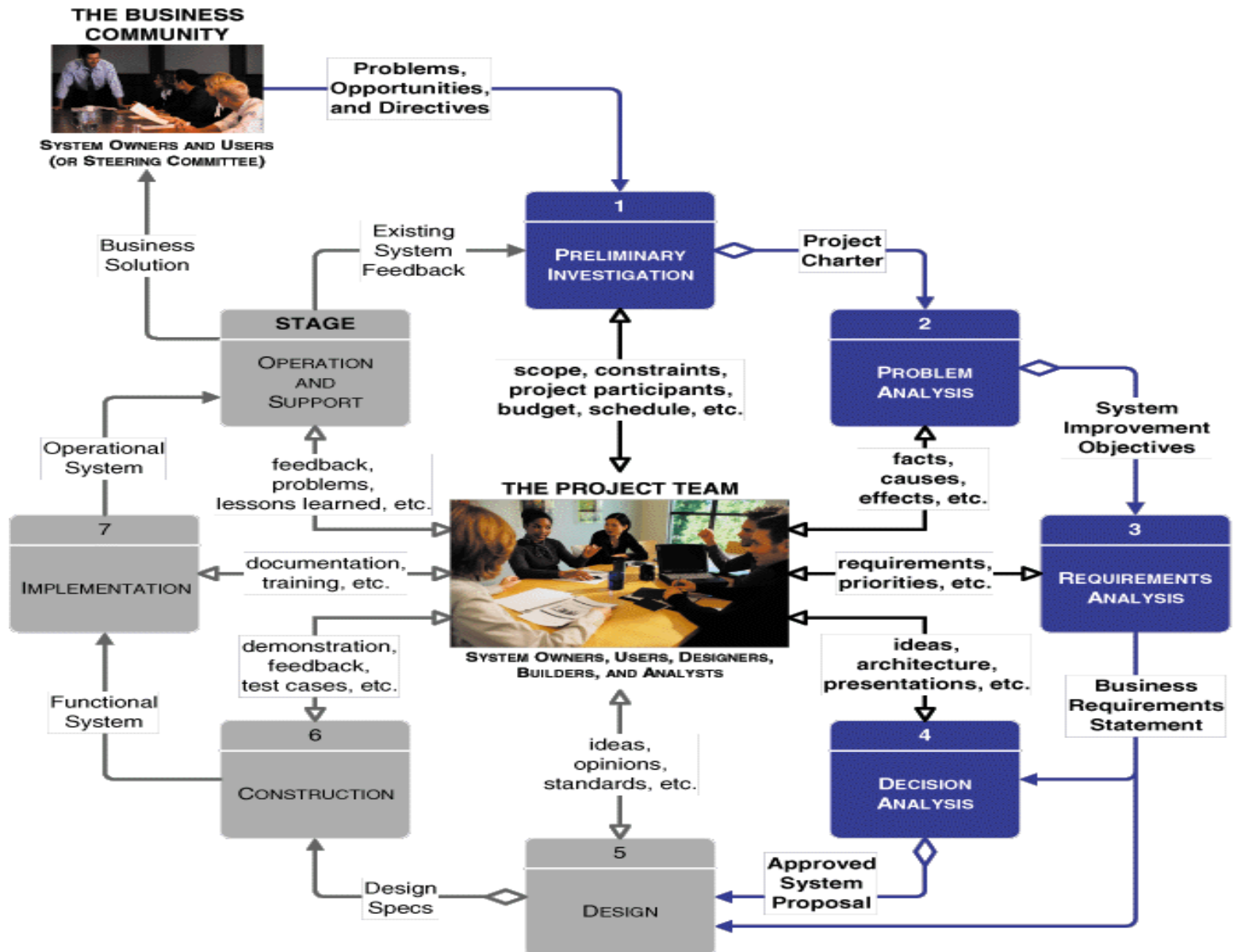
**Systems analysis** is a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose.

**Systems design** (also called systems synthesis) is 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 involve adding, deleting, and changing pieces relative to the original system.

# Information Systems Analysis

Information **systems analysis** is defined as those development phases in a project that primarily focus on the business problem, independent of any technology that can or will be used to implement a solution to that problem.

# Context of Systems Analysis



# Repository

- A **repository** is 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** 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.

A **model** is a representation of either reality or vision. Just as “a picture is worth a thousand words,” most models use pictures to represent the reality or vision.

# Model-Driven Methods

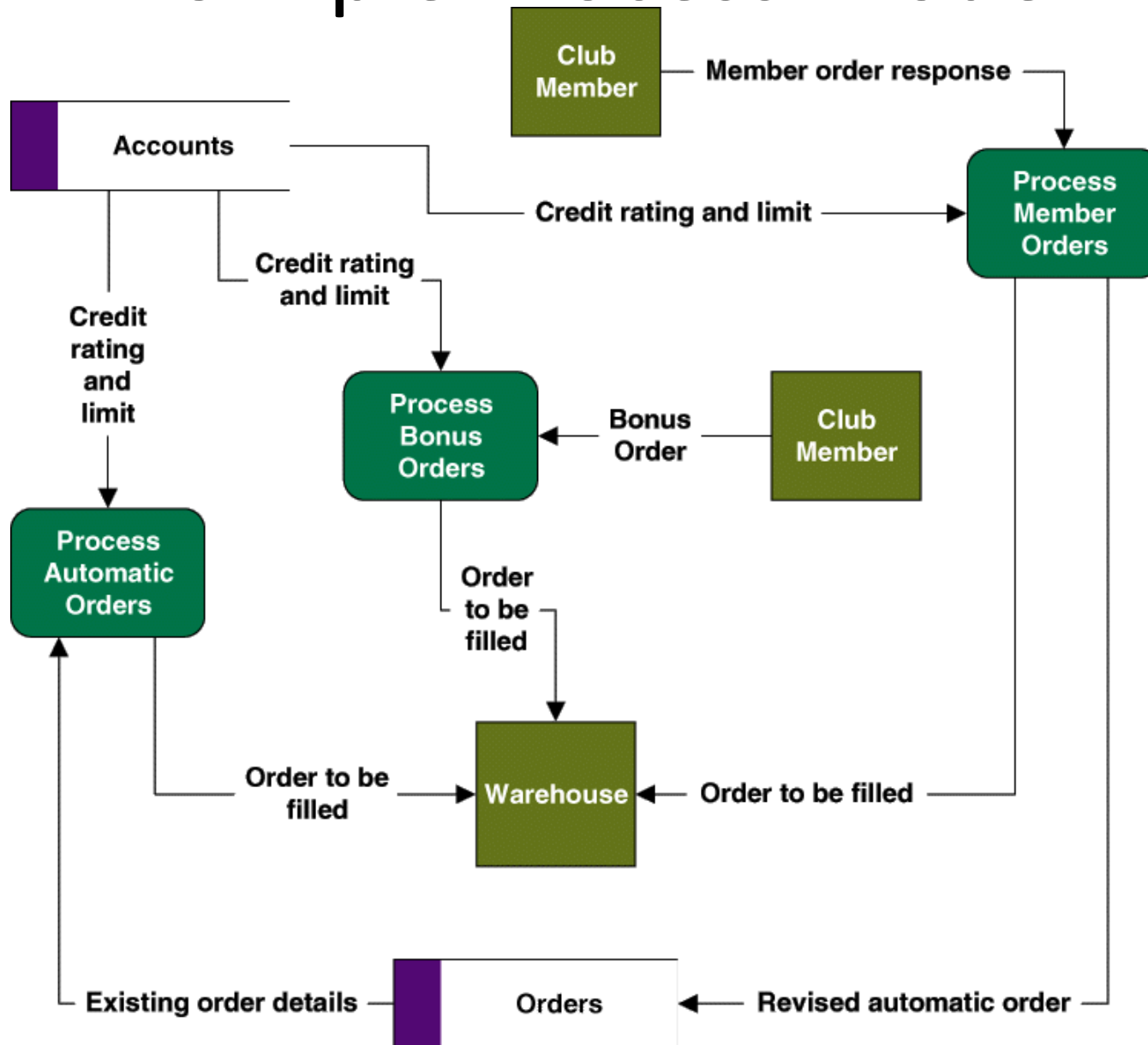
**Structured analysis** is a model-driven, process-centered technique used to either analyze an existing system, define business requirements for a new system, or both. The models are pictures that illustrate the system's component pieces: processes and their associated inputs, outputs, and files.

