V. Systems Development: Overview

Key Concepts in Systems Development

- **Initiating a systems development**
  - Participants involved in a SD project
  - Reasons for having a new system
  - File the request for budgeting and development
  - The request document should include
    - Reasons for having the new system, modification of the existing system
    - Management team for the system development
    - Department in charge of the system
    - The fit of the system to the company IS strategy
   - Expected budget

Key Concepts in Systems Development

- **Information systems planning**
  - Senior management based on the company need to evaluate and prioritize the requests from different departments
  - For each request, the proposal should include
    - *High level system requirement*
    - Feasibility analysis (Financially and technologically)
    - Selection of system development model
    - Objectives and schedule for SD
  - If the request is approved, then schedule when to release the budget and start the development
  - If the request is pending to approve (under review), the proposal will be filed for next meeting.
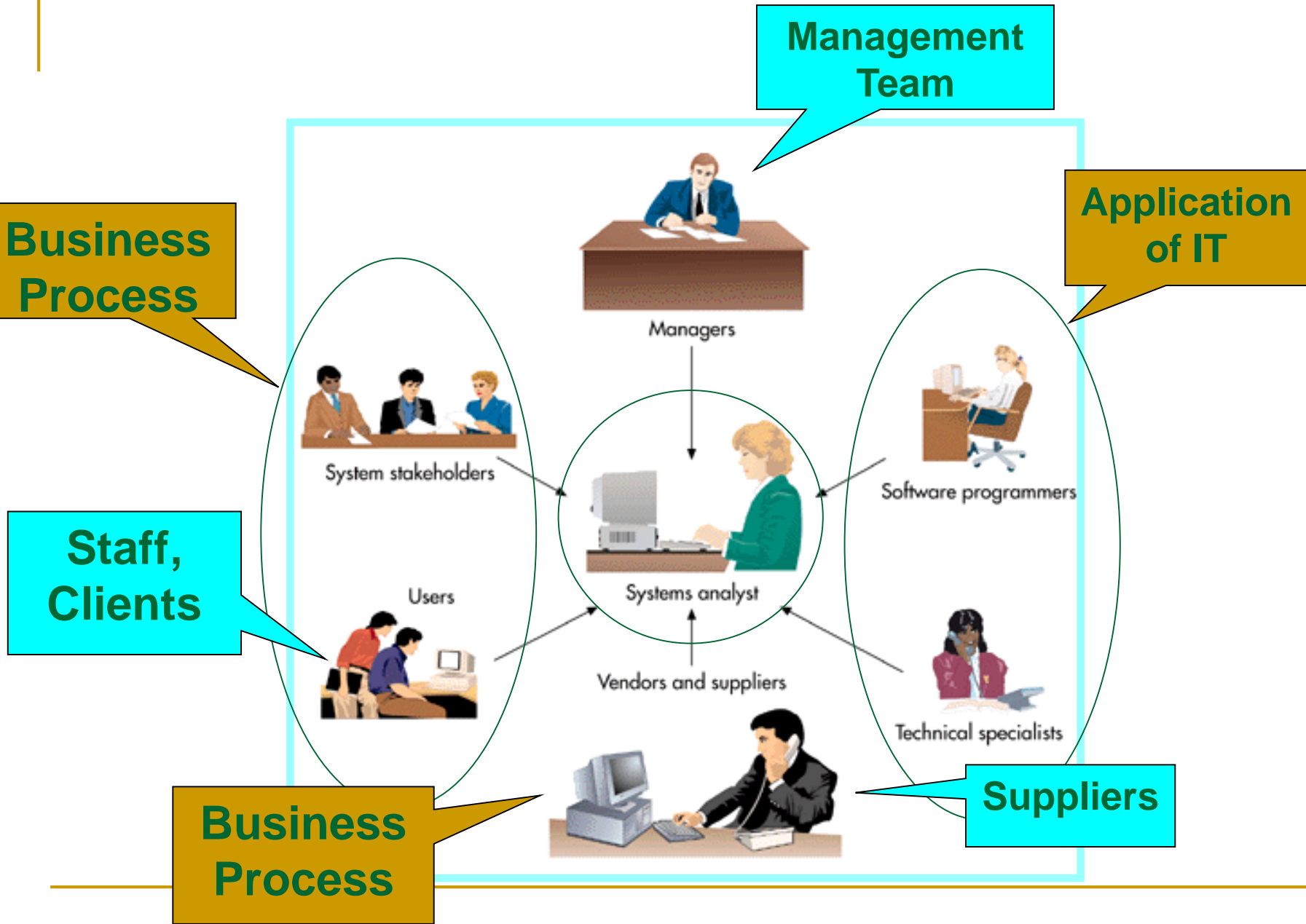
Key Concepts in Systems Development

- **Build the system (System Development)**
  - (After budget has been approved)
  - Detail analysis – *Precise system requirements* (user accepted), a list of user acceptance tests
  - System design – modules, interfacing amongst modules, hardware requirements, programming language, OS
  - Coding
  - In-house testing – unit test, system test, stress test
  - User acceptance test

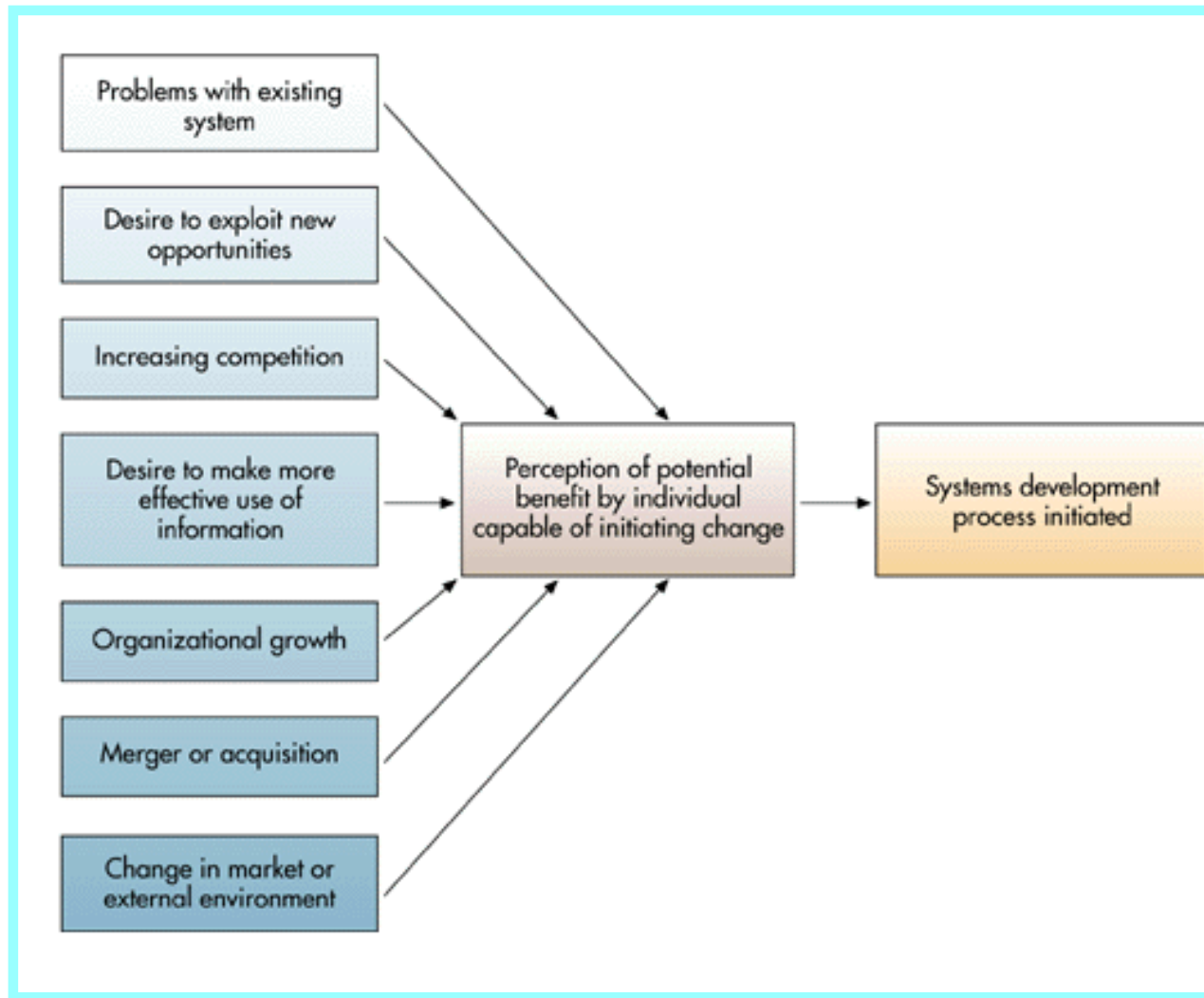# Participants in Systems Development
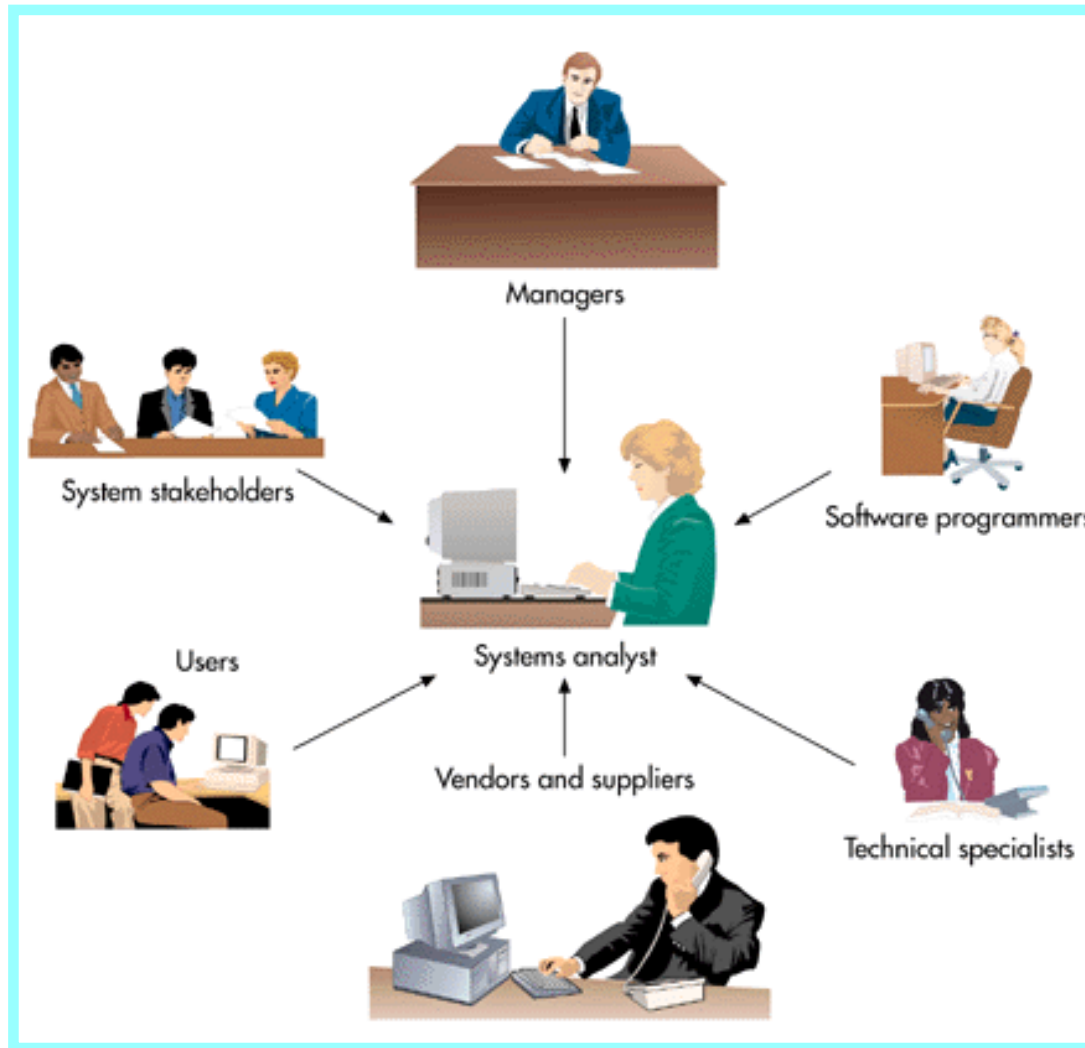
Participants in Systems Development

