SYSTEM ANALYSIS

System Analysis & Design Course

Sharif University of Technology

WHAT IS SYSTEMS ANALYSIS ?

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.

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.

- Network directory of computer-generated files that contain project correspondence, reports, and data
- CASE tool dictionary or encyclopedia
- Printed documentation (binders and system libraries)
- 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 APPROACHES

Traditional Approaches

- Structured Analysis
  - Focuses on the flow of data through processes
  - Key model: data flow diagram
- Information Engineering
  - Focuses on structure of stored data
  - Key model: entity relationship diagram

Object-Oriented Approach

- integrates data and process concerns into 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.
- **Unified Modeling Language (UML)**

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 – 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.

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.

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REQUIREMENTS DISCOVERY

Requirements discovery – the process, used by systems analysts of identifying or extracting system problems and solution requirements from the user community.

REQUIREMENTS DISCOVERY METHODS

Fact-finding – the process of collecting information about system problems, opportunities, solution requirements, and priorities.

- Sampling existing documentation, reports, forms, databases, etc
- Research of relevant literature
- Observation of the current system
- Questionnaires and surveys
- Interviews

Joint requirements planning (JRP) –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.

- 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.

AGILE METHODS

Agile method – integration of various approaches of systems analysis and design for applications as deemed appropriate to 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,

ANALYSIS ACTIVITIES

Scope Definition

- *Is the project worth looking at?*

Problem Analysis

- *Is a new system worth building?*

Requirements Analysis

- *What do the users need and want from the new system?*

Logical Design

- *<u>What</u> must the new system do?*

Decision Analysis

- *What is the best solution?*

ANALYSIS ACTIVITIES

Scope Definition

- *Identifying baseline problems and opportunities*
- *Negotiate baseline scope*
- *Assess baseline worthiness*
- *Develop baseline schedule and budget*
- *Communicate the project plan*

KEY TERMS FOR SCOPE DEFINITION

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.

SAMPLE REQUEST FOR SYSTEM SERVICES

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 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 Game-Screen 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 Game-Screen)	12 months	Low	15,000	3	After new system is developed, provide users with easy-to-learn and -use reporting tools.

ANALYSIS ACTIVITIES

Problem Analysis

- *Understand the problem domain*

- *Analyze problems and opportunities*

- *Analyze business processes*

- *Establish system improvement objectives*

- *Update or refine the project plan*

- *Communicate findings and recommendations*

KEY TERMS OF PROBLEM 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 problems which, in turn, must be analyzed for causes and effects until the causes and effects do not yield symptoms of other problems.

Context Diagram – a pictorial model that shows how the system interacts with the world around it and specifies in general terms the system inputs and outputs.

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**
1. 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.	1. Decrease the time required to process a single order by 30%. 2. Eliminate keyboard data entry for as much as 50% of all orders. 3. For remaining orders, reduce as many keystrokes as possible by replacing keystrokes with point-and-click objects on the computer display screen. 4. Move data editing from a shared computer to the desktop. 5. Replace existing picking tickets with a paperless communication system between member services and the warehouse.	1. There will be no increase in the order processing workforce. 2. Any system developed must be compatible with the existing Windows 95 desktop standard. 3. New system must be compatible with the already approved automatic identification system (for bar coding).