**Information engineering (IE)** is a model-driven and data-centered, but process-sensitive technique to plan, analyze, and design information systems. IE models are pictures that illustrate and synchronize the system's data and processes.

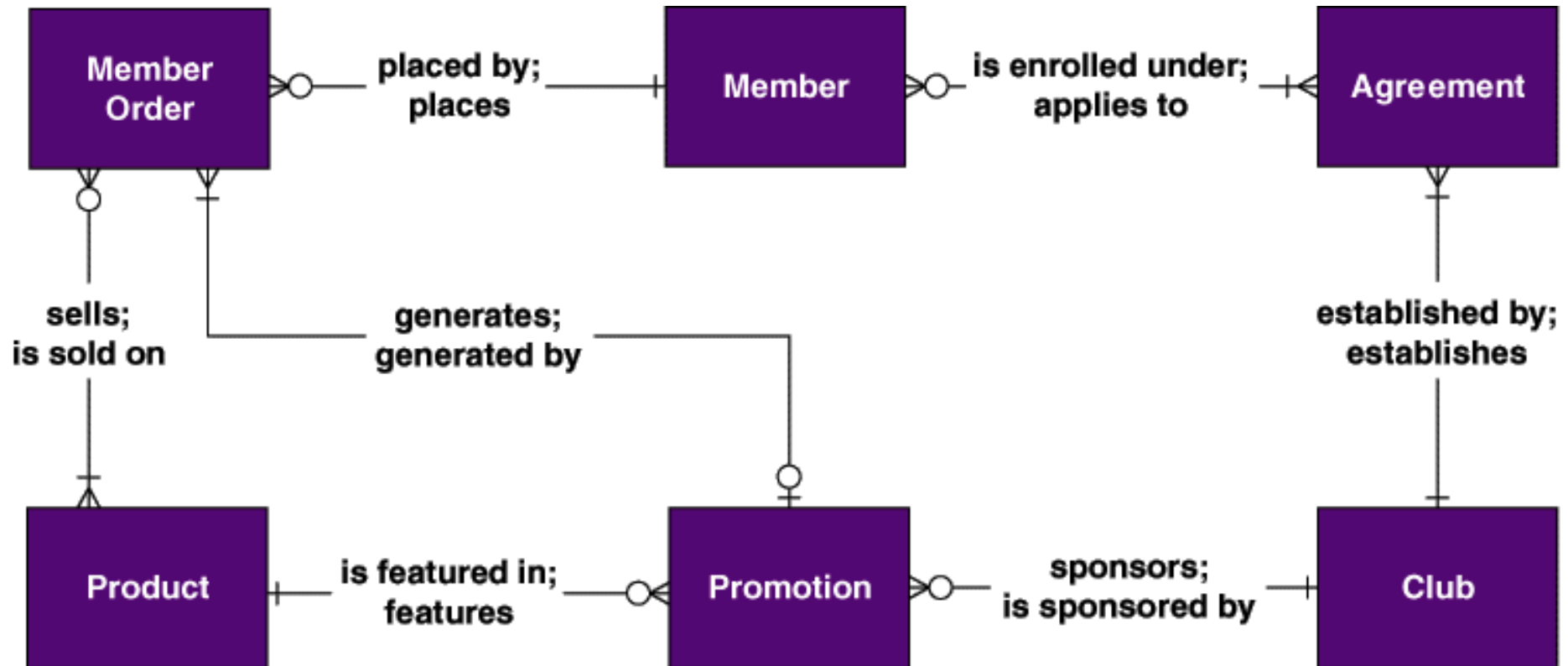
**Object-oriented analysis (OOA)** is a model-driven technique that integrates data and process concerns into constructs called objects. OOA models are pictures that illustrate the system's objects from various perspectives such as structure and behavior.



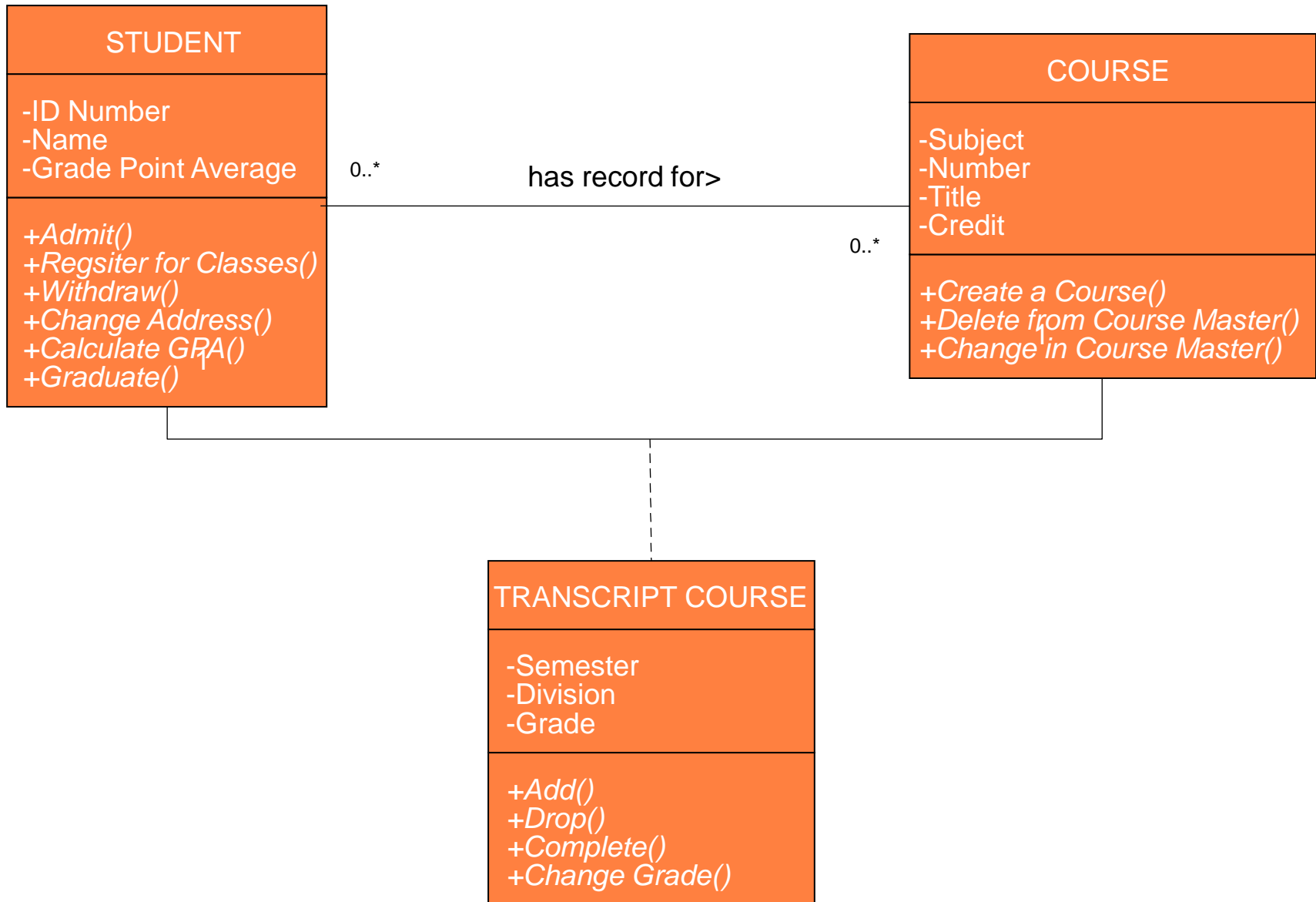
# A Simple Process Model



# A Simple Data Model



# A Simple Object Model



# Accelerated Analysis Methods

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

A **prototype** is a small-scale, incomplete, but working sample of a desired system.