- ## Stakeholders
    - Individuals who either themselves or through the organization are beneficiaries of the systems development effort.
- ## Users
    - Individuals who interact with the system regularly
- ## System Analyst
    - Professional who specializes in analyzing and designing business systems.
- ## Programmers
    - Individual responsible for modifying or developing programs to satisfy user requirements.

Management Team

Application of IT

Business Process

Staff, Clients

Business Process

Suppliers

Managers

System stakeholders

Systems analyst

Software programmers

Users

Vendors and suppliers

Technical specialists

Reasons to Initiate a Development Project

Planning

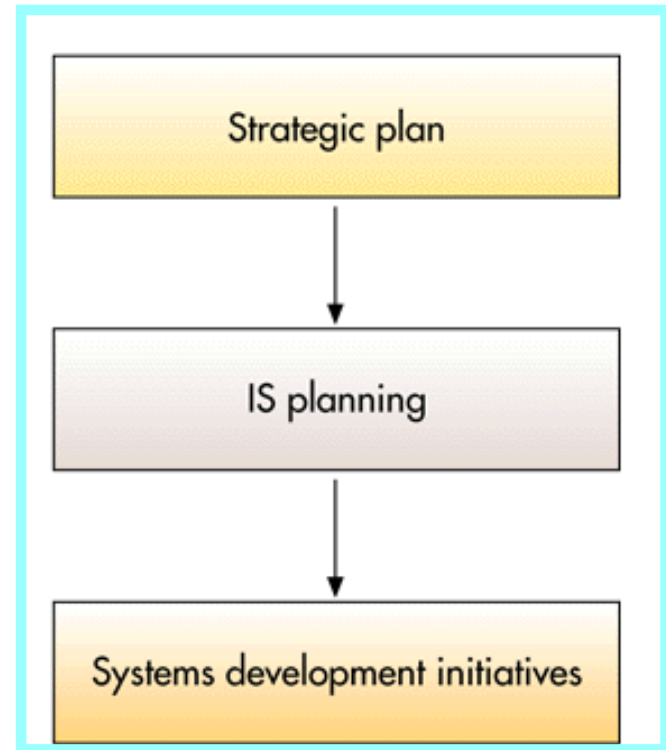What kind of person is capable to do this translation?

Information Systems Planning
The translation of strategic and organizational goals into systems development initiatives.

Creative Analysis
The investigation of new approaches to existing problems.

Critical and difficult task

Strategic plan

↓

IS planning
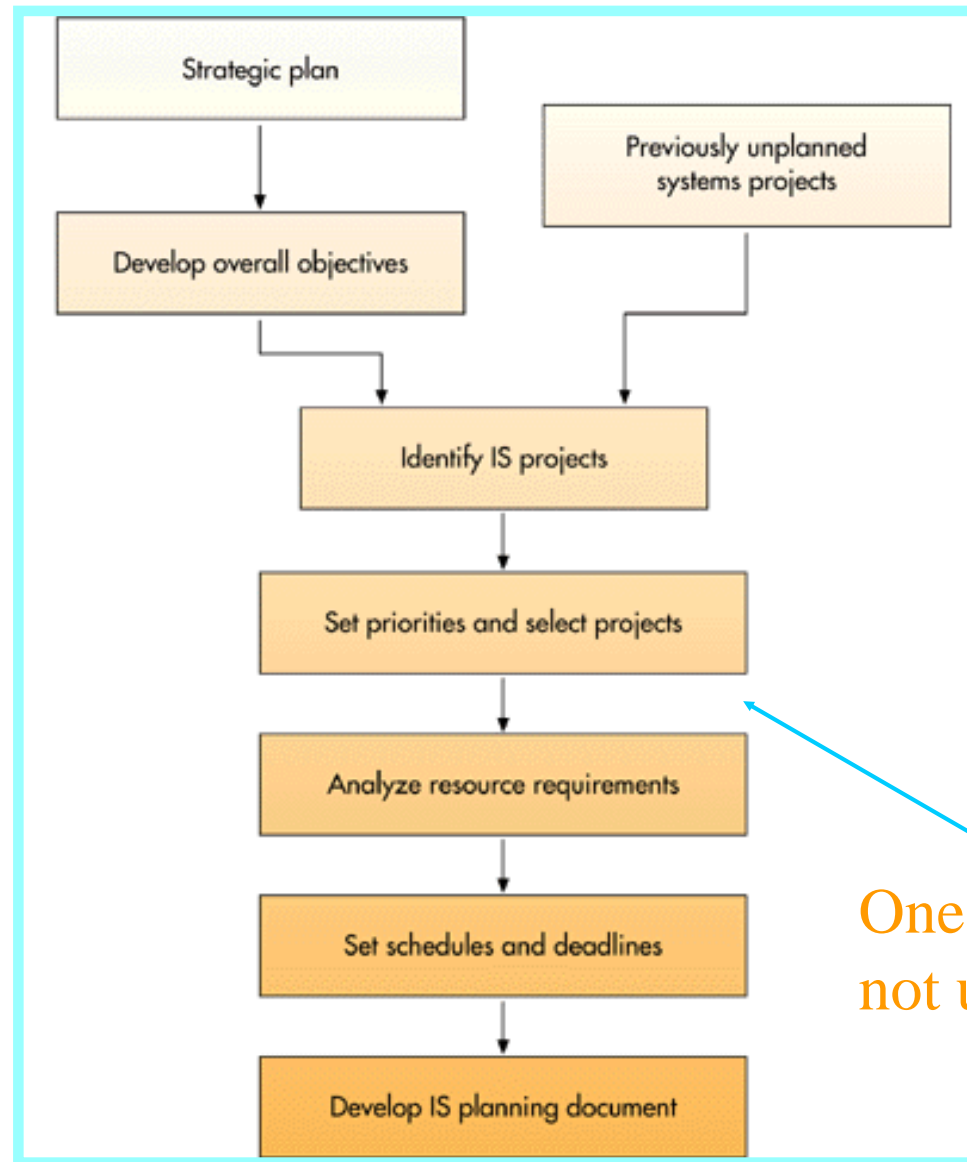
↓

Systems development initiatives

Planning

Critical Analysis
The unbiased and careful questioning of whether system elements are related in the most effective or efficient ways.

Critical and difficult task

Strategic plan

Previously unplanned systems projects

Develop overall objectives

Identify IS projects

Set priorities and select projects

Analyze resource requirements

Set schedules and deadlines

Develop IS planning document

One approach, not universal

Planning

- **Design objectives**
  - ❑ Performance objectives
    - ◼ Quality or usefulness of the output
    - ◼ The speed at which the output is generated
  - ❑ Cost objectives
    - ◼ Development costs
    - ◼ Costs related to the uniqueness of the system application
    - ◼ Fixed investments in hardware and related equipment
    - ◼ On-going operating costs of the system

Planning

- **Decision on getting the system**
  - ❏ Buy it on the market
  - ❏ In-house
    - Open sources
    - Re-usable components
    - Web services
    - Customized software package
  - ❏ Outsourcing

Planning

- Challenges
  - We would like to have a website for ITM.
  - We would like to have a website for ITM, which is similar to the following:
    - www.ucla.edu
    - www.anderson.ucla.edu
    - www.cism.kingston.ac.uk
    - www.igec.umbc.edu
  - We would like to have a website for ITM, with *design*, *outlook* and *functions* similar to the above.

