Systems Analysis and Design: What is it?

• **Systems analysis**: the systematic study of the information needs and problems of some organizational domain in order to recommend improvements and specify the business requirements for the solution.

• **Systems design**: the specification of a technical, computer-based solution for the business requirements identified in a systems analysis
Systems Analysis and Design: Why is it?

• Many information systems fail, because of:
  • lack of reliability
  • lack of usability
  • not what the users wanted
  • incompatible with other systems
• SA&D addresses all but the first problem
• SA&D is also long-term approach to ensure the overall effectiveness of IT in the organization
A systems analyst studies the information problems and needs of an organization to determine how to best solve the problems and accomplish improvements using information technology.

- improved business processes
- improved information systems
- improved computer applications

Three major roles:
- consultant (outsider)
- supporting expert (insider)
- agent of change (shaker)
Systems Analysis and Design: Where is it?

Not just for businesses!

– non-profit organizations
– government agencies
– educational institutions
Types of Information Systems

Transaction processing systems
Office automation systems
Management information systems
Decision support systems
Expert systems
Group decision support systems (CSCW)
Executive support systems
Two Perspectives on an IS

• What does it do?
  – Process-oriented approach
  – focus on software development

• What information does it use?
  – Data-oriented approach
  – focus on data modeling and DB design

One of these perspectives usually drives system development
Skills of a Systems Analyst

- Analytical
- Technical
- Management
- Interpersonal
Systems Thinking

Nine system characteristics:

- components
- interrelationships between components
- boundary
- purpose
- environment
- interfaces
- input
- output
- constraints
Systems Thinking (cont.)

Four system concepts
– decomposition
– modularity
– coupling
– cohesion
Systems Thinking (cont.)

Advantages of systems thinking:
- allows you to think about an organization, a process, a program, etc. at a higher, more abstract level
- reveals problems that are obscured by physical details
- abstractions are easier to manipulate
- promotes creativity
Systems Development Lifecycle

- Project Identification & Selection
- Project Initiation & Planning
- Analysis
- Logical Design
- Physical Design
- Implementation
- Maintenance
Different Lifecycle Models

- Waterfall
- Iterative Enhancement
- Prototyping
- Spiral model
- Rapid Application Development
- Inspections and Reviews
Iterative Enhancement

- Project Identification & Selection
- Project Initiation & Planning
- Analysis
- Logical Design
- Physical Design
- Implementation
- Maintenance
- Next Iteration

Next iteration
Spiral Model

- Project Identification & Selection
- Project Initiation & Planning
- Analysis
  - Logical Design
  - Physical Design
  - Implementation
  - Maintenance

Next Spiral
Rapid Application Development

- Project Planning
- **User Design**
- Physical Design
- Implementation
- Maintenance
Inspections and Reviews

- Project Identification & Selection
- Project Initiation & Planning
- Analysis
  - Project Plan Review
  - Requirements Review
  - Logical Design Review
  - Logical Design Review
  - Physical Design Review
- Logical Design
  - Physical Design
  - Implementation
    - Code Inspection
    - Maintenance
CASE Tools

Software packages that an analyst can use to:

- increase productivity by taking care of tedious clerical tasks
- facilitate communication with users
- keep track of different lifecycle products
- assess the impact of maintenance
Systems Development Lifecycle

- Project Identification & Selection
- Project Initiation & Planning
- Analysis
- Logical Design
- Physical Design
- Implementation
- Maintenance
Project Identification & Selection

- Process depends on organization
- Usually too many requests
- First weeding-out step
- Initial criteria:
  - backing from management
  - right timing for resource availability
  - fits in with larger organizational goals
  - practicable
  - high enough on the priority list
- Result is a set of proposed projects that merit further investigation
Problem Definition

- Have to find the “real” problem
- Lack of technology is not necessarily a problem!
- Must include *only* the problem, *not* the solution
- Usually boils down to:
  - money
  - time (= money)
  - inability to achieve organizational “mission”
Problems vs. Opportunities

• Problem - something that’s going wrong
• Opportunity - something that could be going better
• Examples
  – Problem: current system wastes resources
  – Opportunity: new system would increase revenues
Good Examples

“XYZ Company currently maintains a database of current and past customers, but no analysis is done of this database to identify possibilities for further sales. Providing support for this analysis would increase sales, and thus revenue and profit.”

“Field representatives currently enter information on the services they have performed into laptop computers at the customer site. Then, at the main office, they print out reports on the services performed that day. These reports are given to a clerk who enters some of this information into a central database. This represents a lot of wasted time in redundant data entry.”
Bad Examples

“XYZ Company’s current inventory and ordering system is entirely paper-based. The entire system is outdated.”

“The organization’s problem is that they need a centralized database for storing and tracking customer information.”

“A state-of-the-art decision support system for marketing strategy would bring ABC Corp. into the 21st century.”
Determining Project Scope

- Which organizational units affected?
- What current systems have to be understood and/or changed?
- Who cares?
- What is the range of capabilities?

A context-level diagram is useful!
Project Planning and Management

Planning activities:
- project scope, alternatives, feasibility
- work breakdown decomposition
- estimating effort and resources
- estimating schedule
- developing a communication plan
- standards and procedures
- risk assessment
- preliminary budget
- statement of work
- baseline project plan
Identifying Risks

**Risk factors**: what are the characteristics of this project that make it risky?

**Risk events**: what are the things that could go wrong?

**Potential loss**: how bad would it be if it happened?

**Preventive actions**: what could we do to prevent it from happening?

**Mitigating actions**: what could we do to prepare in case it does happen?
Assessing Feasibility

Technical – is technology available or are we able to develop it?
Economic – do we have the time and money?
Operational - will it work?
Schedule – can it be done in the given time?
Legal and contractual - are we allowed to do this?
Political – is anyone trying to undermine this project?
Operational Feasibility

• Will it work with current systems?
• Will it be accepted by users?
• Will it solve real problems?
Economic Feasibility

- **Identification** of costs and benefits
- Quantify as many as possible
- Estimates based on all available information
- Both tangible and intangible
- One-time and recurring
- More detailed cost/benefit analysis performed after systems analysis
Reviews, Inspections, and Walkthroughs

• Basic philosophy:
  – Testing finds problems too late; the problems are very expensive to fix if the system is already implemented
  – So look for problems earlier, when less rework has to be done
  – Look for problems in early products of the process: project plans, requirements, designs, etc.
Types of Reviews

• **Review** - any manual, human-based method for finding defects in a document (plan, design, code, etc.)

• **Inspection** - one or more peers individually review a document then report back any defects found

• **Walkthrough** - a group of reviewers meet together to review a document, piece by piece, as a group; if the document is executable, it is mentally “executed” by the group
Project Planning Walkthrough

• Can be used for any project deliverable
• **Strongly** recommended for group projects!
• Fairly informal meeting
• Roles:
  - coordinator
  - presenter
  - user
  - secretary
  - standards bearer
  – maintenance oracle