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.

# Accelerated Analysis Methods

**Discovery prototyping** (sometimes called *requirements prototyping*) is used to identify the users' business requirements by having them react to a quick-and-dirty implementation of those requirements.

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

- **Reverse engineering** technology reads the program code for a database, application program, and/or user interface and automatically generates the equivalent system model.

# Requirements Discovery Methods

- **Requirements discovery** includes those techniques to be used by systems analysts to identify or extract system problems and solution requirements from the user community.
  - **Fact-finding** (or information gathering) is a classical set of techniques used to collect information about system problems, opportunities, solution requirements, and priorities.
    - Sampling
    - Research
    - Observation
    - Questionnaires and surveys
    - Interviews
  - **Joint requirements planning** (JRP) techniques use facilitated workshops to bring together all of the system owners, system users, systems analysts, and some systems designer and builders to jointly perform systems analysis.

# Business Process Redesign Methods

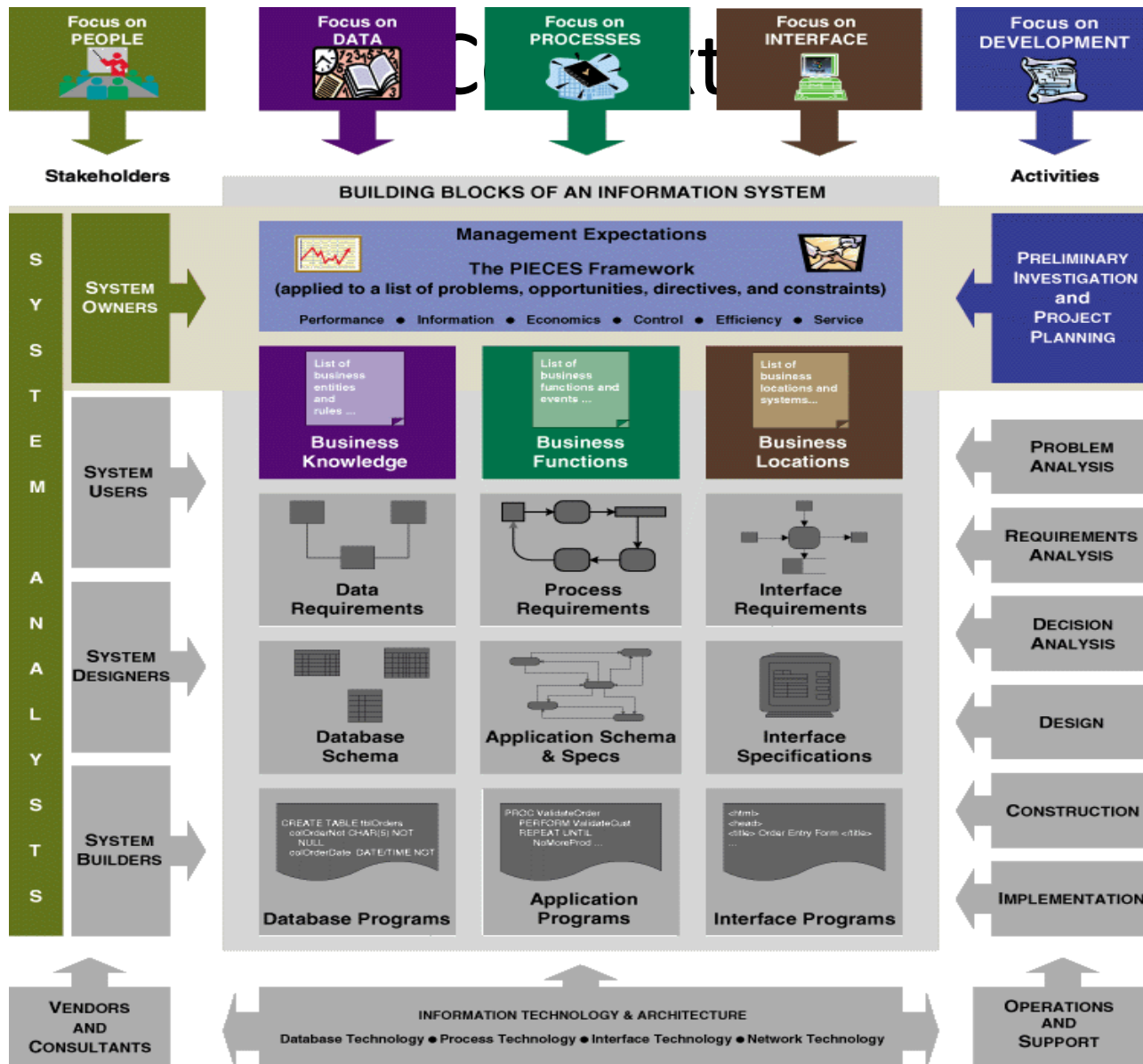
**Business process redesign** is the application of systems analysis methods to the goal of dramatically changing and improving the fundamental business processes of an organization, independent of information technology.