System Development Model

- Waterfall model

- Spiral Model

- Component-based Development

- Prototyping

- Rapid Application Development

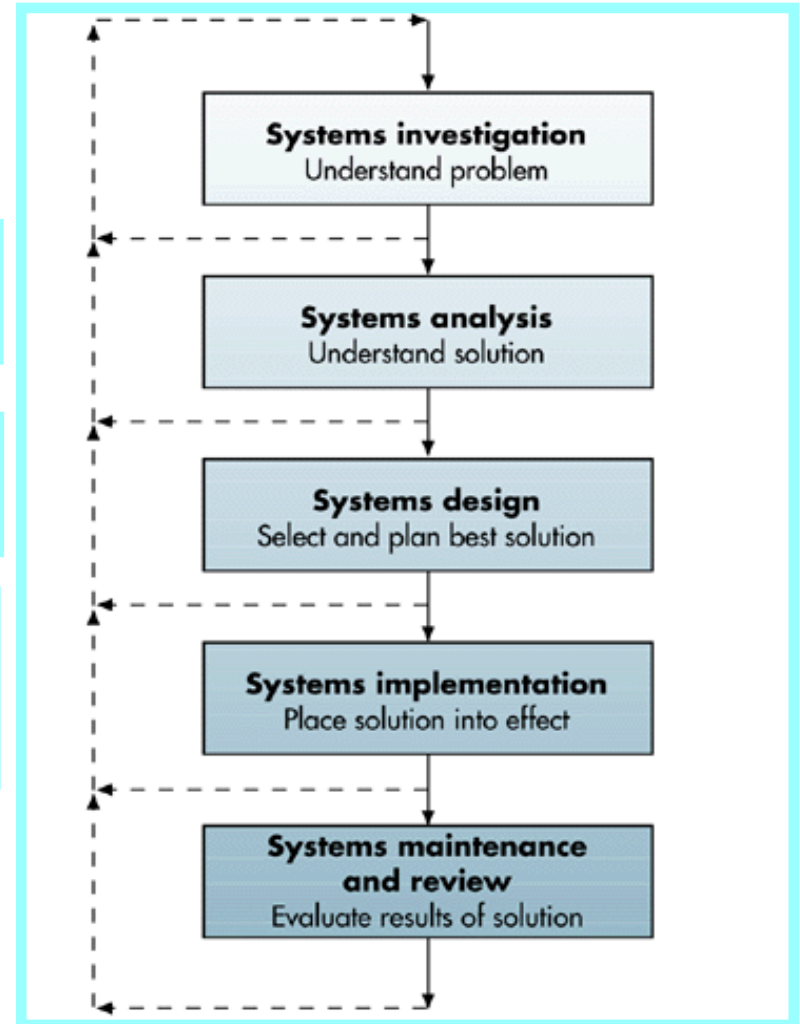- Others

Waterfall Model

Systems Investigation
Problems and opportunities are identified

Systems Analysis
Existing systems and work processes are studied

Systems Design
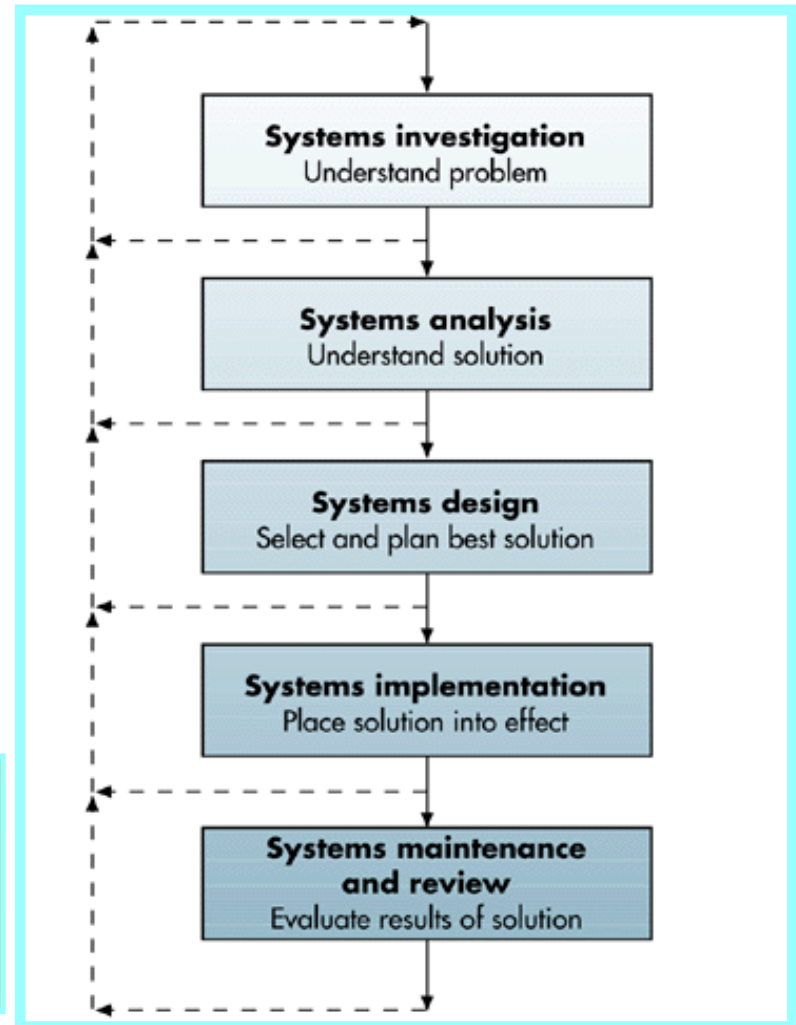Defines how the information system will do what it must do to solve the problem.

Systems investigation
Understand problem

Systems analysis
Understand solution

Systems design
Select and plan best solution

Systems implementation
Place solution into effect

Systems maintenance and review
Evaluate results of solution
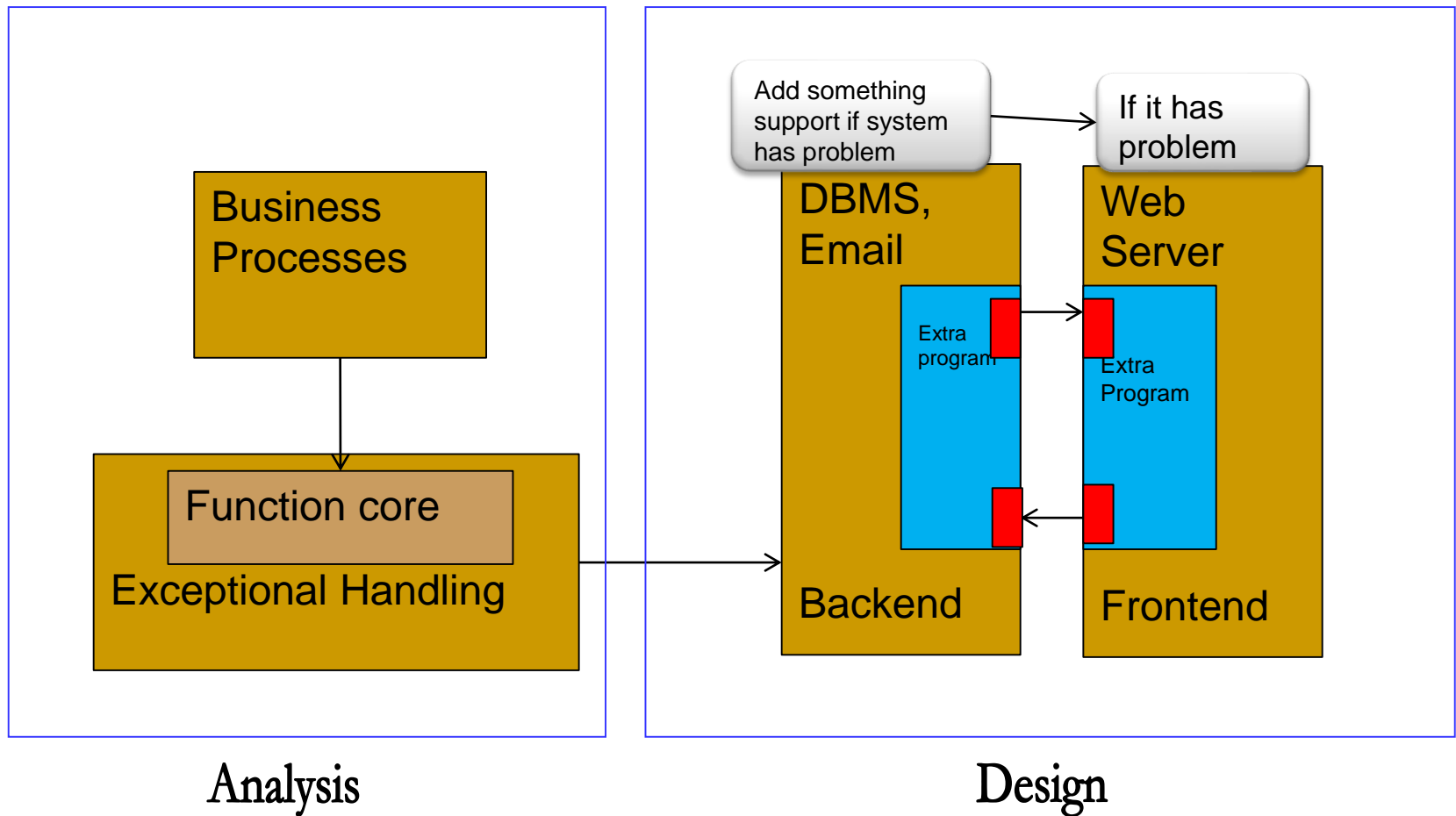
Waterfall Model

Systems Implementation
System components are assembled and the new or modified system is placed into operation.

Systems Maintenance and Review
Ensures the system operates and is modified to keep up with business changes.