SAMPLE CONTEXT DIAGRAM
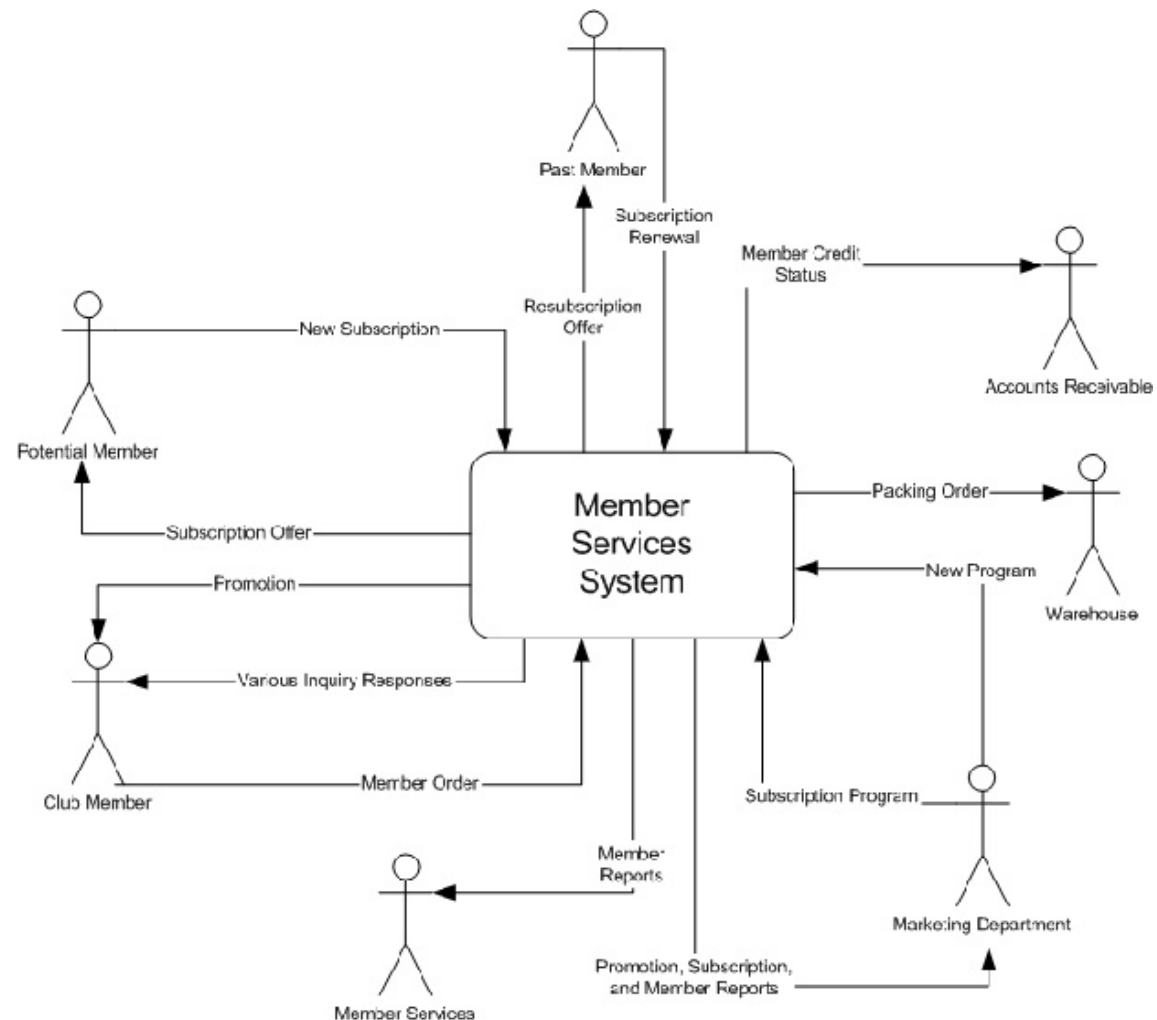
KEY TERMS OF THE PROBLEM ANALYSIS

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.*

SYSTEM IMPROVEMENT REPORT OUTLINE

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 current system (approximately 5 pages)
    A. Strategic implications (if project is part of or impacts existing IS strategic plan)
    B. Models of the current system
        1. Interface model (showing project scope)
        2. Data model (showing project scope)
        3. Geographical models (showing project scope)
        4. Process model (showing functional decomposition only)

SYSTEM IMPROVEMENT REPORT OUTLINE

IV.   Analysis of the current system (approx. 5-10 pages)

        A.   Performance problems, opportunities, cause-effect analysis

        B.   Information problems, opportunities, cause-effect analysis

        C.   Economic problems, opportunities, cause-effect analysis

        D.   Control problems, opportunities, cause-effect analysis

        E.   Efficiency problems, opportunities, cause-effect analysis

        F.   Service problems, opportunities, and cause-effect analysis

V.   Detailed recommendations (approx. 5-10 pages)

        A.   System improvement objectives and priorities

        B.   Constraints

        C.   Project Plan

                1.   Scope reassessment and refinement

                2.   Revised master plan

                3.   Detailed plan for the definition phase

VI.   Appendixes

        A.   Any detailed system models

        B.   Other documents as appropriate

ANALYSIS ACTIVITIES

Requirement Analysis

- *Identify and express requirements*
- *Prioritize system requirements*
- *Update or refine the project plan*

KEY TERMS OF REQUIREMENTS ANALYSIS

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

KEY TERMS OF REQUIREMENTS ANALYSIS

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.

KEY TERMS OF REQUIREMENTS ANALYSIS

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.

ANALYSIS ACTIVITIES

Logical Design

- *Structure functional requirements*

- *Design logical models or Develop a prototype*

- *Define acceptance tests*

ANALYSIS ACTIVITIES

Decision Analysis

- *Similar concepts with Feasibility Analysis*

- *Is run when we have more than one solution*

- *The proposal can be an output of this activity*