# Systems Analysis Phases

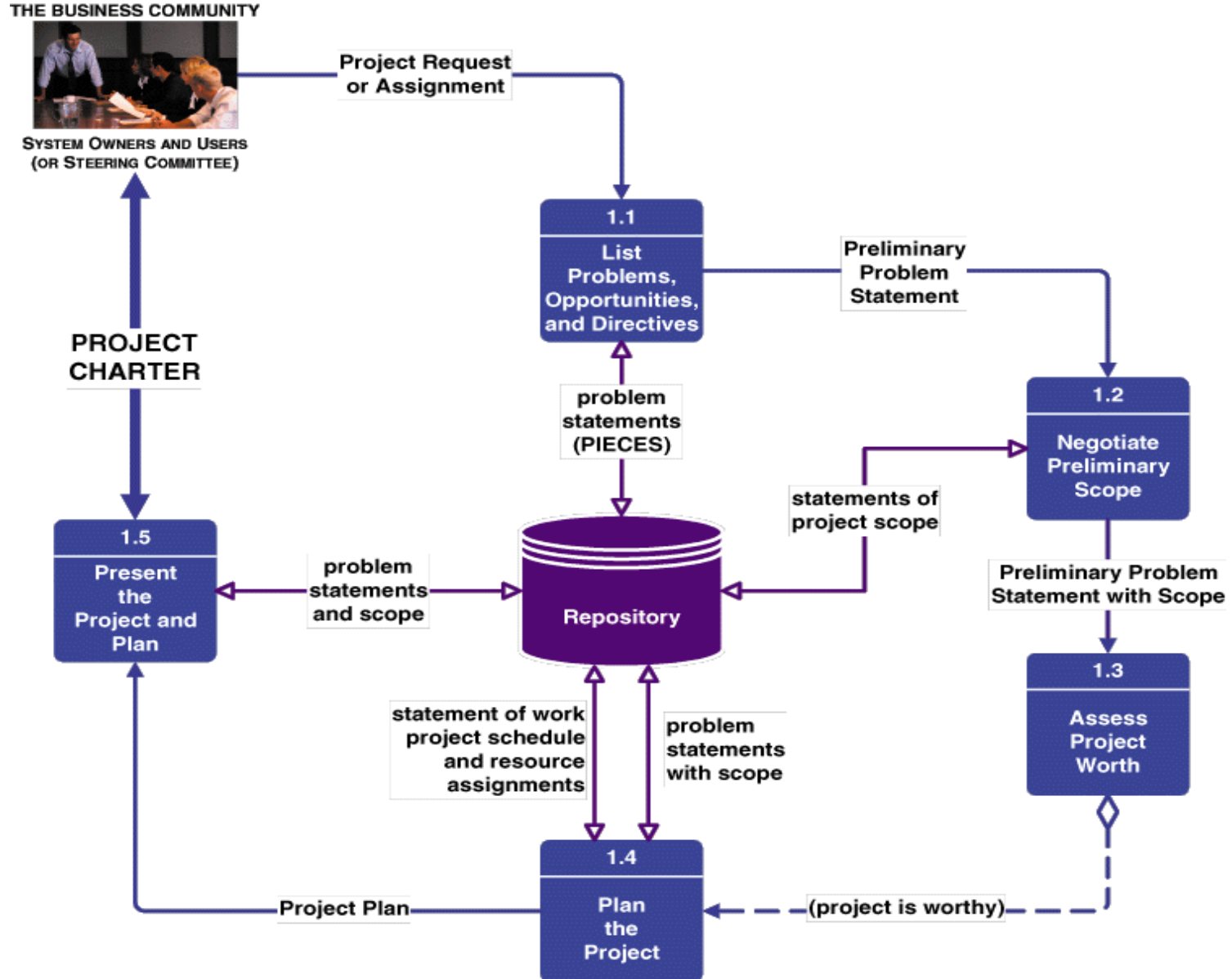
- Preliminary Investigation Phase
- Problem Analysis Phase
- Requirements Analysis Phase
- Decision Analysis Phase




# Preliminary Investigation Phase



# Preliminary Investigation Phase Tasks



# Sample Request for System Services

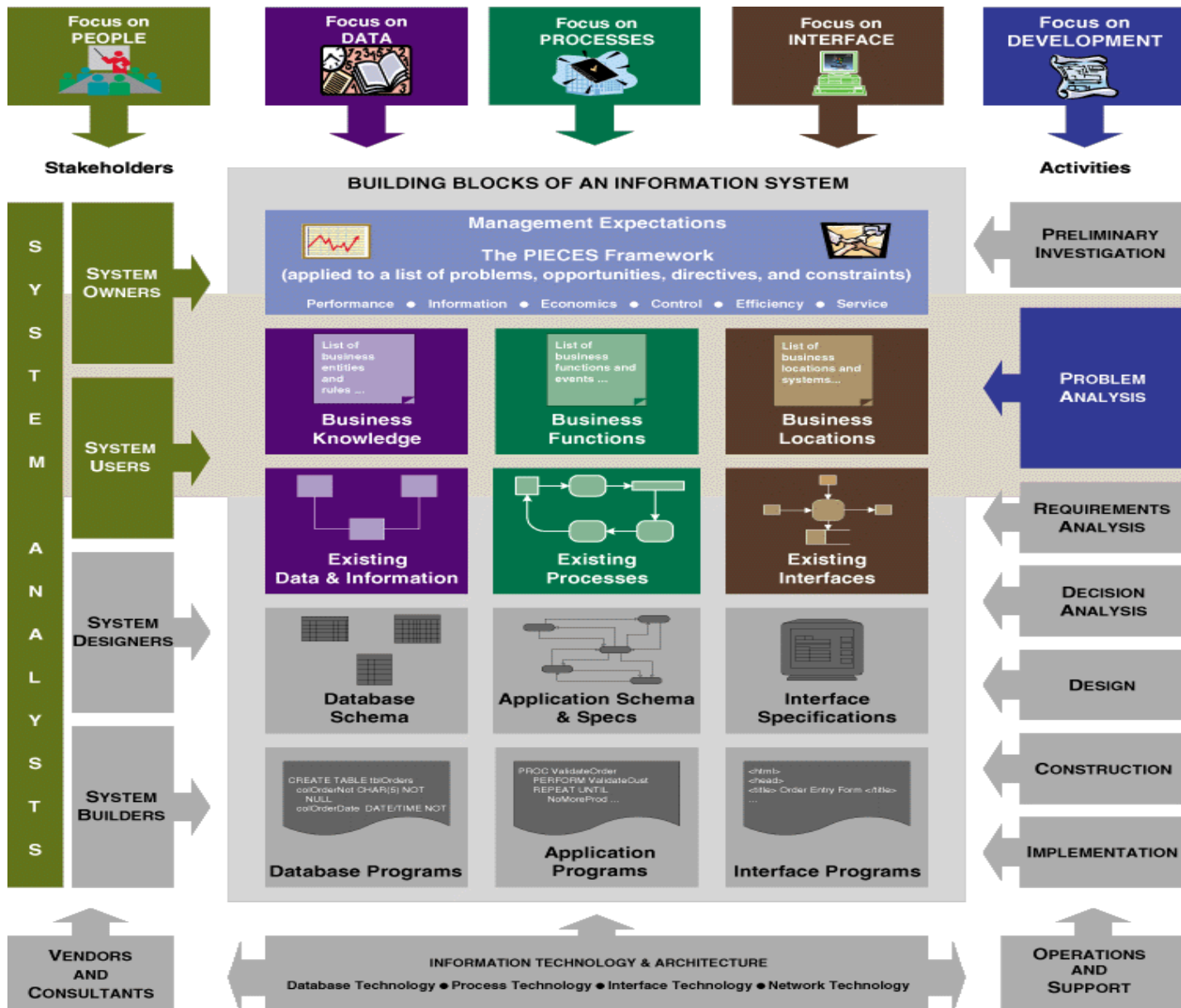
		<b>SoundStage Entertainment Club</b> <i>Information System Services</i> Phone: 494-0666 Fax: 494-0999 Internet: <a href="http://www.soundstage.com">http://www.soundstage.com</a> Intranet: <a href="http://www.soundstage.com/iss">http://www.soundstage.com/iss</a>	<b>REQUEST FOR INFORMATION SYSTEM SERVICES</b>
<b>DATE OF REQUEST</b>		<b>SERVICE REQUESTED FOR DEPARTMENT(S)</b>	
January 10, 2001		Member Services, Warehouse, Shipping	
<b>SUBMITTED BY (key user contact)</b>		<b>EXECUTIVE SPONSOR (funding authority)</b>	
<b>Name</b> Sarah Hartman <b>Title</b> Business Analyst, Member Services <b>Office</b> B035 <b>Phone</b> 494-0867		<b>Name</b> Galen Kirkhoff <b>Title</b> Vice President, Member Services <b>Office</b> G242 <b>Phone</b> 494-1242	
<b>TYPE OF SERVICE REQUESTED:</b> <input type="checkbox"/> Information Strategy Planning <input checked="" type="checkbox"/> Business Process Analysis and Redesign <input checked="" type="checkbox"/> New Application Development <input type="checkbox"/> Other (please specify) _____ <input type="checkbox"/> Existing Application Enhancement <input type="checkbox"/> Existing Application Maintenance (problem fix) <input type="checkbox"/> Not Sure			
<b>BRIEF STATEMENT OF PROBLEM, OPPORTUNITY, OR DIRECTIVE (attach additional documentation as necessary)</b> The information strategy planning group has targeted member services, marketing, and order fulfillment (inclusive of shipping) for business process redesign and integrated application development. Currently serviced by separate information systems, these areas are not well integrated to maximize efficient order services to our members. The current systems are not adaptable to our rapidly changing products and services. In some cases, separate systems exist for similar products and services. Some of these systems were inherited through mergers that expanded our products and services. There also exist several marketing opportunities to increase our presence to our members. One example includes Internet commerce services. Finally, the automatic identification system being developed for the warehouse must fully interoperate with member services.			
<b>BRIEF STATEMENT OF EXPECTED SOLUTION</b> We envision completely new and streamlined business processes that minimize the response time to member orders for products and services. An order shall not be considered fulfilled until it has been received by the member. The new system should provide for expanded club and member flexibility and adaptability of basic business products and services. We envision a system that extends to the desktop computers of both employees and members, with appropriate shared services provided across the network, consistent with the ISS distributed architecture. This is consistent with strategic plans to retire the AS/400 central computer and replace it with servers.			
<b>ACTION (ISS Office Use Only)</b>			
<input type="checkbox"/> Feasibility assessment approved		Assigned to <u>Sandra Shepherd</u>	
<input checked="" type="checkbox"/> Feasibility assessment waived		Approved Budget \$ <u>450,000</u>	
<input type="checkbox"/> Request delayed		Start Date <u>ASAP</u> Deadline <u>ASAP</u>	
<input type="checkbox"/> Request rejected		Backlogged until date: _____	
Reason: _____			
Authorized Signatures: <u>Rebecca J. Todd</u> Chair, ISS Executive Steering Body		<u>Galen Kirkhoff</u> Project Executive Sponsor	
FORM ISS-100-RFSS (Last revised December, 1999)			