Systems investigation
Understand problem

Systems analysis
Understand solution

Systems design
Select and plan best solution

Systems implementation
Place solution into effect

Systems maintenance and review
Evaluate results of solution
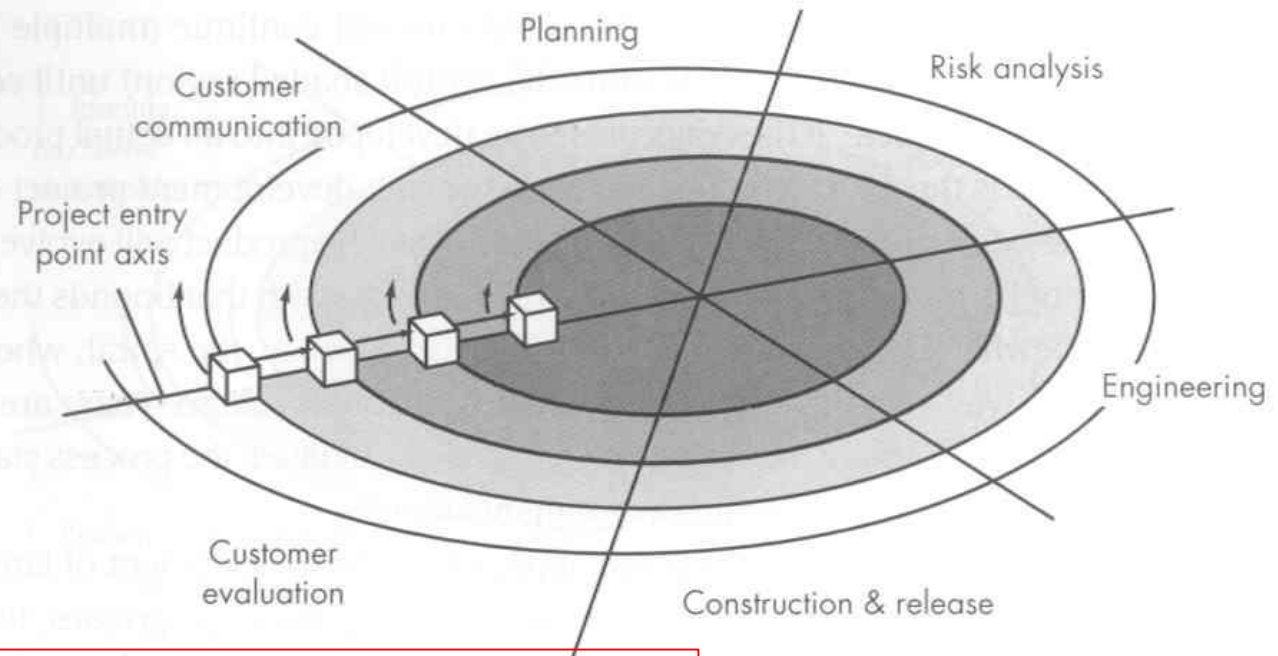
Waterfall Model

Analysis

Design

Waterfall Model

- **Analysis Stage**
    - Business process → Core functions to be implemented
    - Additional functions to handling human errors (exceptional handling)
    - System = Core + Additional

- **Design Stage**
    - System → Sub-systems
    - Each sub-system is realized by a single program (not enough)
    - Additional programs to handle data communications amongst sub-systems
    - Big program = Programs + Additional Programs + Others

- Will elaborate later about this!
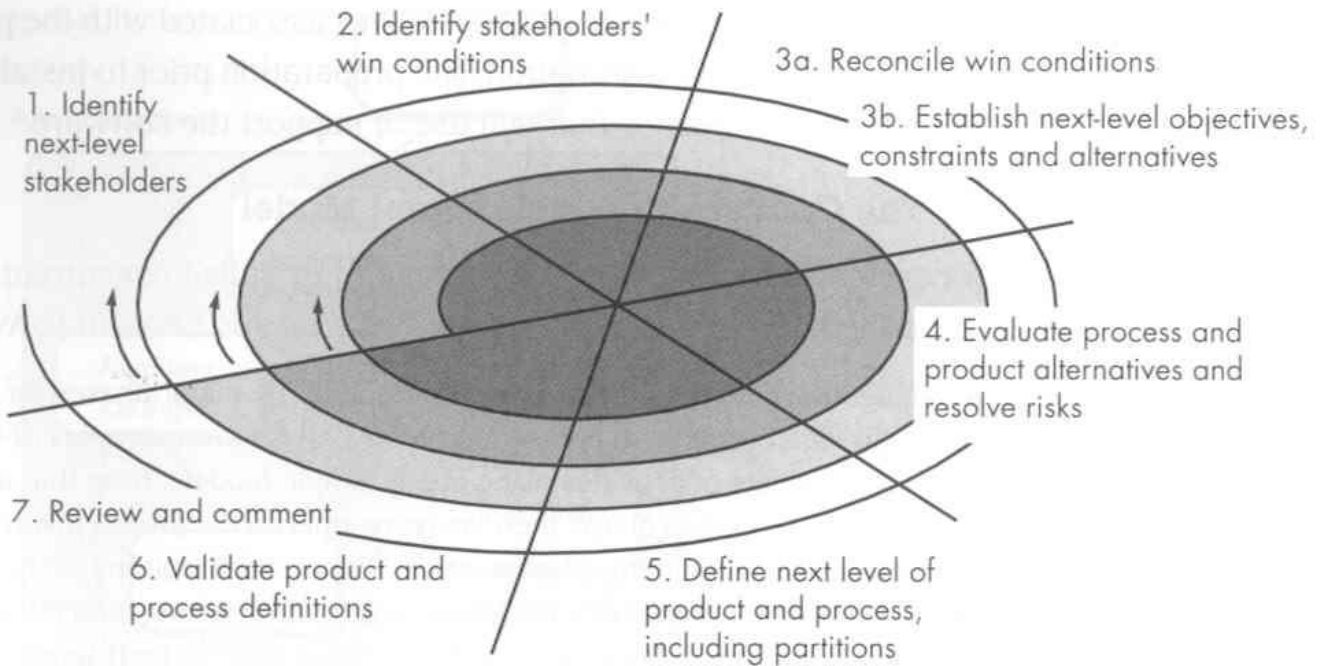
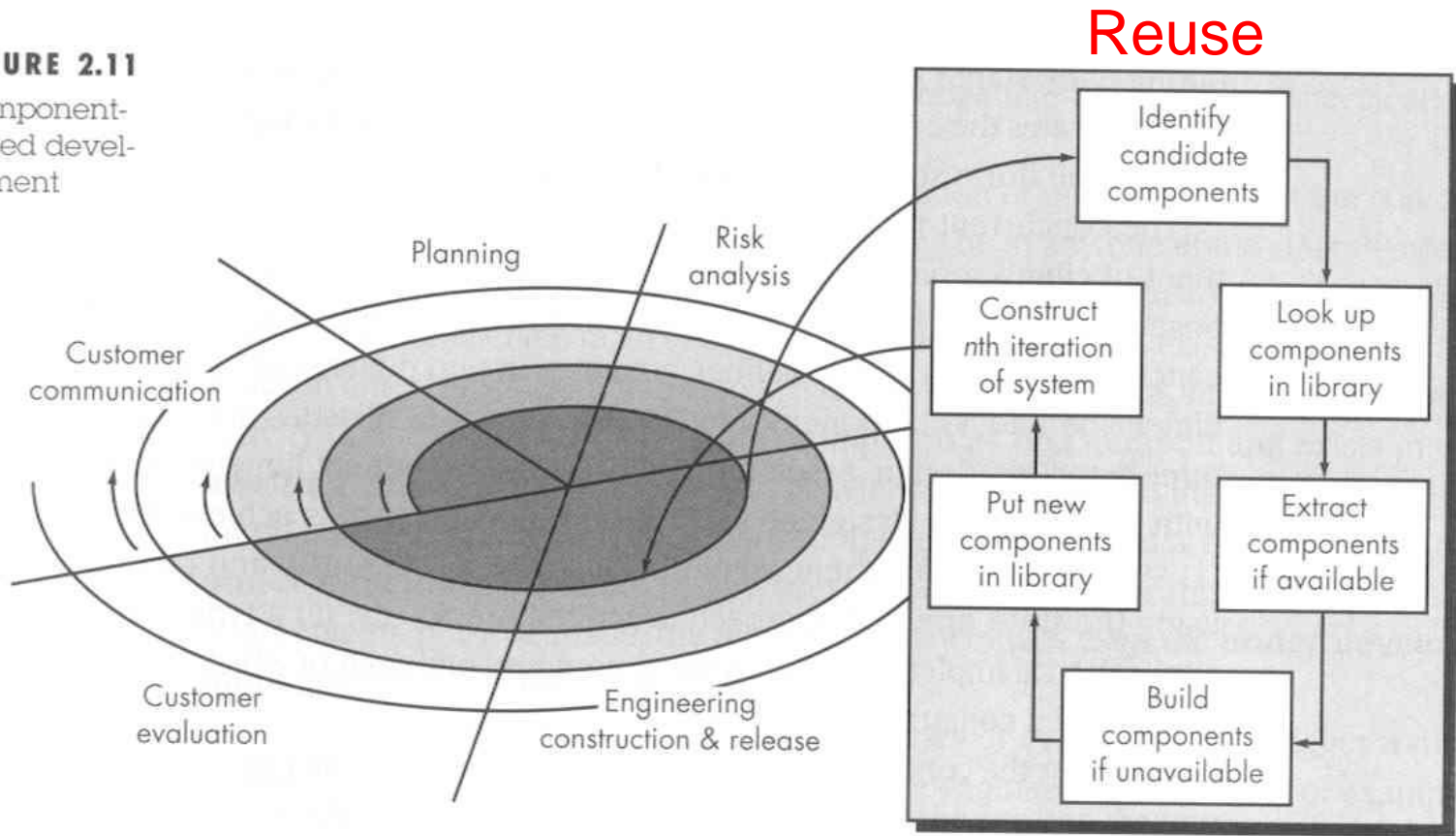# Spiral Model

FIGURE 2.8

A typical spiral model

Planning

Risk analysis

Customer communication

Project entry point axis

Engineering

Customer evaluation

Construction & release

Product maintenance projects

Product enhancement projects

New product development projects

Concept development projects

Spiral Model

FIGURE 2.9

The WINWIN spiral model [BOE98].

1. Identify next-level stakeholders

2. Identify stakeholders' win conditions

3a. Reconcile win conditions

3b. Establish next-level objectives, constraints and alternatives

4. Evaluate process and product alternatives and resolve risks

5. Define next level of product and process, including partitions

6. Validate product and process definitions

7. Review and comment

Component-based Model

Reuse

FIGURE 2.11

Component-based development

12 This is a simplified description of class definition. For a more detailed discussion, see Chapter 20.
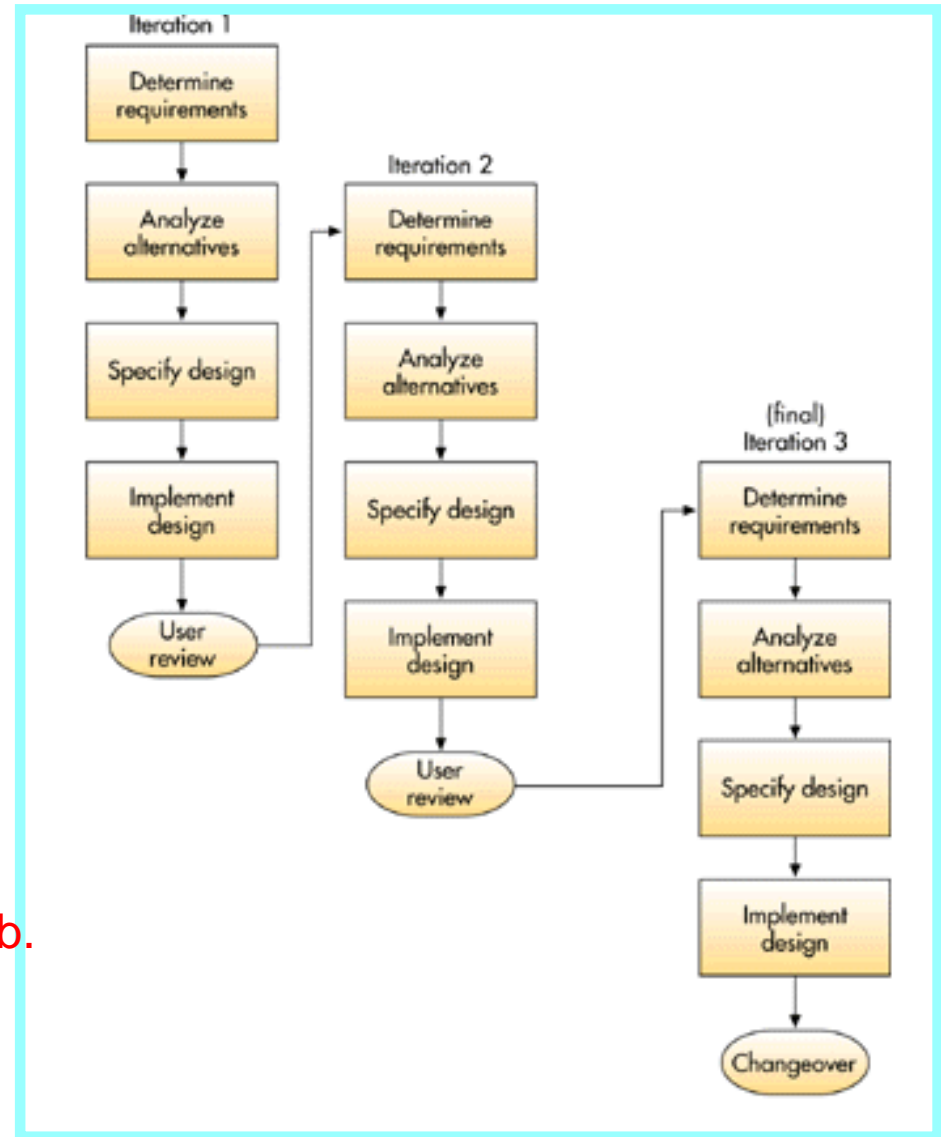
Prototyping

Operational Prototype
Accesses real data files, edits input data, makes necessary computations and comparisons, and produces real output.

Nonoperational Prototype
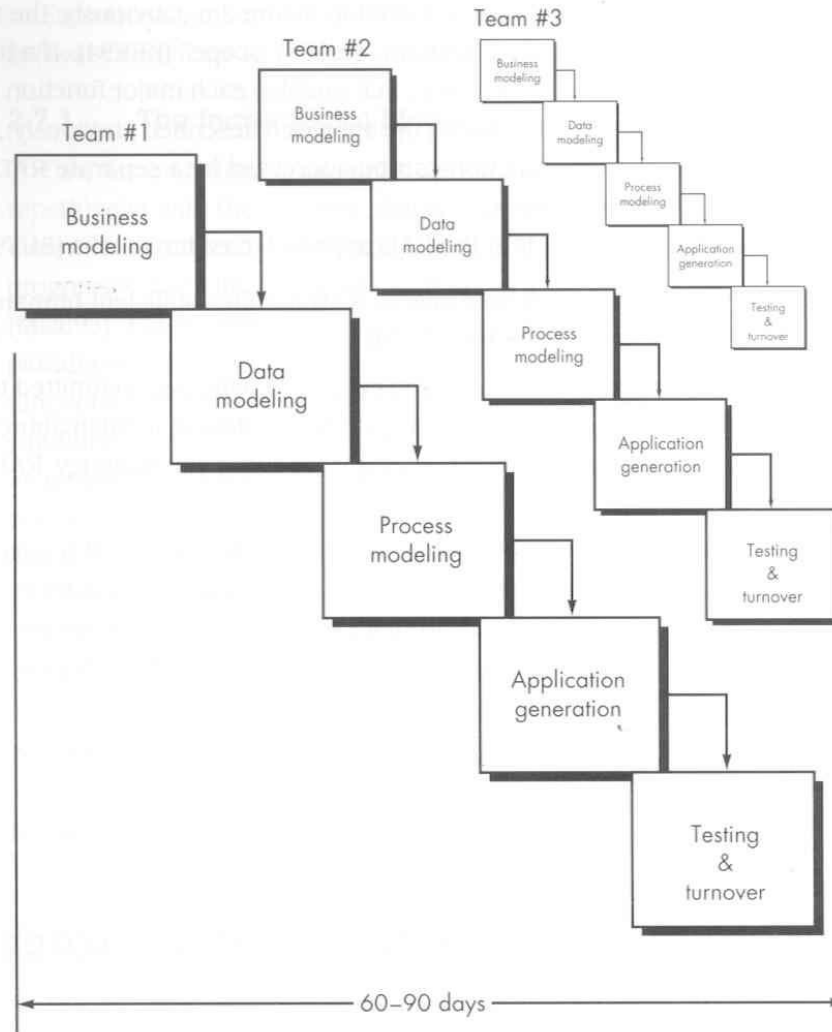A mockup or model that includes output and input specifications and formats.

Each department do just their job.

Rapid Application Development

FIGURE 2.6
The RAD model

Team #1 — Business modeling → Data modeling → Process modeling → Application generation → Testing & turnover

Team #2 — Business modeling → Data modeling → Process modeling → Application generation → Testing & turnover

Team #3 — Business modeling → Data modeling → Process modeling → Application generation → Testing & turnover
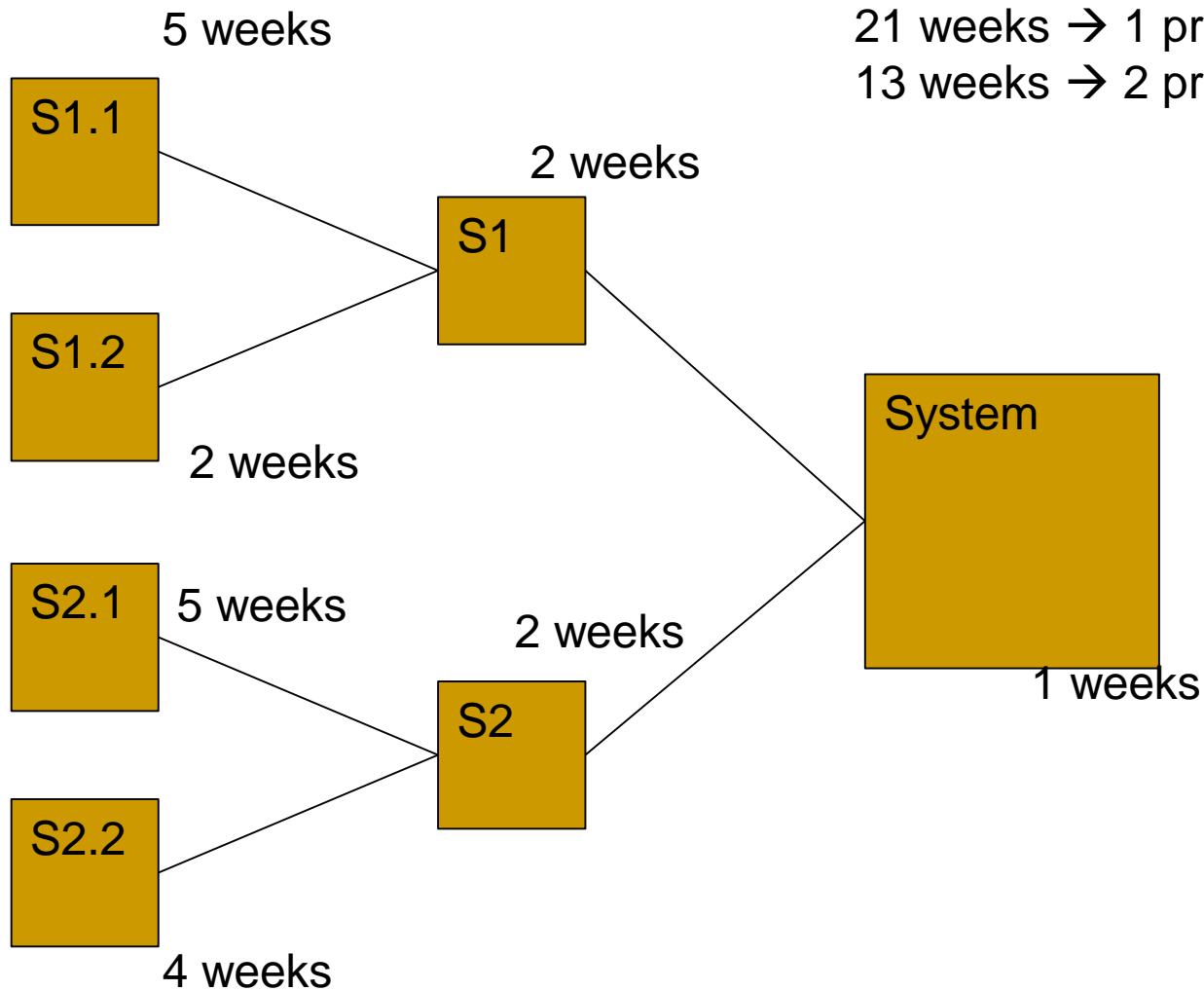
60–90 days