# Problem Statements

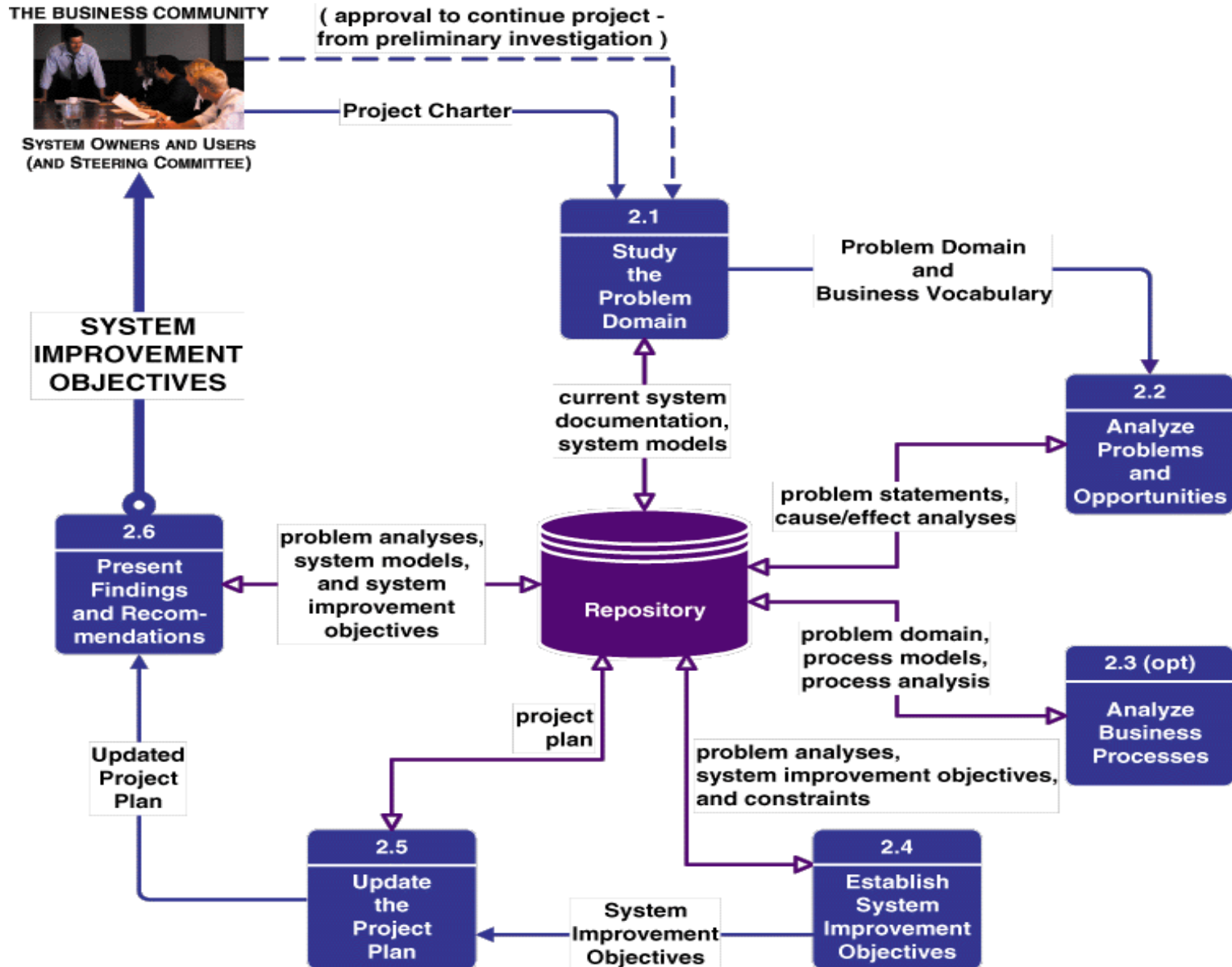
<b>PROJECT:</b>	Member Services Information System	<b>PROJECT MANAGER:</b>	Sandra Shepherd
<b>CREATED BY:</b>	Sandra Shepherd	<b>LAST UPDATED BY:</b>	Robert Martinez
<b>DATE CREATED:</b>	January 15, 2001	<b>DATE LAST UPDATED:</b>	January 17, 2001

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 customer 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 GameScreen will further stress the throughput 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	2	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 GameScreen)	12 months	Low	15,000	3	After new system is developed, provide users with easy-to-learn and use reporting tools.
5. There currently exists data inconsistencies 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	2	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 is 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

# Problem Analysis Phase Context



# Problem Analysis Phase Context



# Cause-and-Effect Analysis

**Cause-and-effect analysis** is 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

An **objective** is 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.*

A **constraint** is something that will limit your flexibility in defining a solution to your objectives. Essentially, constraints cannot be changed.