Factors Affecting System Development

- Resource Constraint Analysis
- Project Schedule and Tracking
- Systems Configuration Management
- Selected Project Management Software Packages
- Use of Computer-Aided Software Engineering (CASE) Tools
- Systems Investigation
- Requirements Analysis
- Systems Analysis

Project Schedule and Tracking

- **Use of project management tools**
  - Schedule
  - Milestone
  - Deadline
  - Critical path
  - Program Evaluation Review Technique (PERT)
  - Gantt chart

8 weeks → 4 programmers
21 weeks → 1 programmer
13 weeks → 2 programmers

5 weeks

S1.1

S1.2

2 weeks

2 weeks

S1

S2.1   5 weeks

2 weeks

S2.2

4 weeks

S2

System

1 weeks

Gantt Chart

Project Planning Documentation																	Page 1 of 1

Project Planning Documentation — Page 1 of 1

System	Warehouse Inventory System (Modification)																Date 12/10

| System | — Scheduled activity ▬ Completed activity | Analyst: Cecil Truman | | | | | | | | | | | | | | Signature |

Activity*	Individual assigned	Week													
		1	2	3	4	5	6	7	8	9	10	11	12	13	1
R–Requirements definition															
R.1 Form project team	Vp, Cecil, Bev	▬													
R.2 Define obj. and constraints	Cecil	▬													
R.3 Interview warehouse staff for requirements report	Bev			▬											
R.4 Organize requirements	Team				—▬										
R.5 VP review	VP, Team				—▬										
D – Design															
D.1 Revise program specs.	Bev					—▬									
D. 2. 1 Specify screens	Bev					—▬									
D. 2. 2 Specify reports	Bev						—▬								
D. 2. 3 Specify doc. changes	Cecil						▬								
D. 4 Management review	Team							—							
I – Implementation															
I. 1 Code program changes	Bev								—						
I. 2. 1 Build test file	Team								—						
I. 2. 2 Build production file	Bev									—					
I. 3 Revise production file	Cecil									—					
I. 4. 1 Test short file	Bev									—					
I. 4. 2 Test production file	Cecil												—		
I. 5 Management review	Team												—		
I. 6 Install warehouse**															
I. 6. 1 Train new procedures	Bev												—		
I. 6. 2 Install	Bev													—	
I. 6. 3 Management review	Team														—

*Weekly team reviews not shown here
**Report for warehouses 2 through 5

Systems Investigation

- Identify potential problems and opportunities and consider them in light of the goals of the company.

- It is the second round analysis. The first round analysis has been conducted during system planning.
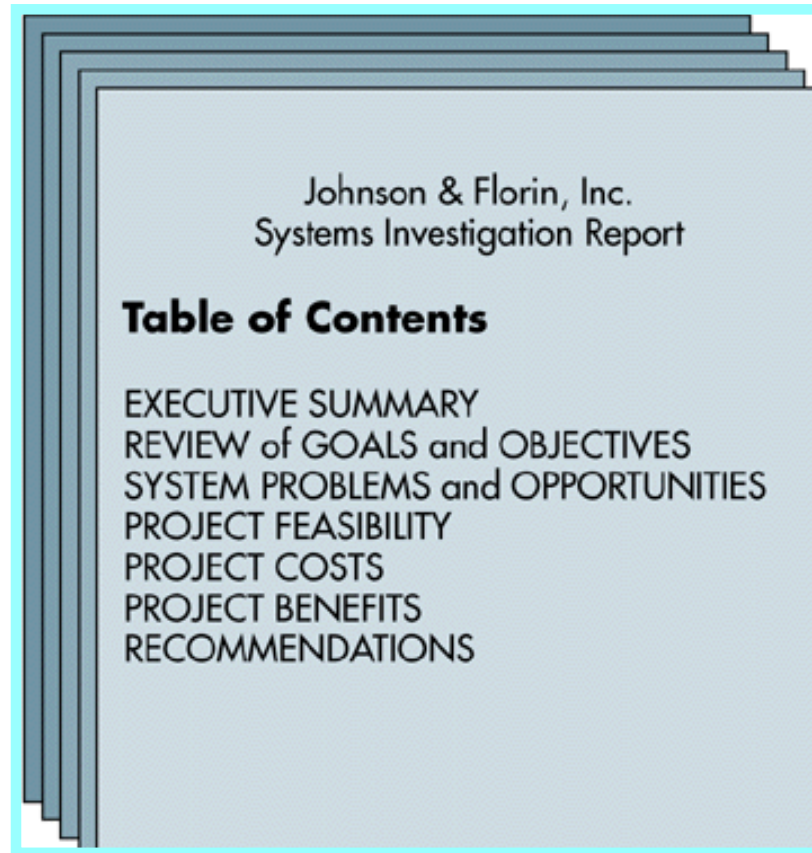

The Investigation Team

Managers and stakeholders

IS personnel

- Undertakes feasibility analysis
- Establishes system development goals
- Selects system development methodology
- Prepares system investigation report

Systems Investigation

- **Feasibility Analysis**

Technical feasibility	Can the hardware, software, and other system components be acquired or developed to solve the problem?
Operational feasibility	Can the project be put into action or operation? What are the logistical and motivational (acceptance of change) considerations?
Schedule feasibility	Can the project be completed in a reasonable amount of time?
Economic feasibility	Does the project make financial sense? Do the predicted benefits offset the cost and time needed to obtain them?

Systems Investigation

- **Systems Investigation Report**
  - A report that summarizes the results of the systems investigation and the process of feasibility analysis and recommends a course of action.
  - The investigation is usually conducted by a system investigation team and a steering committee.
  - Steering committee is an advisory group consisting of senior management and users from the IS department and other functional areas.

Systems Investigation

Johnson & Florin, Inc.
Systems Investigation Report

Table of Contents

EXECUTIVE SUMMARY
REVIEW of GOALS and OBJECTIVES
SYSTEM PROBLEMS and OPPORTUNITIES
PROJECT FEASIBILITY
PROJECT COSTS
PROJECT BENEFITS
RECOMMENDATIONS

Requirement Analysis

- Requirements Analysis
  - It is the third round analysis.
  - An assessment used to determine the need of the users, the stakeholders, and the organization.
  - Converting organizational goals into systems requirements
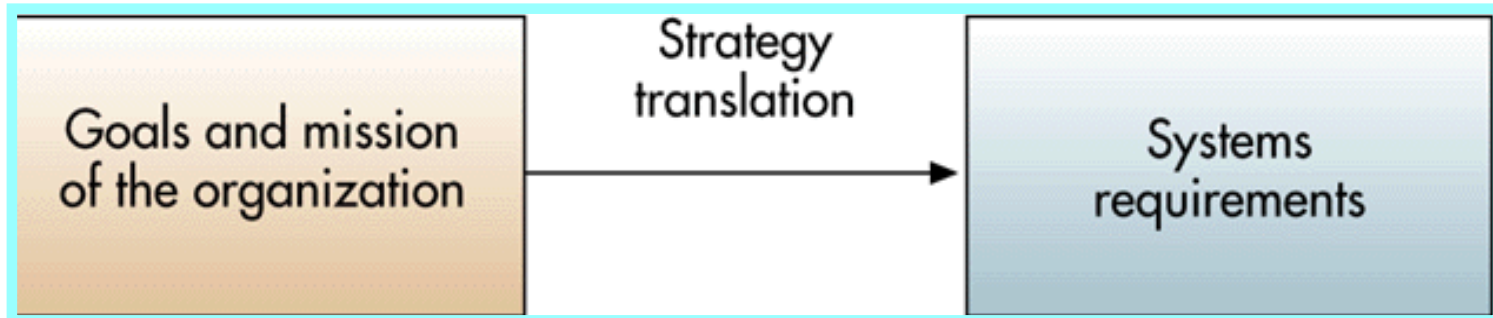
Systems Analysis

- External and Internal Sources of Data
- It is the forth and the last round analysis.
- The analysis must be very precise.
- The results will be used in system design.

Internal Sources	External Sources
Users, stakeholders, and managers	Customers
Organization charts	Suppliers
Forms and documents	Stockholders
Procedure manuals and policies	Government agencies
Financial reports	Competitors
IS manuals	Outside groups
Other measures of business process	Journals, etc.
	Consultants

Systems Analysis

Help : What do the users want?

- **Data Collection**
  - To understand what exactly the users needs
  - What data/information should be processed in the system, and what sort of interface design the users expect.
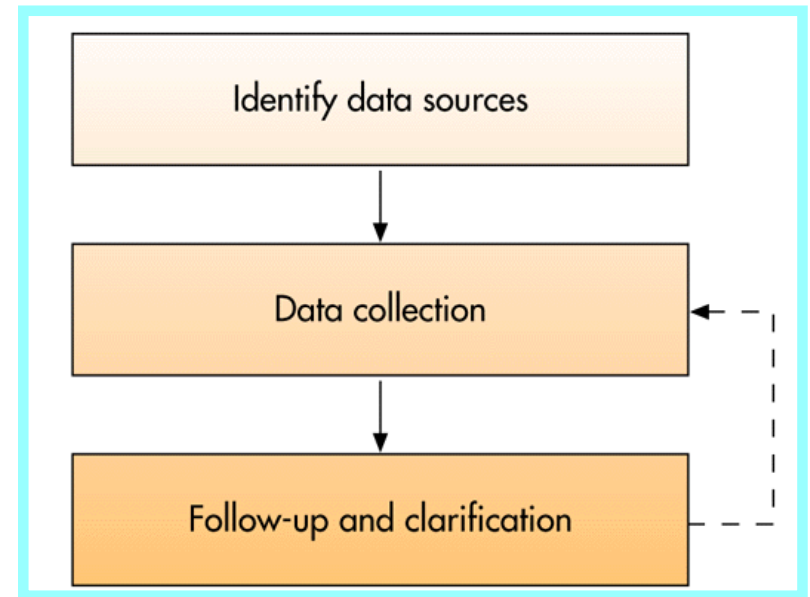
Systems Analysis

- **Techniques**
  - ❑ Structured Interview
  - ❑ Unstructured Interview
  - ❑ Direct Observation
  - ❑ Questionnaires
  - ❑ Statistical Sampling
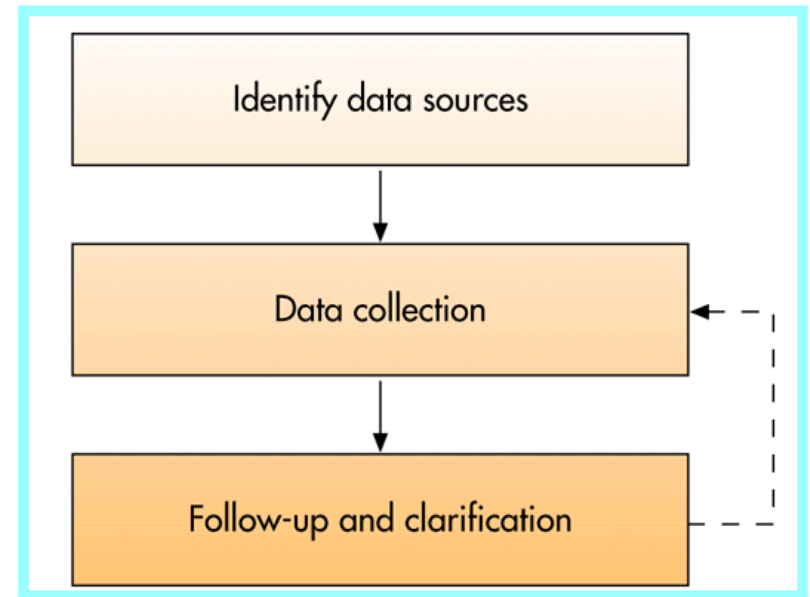
Systems Analysis

Help : What kind of data should be put in Data Base?

- ## Data Analysis

  - Manipulating the collected data so that it is usable for the development team members who are participating in systems analysis.

  Data Modeling
  A commonly accepted approach to modeling organizational objects and associations that employ both text and graphics.

  Activity (Process) Modeling
  A method to describe related objects, associations, and activities.

  Data Flow Diagram
  A diagram that models objects, associations, and activities by describing how data can flow between and around them.

Entity-Relationship Diagram (ERD)
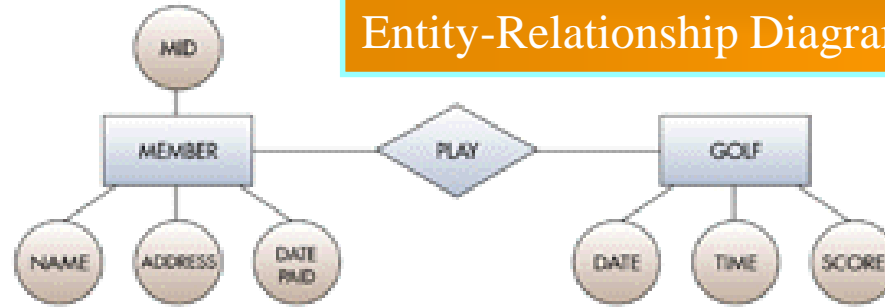
Data Flow Diagram (DFD)
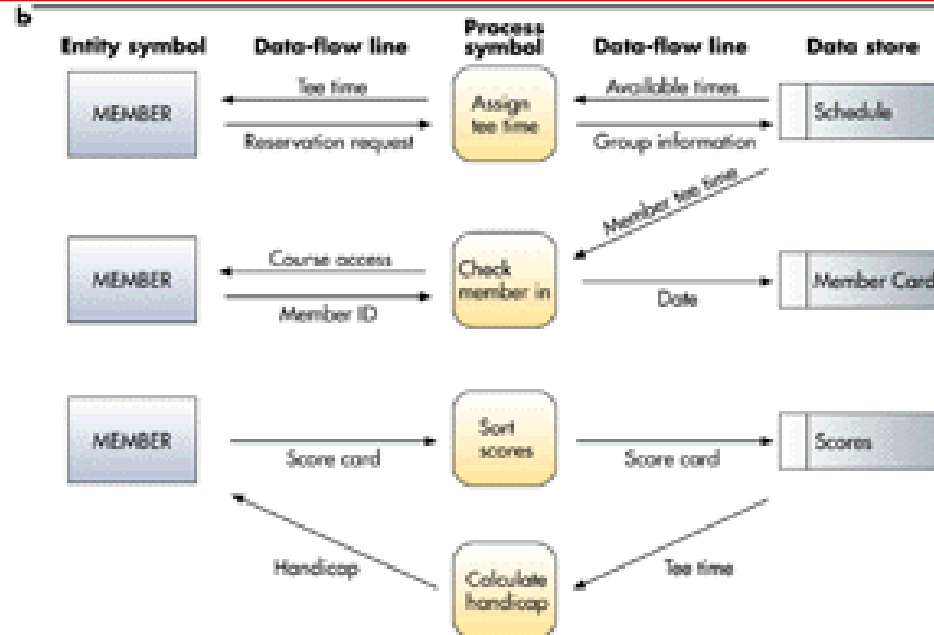
Semantic Description of a Business Process

To play golf at the course, you must first pay a fee to become a member of the golf club. Members are issued member cards and are assigned member ID numbers. To reserve a tee time (a time to play golf), a member calls the club house at the golf course and arranges an available time slot with the reception clerk. The reception clerk reserves the tee time by writing the member's name and number of players in the group on the course schedule. When a member arrives at the course, he or she checks in at the reception desk where the reception clerk checks the course schedule and notes the date on the member's card. After a round of golf has been completed, the members leave their score card with the reception clerk. Member scores are tracked and member handicaps are updated on a monthly basis.

Application Flowchart
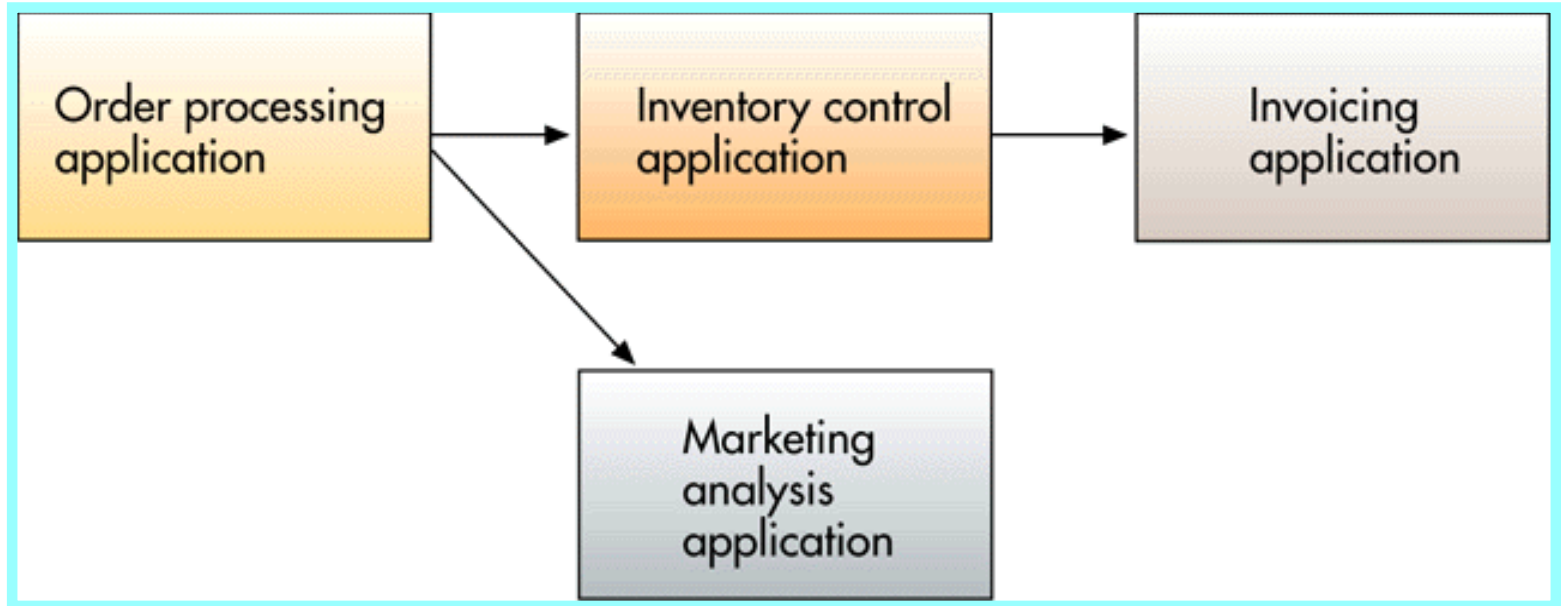
Application Flowcharts
Charts that show relationships among applications or systems.

Grid Charts

Databases → Applications	Customer database	Inventory database	Supplier database	Accounts receivable database
Order processing application	X	X		
Inventory control application		X	X	
Marketing analysis application	X	X		
Invoicing application	X			X

Grid Charts
A table that shows relationships among the various aspects of a systems development effort.