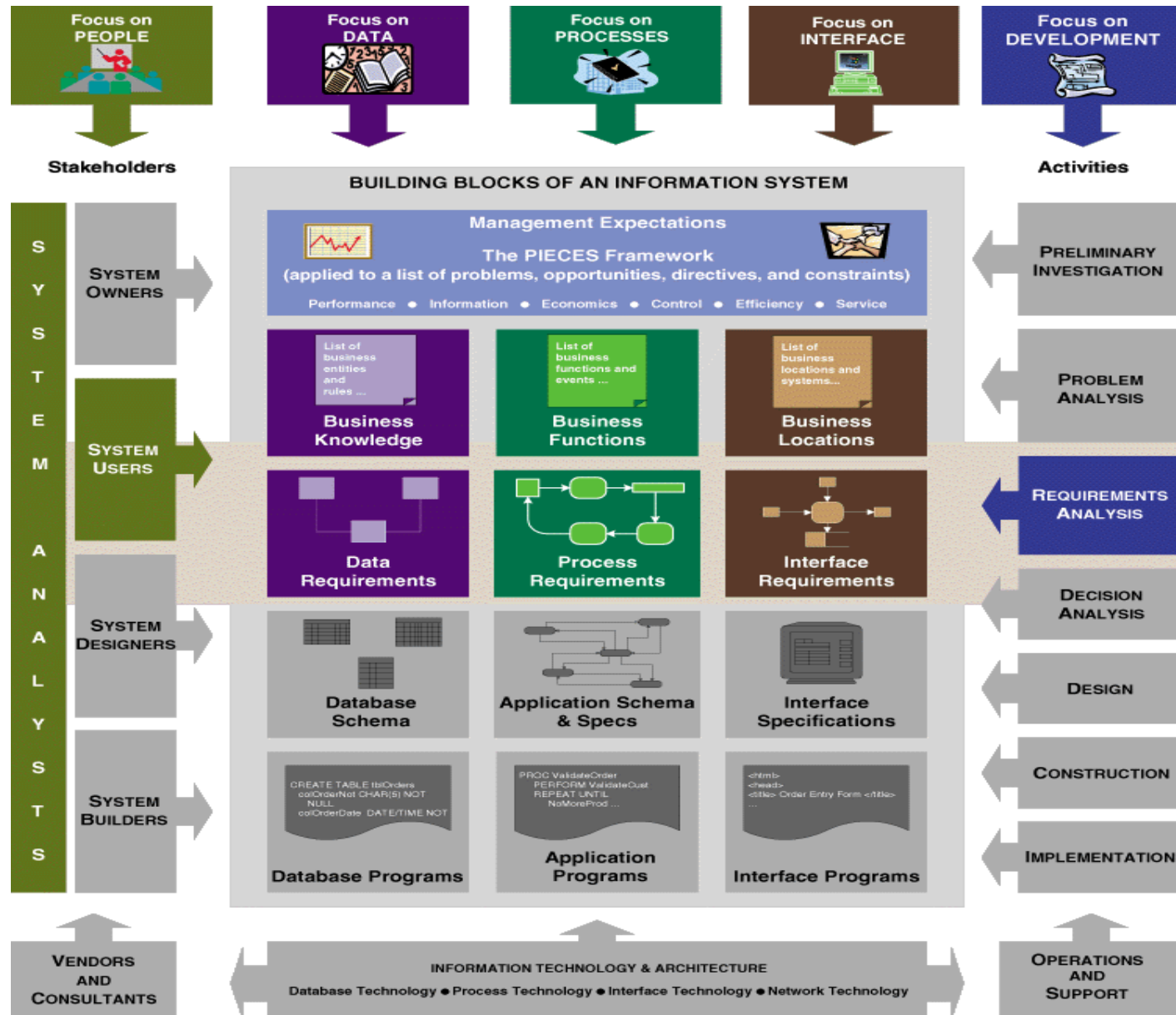
# Cause-and-Effect / System Improvement Objectives

## PROBLEMS, OPPORTUNITIES, OBJECTIVES, AND CONSTRAINTS MATRIX

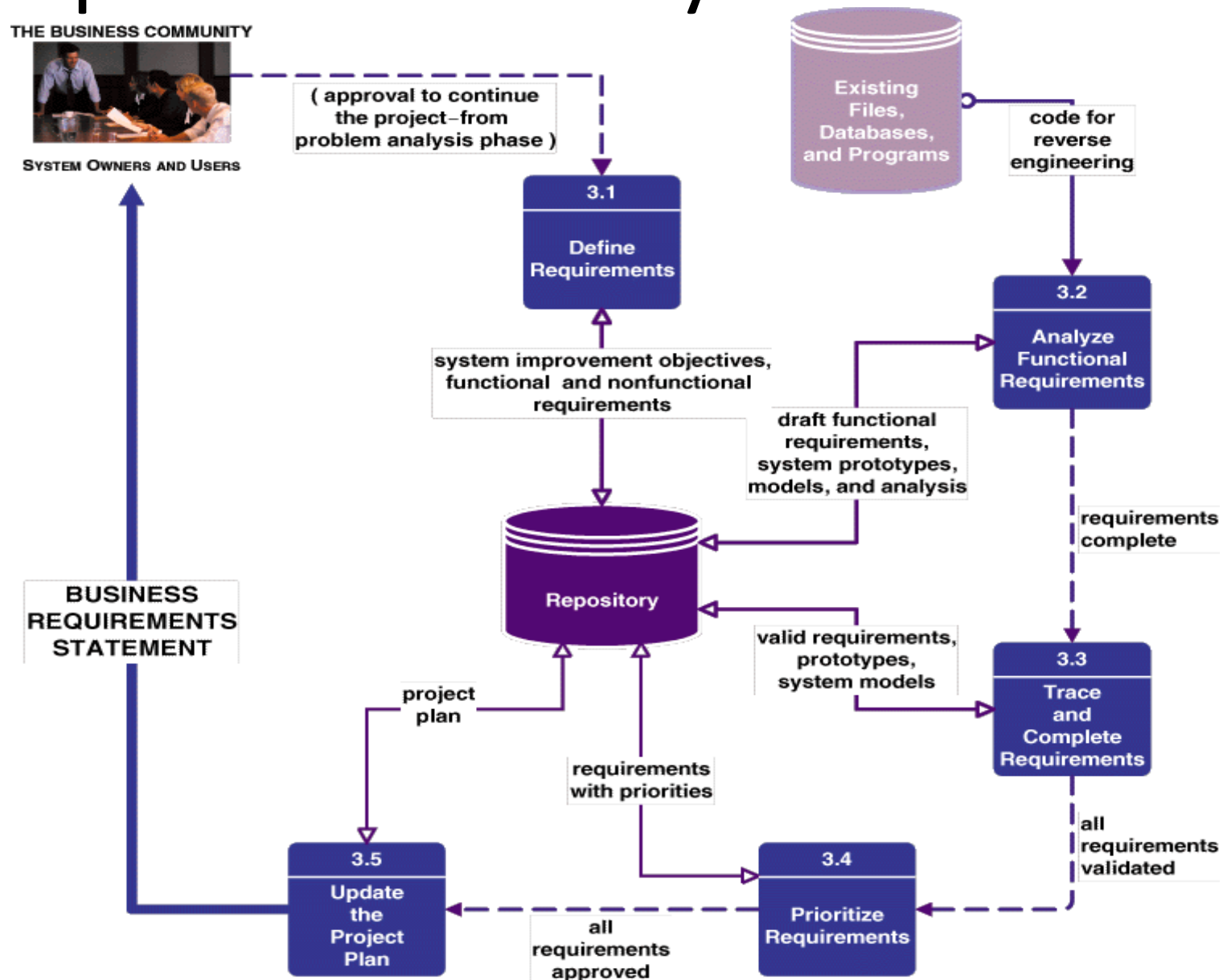
<b>Project:</b>	Member Services Information System	<b>Project Manager:</b>	Sandra Shepherd
<b>Created by:</b>	Robert Martinez	<b>Last Updated by:</b>	Robert Martinez
<b>Date Created:</b>	January 21, 2001	<b>Date Last Updated:</b>	January 31, 2001

CAUSE-AND-EFFECT ANALYSIS		SYSTEM IMPROVEMENT OBJECTIVES	
Problem or Opportunity	Causes and Effects	System Objective	System Constraint
1. Order response time is unacceptable.	<ol style="list-style-type: none"> <li>Throughput has increased while number of order clerks was downsized. Time to process a single order has remained relatively constant.</li> <li>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.</li> <li>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.</li> <li>Warehouse picking tickets for orders were never designed to maximize the efficiency of order fillers. As warehouse operations grew, order filling delays were inevitable.</li> </ol>	<ol style="list-style-type: none"> <li>Decrease the time required to process a single order by 30%.</li> <li>Eliminate keyboard data entry for as much as 50% of all orders.</li> <li>For remaining orders, reduce as many keystrokes as possible by replacing keystrokes with point-and-click objects on the computer display screen.</li> <li>Move data editing from a shared computer to the desktop.</li> <li>Replace existing picking tickets with a paperless communication system between member services and the warehouse.</li> </ol>	<ol style="list-style-type: none"> <li>There will be no increase in the order processing workforce.</li> <li>Any system developed must be compatible with the existing <i>Windows 95</i> desktop standard.</li> <li>New system must be compatible with the already approved automatic identification system (for bar coding).</li> </ol>

# Requirements Analysis Phase Context



# Requirements Analysis Phase Tasks



# Business Requirements

A **functional requirement** is a description of activities and services a system must provide.

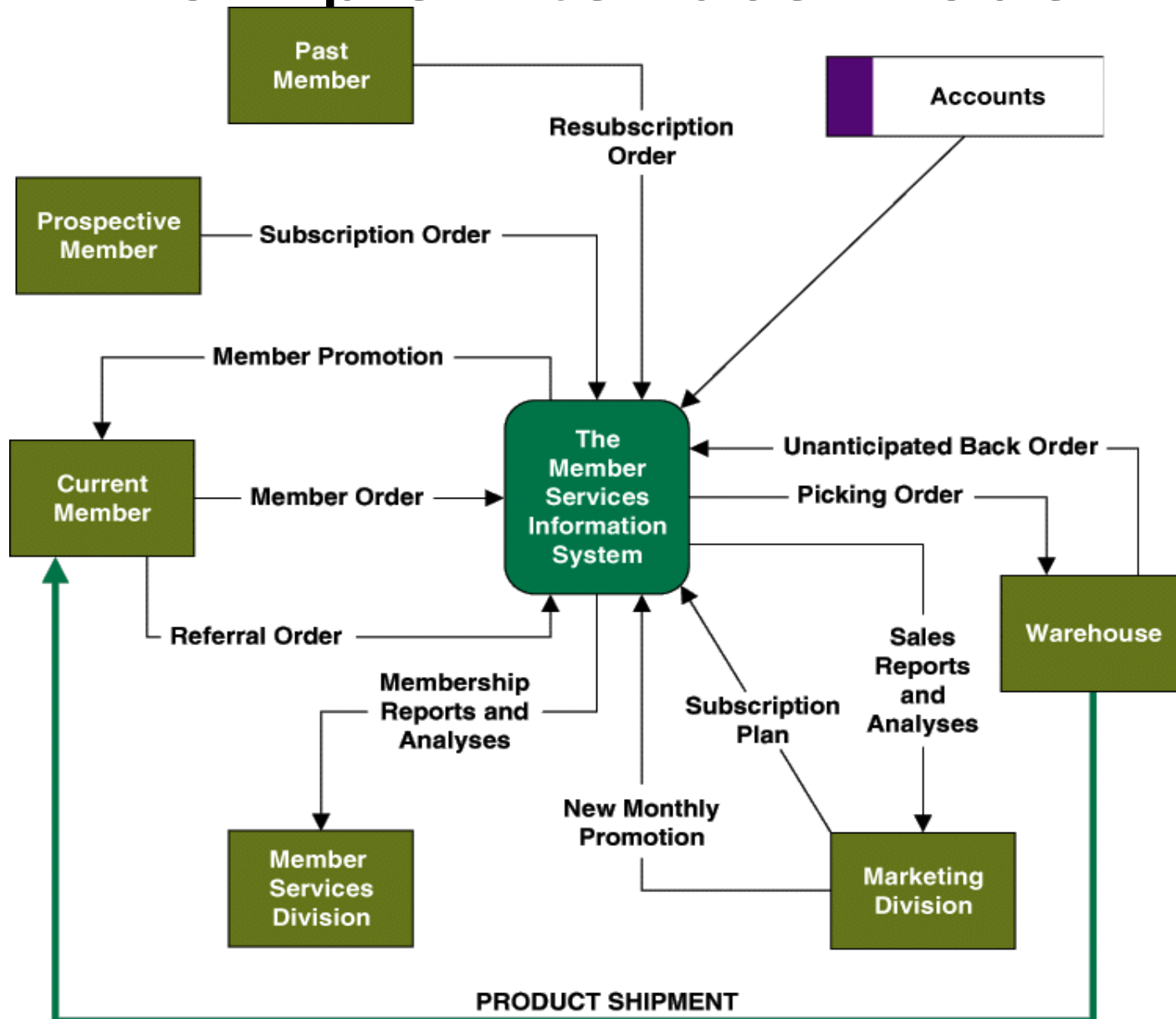
A **nonfunctional requirement** is a description of other features, characteristics, and constraints that define a satisfactory system.

# Logical System Models

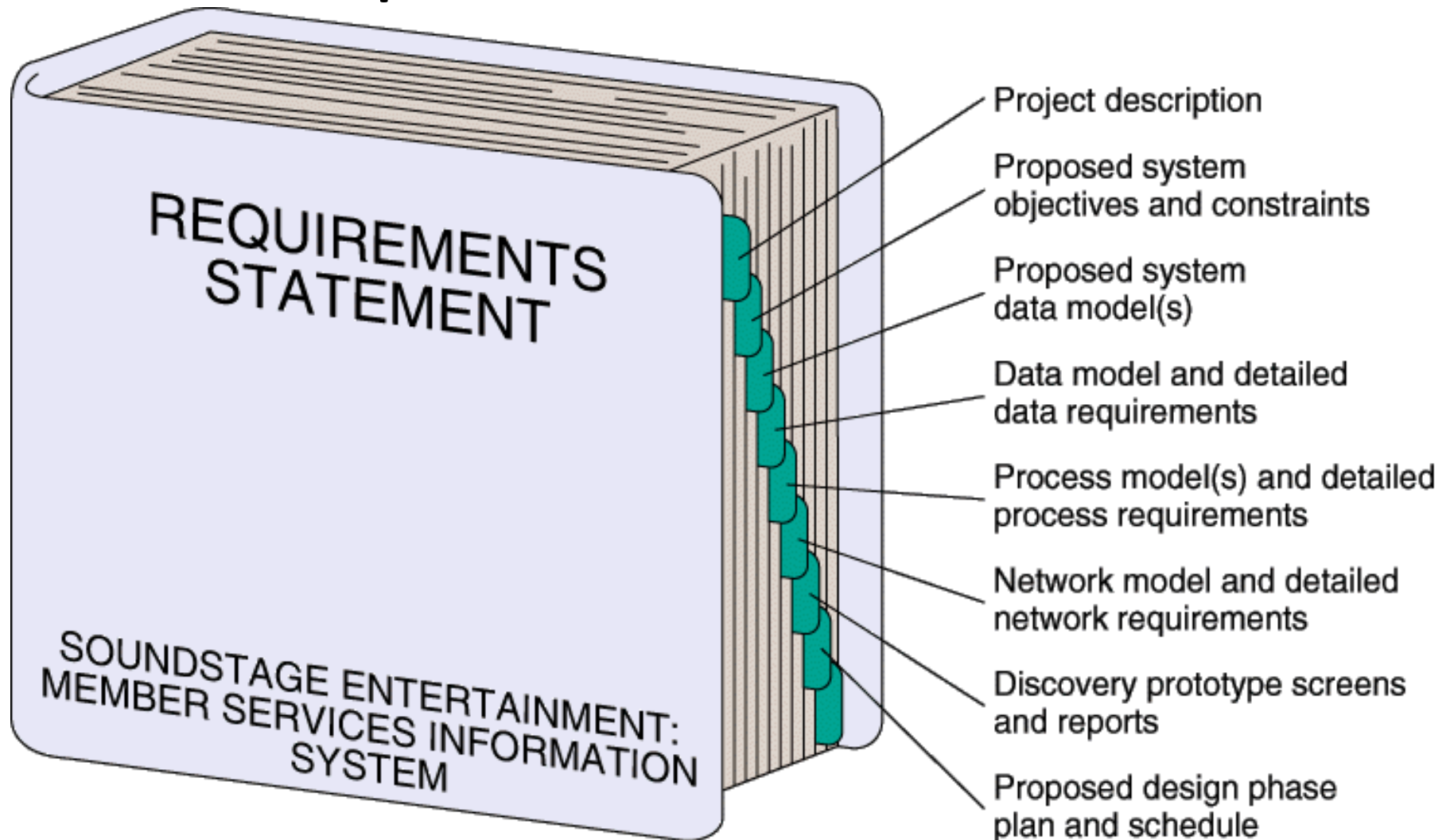
**Logical system models** depict what a system is or what a system must do—*not* how the system will be implemented. Because logical models depict the *essential* requirements of a system, they are sometimes called *essential system models*.

- Process models (e.g., data flow diagrams)
- Data models (e.g., entity relationship diagrams)
- Interface models (e.g., context diagrams)
- Object models (e.g., Uniform Modeling Language diagrams)

# A Simple Interface Model



# Requirements Statement

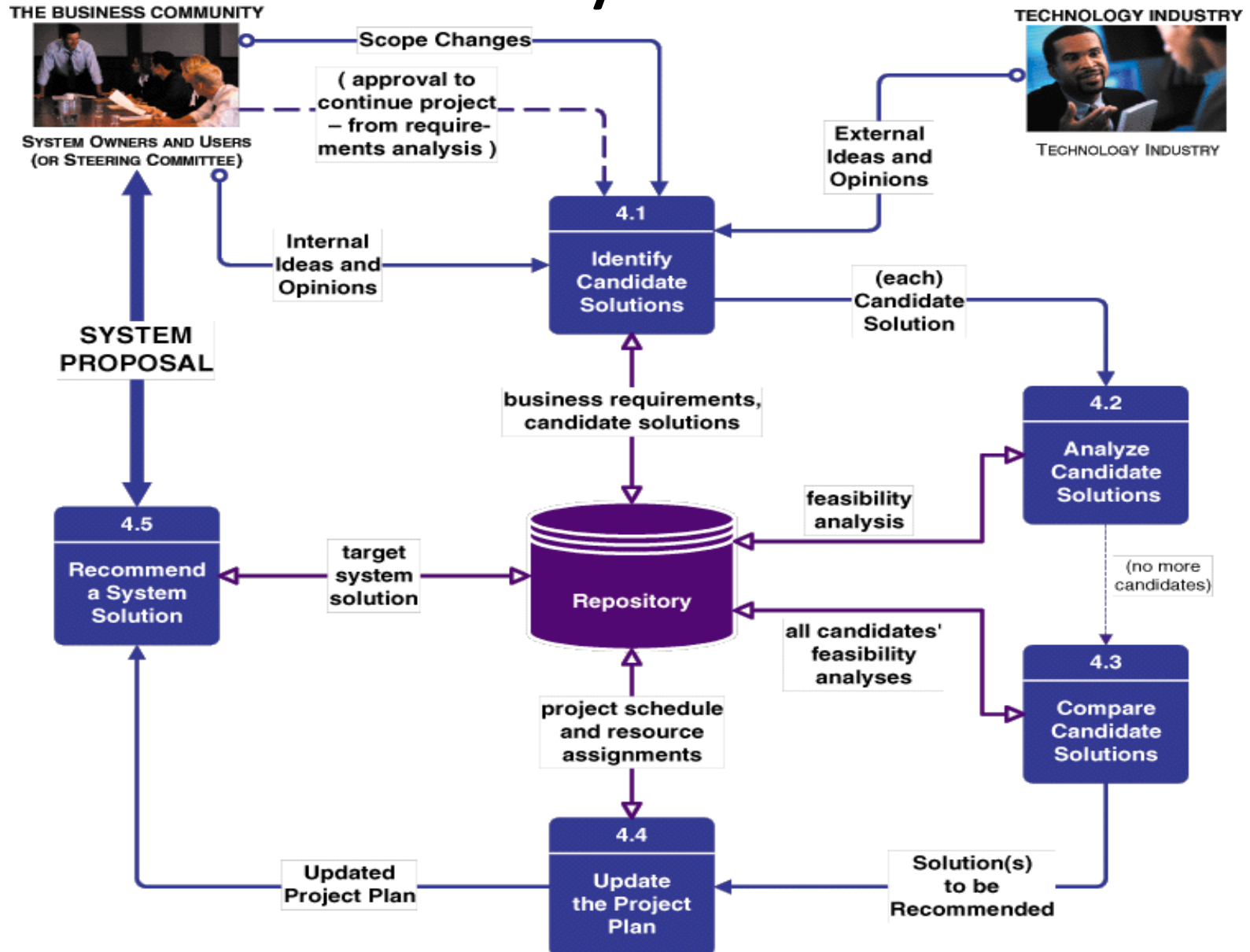


# Decision Analysis Phase Context





# Decision Analysis Phase Tasks



# Feasibility Analyses

- 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 ...
<b>Portion of System Computerized</b>  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.	
<b>Benefits</b>  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.	
<b>Servers and Workstations</b>  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.	
<b>Software Tools Needed</b>  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	
<b>Application Software</b>  A description of the software to be purchased, built, accessed, or some combination of these techniques.	Package Solution	Custom Solution	Same as candidate 2.	

(Continued)

# Candidate Systems Matrix (concluded)

<b>Method of Data Processing</b>  Generally some combination of: on-line, batch, deferred batch, remote batch, and real-time.	Client/Server	Same as candidate 1.	Same as candidate 1.	
<b>Output Devices and Implications</b>  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 bar-code 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.	
<b>Input Devices and Implications</b>  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.	
<b>Storage Devices and Implications</b>  Brief description of what data would be stored, what data would be accessed from existing stores, what storage media would be used, how much storage capacity 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.	

# Feasibility Matrix

Feasibility Criteria	Weight	Candidate 1	Candidate 2	Candidate 3	Candidate . . .
<b>Operational Feasibility</b>  <b>Functionality.</b> A description of to what degree the candidate would benefit the organization and how well the system would work.  <b>Political.</b> A description of how well received this solution would be from both user management, user, and organization perspective.	30%	Only supports Member Services requirements and current business processes would have to be modified to take advantage of software functionality  <b>Score: 60</b>	Fully supports user required functionality.  <b>Score: 100</b>	Same as candidate 2.  <b>Score: 100</b>	
<b>Technical Feasibility</b>  <b>Technology.</b> An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate.  <b>Expertise.</b> An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.	30%	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.  <b>Score: 50</b>	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.  <b>Score: 95</b>	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.  <b>Score: 60</b>	
<b>Economic Feasibility</b>  <b>Cost to develop:</b>  <b>Payback period (discounted):</b>  <b>Net present value:</b>  <b>Detailed calculations:</b>	30%	Approximately \$350,000.  Approximately 4.5 years.  Approximately \$210,000.  See Attachment A.  <b>Score: 60</b>	Approximately \$418,040.  Approximately 3.5 years.  Approximately \$306,748.  See Attachment A.  <b>Score: 85</b>	Approximately \$400,000.  Approximately 3.3 years.  Approximately \$325,500.  See Attachment A.  <b>Score: 90</b>	
<b>Schedule Feasibility</b>  An assessment of how long the solution will take to design and implement.	10%	Less than 3 months.  <b>Score: 95</b>	9–12 months  <b>Score: 80</b>	9 months  <b>Score: 85</b>	
<b>Ranking</b>	100%	60.5	92	83.5	