User Interface

E-Commerce Websites Development

| Pre-requisites | Syllabus | Outcomes | Class Schedule | Assessment | Examination |
| Project | Groups | Ref. & Readings | Group List | Mid-Term Exam Paper |

Companion course: Website Design (Elective)

Instructor:	John Sum, Institute of Electronic Commerce
Time:	Monday 14:10-17:00 (2007 Fall)
Venue:	Room 204, Hung Tao Building
Email:	pfsum@nchu.edu.tw (for general enquiries)
	pfsum@yahoo.com.hk (for document submission)
URL:	web.nchu.edu.tw/~pfsum/WDM/wdm_index.html

PRE-REQUISITES

1. Able to read, write, speak and listen in English.
2. Skillful in using application software, such as PowerPoint, Word, Excel and etc.
3. Skillful in using IE or other browsers to access the Internet, and searching information on the web.
4. Knowledge in one of the following subjects: *Principles of Computing, Computer Literacy, Introduction of Information Systems or Introduction of Information Technologies.*

SYLLABUS

1. E-Commerce Websites
   - Appreciation of EC Website: What do they look like and what are they used for?
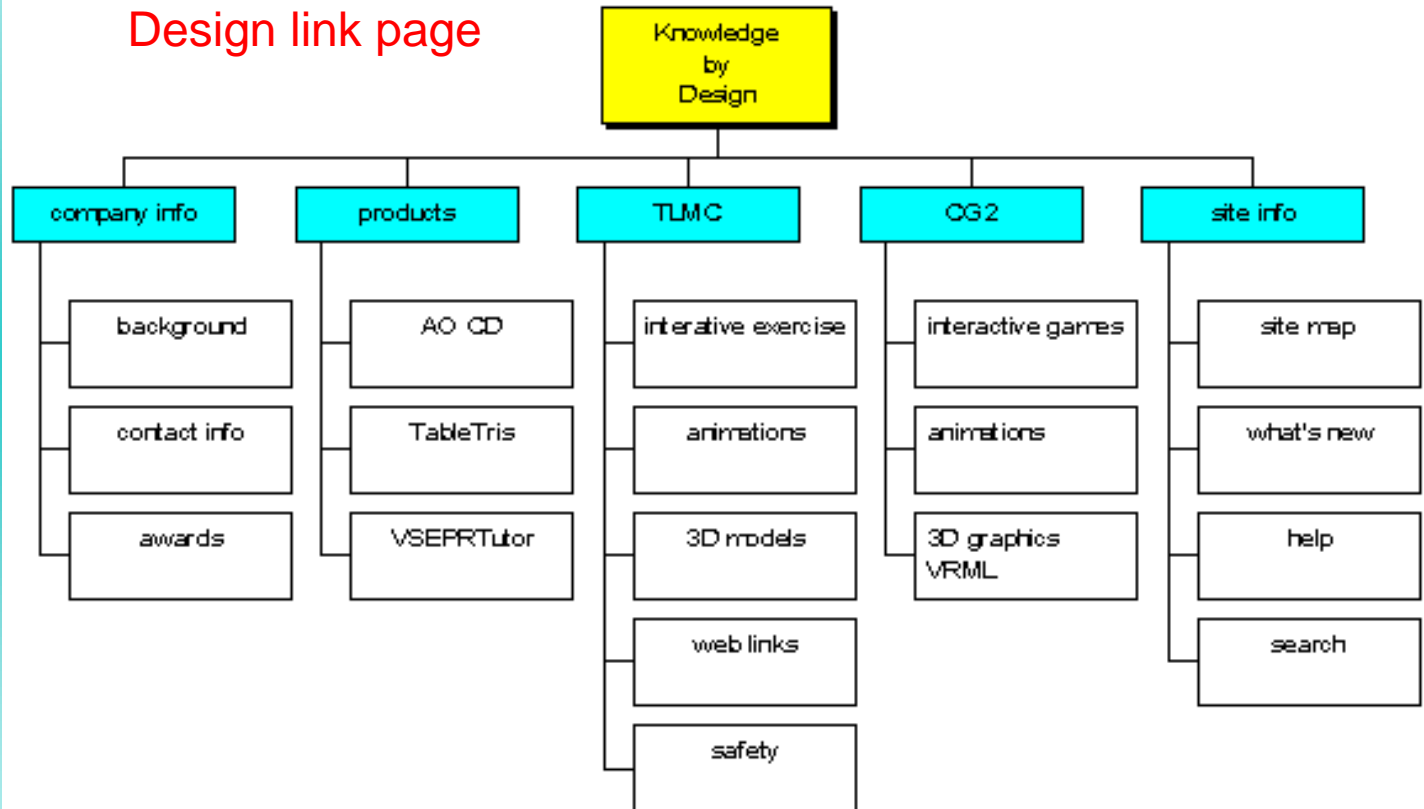   - E-Commerce and E-Business: Similarities and differences
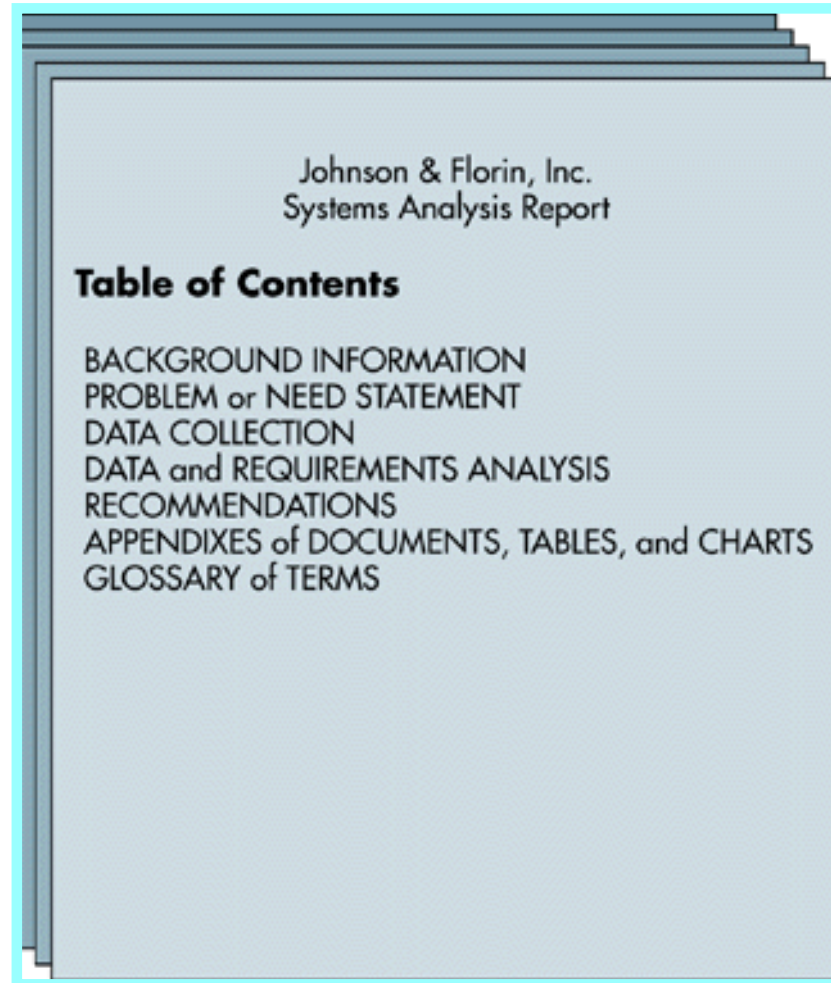
User Interface

User Interface

Design link page

Systems Analysis Report

- Strength and weaknesses of existing system from stakeholders' perspective.

- User/stakeholder requirements for the new system.

- Organizational requirements.

- Description of what new information systems should do to solve the problem
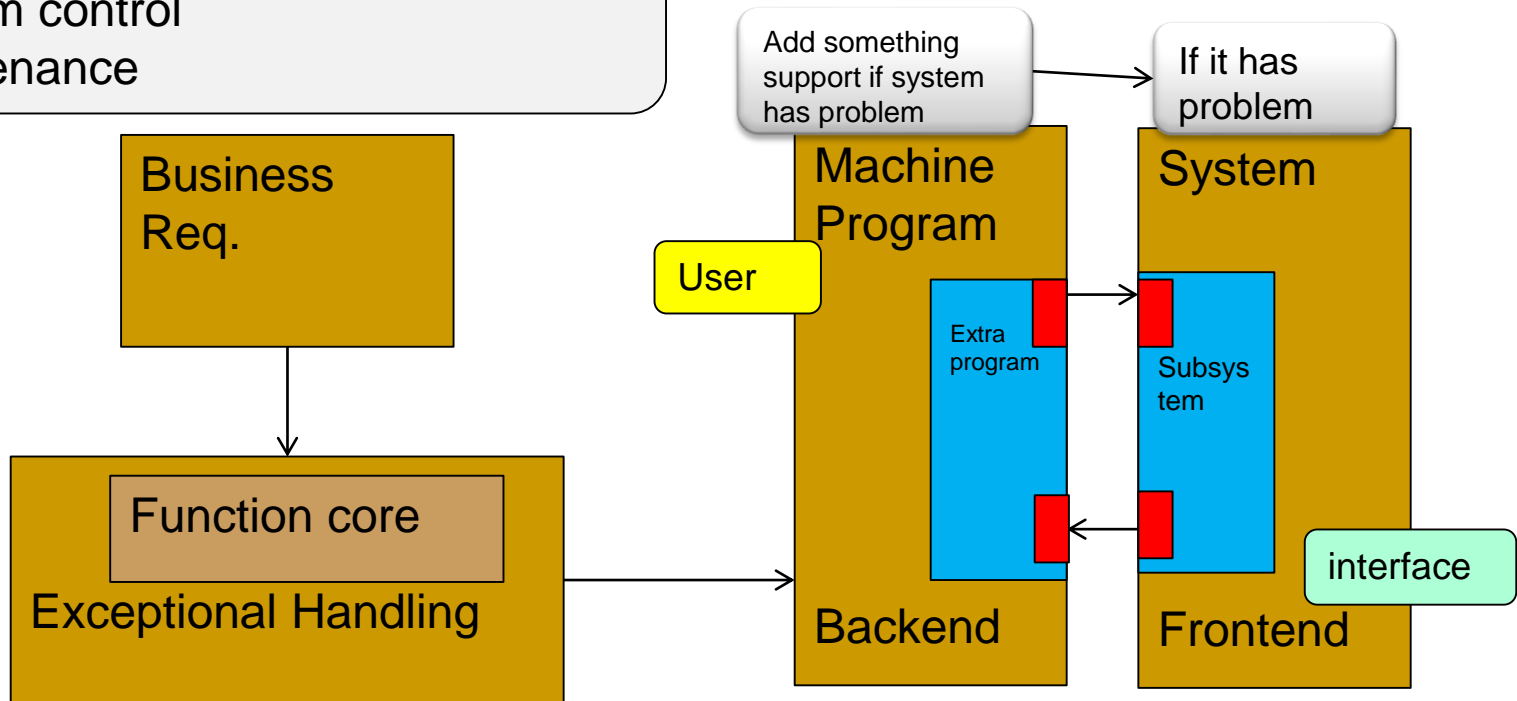
Systems Analysis Report

Johnson & Florin, Inc.
Systems Analysis Report

Table of Contents

BACKGROUND INFORMATION
PROBLEM or NEED STATEMENT
DATA COLLECTION
DATA and REQUIREMENTS ANALYSIS
RECOMMENDATIONS
APPENDIXES of DOCUMENTS, TABLES, and CHARTS
GLOSSARY of TERMS
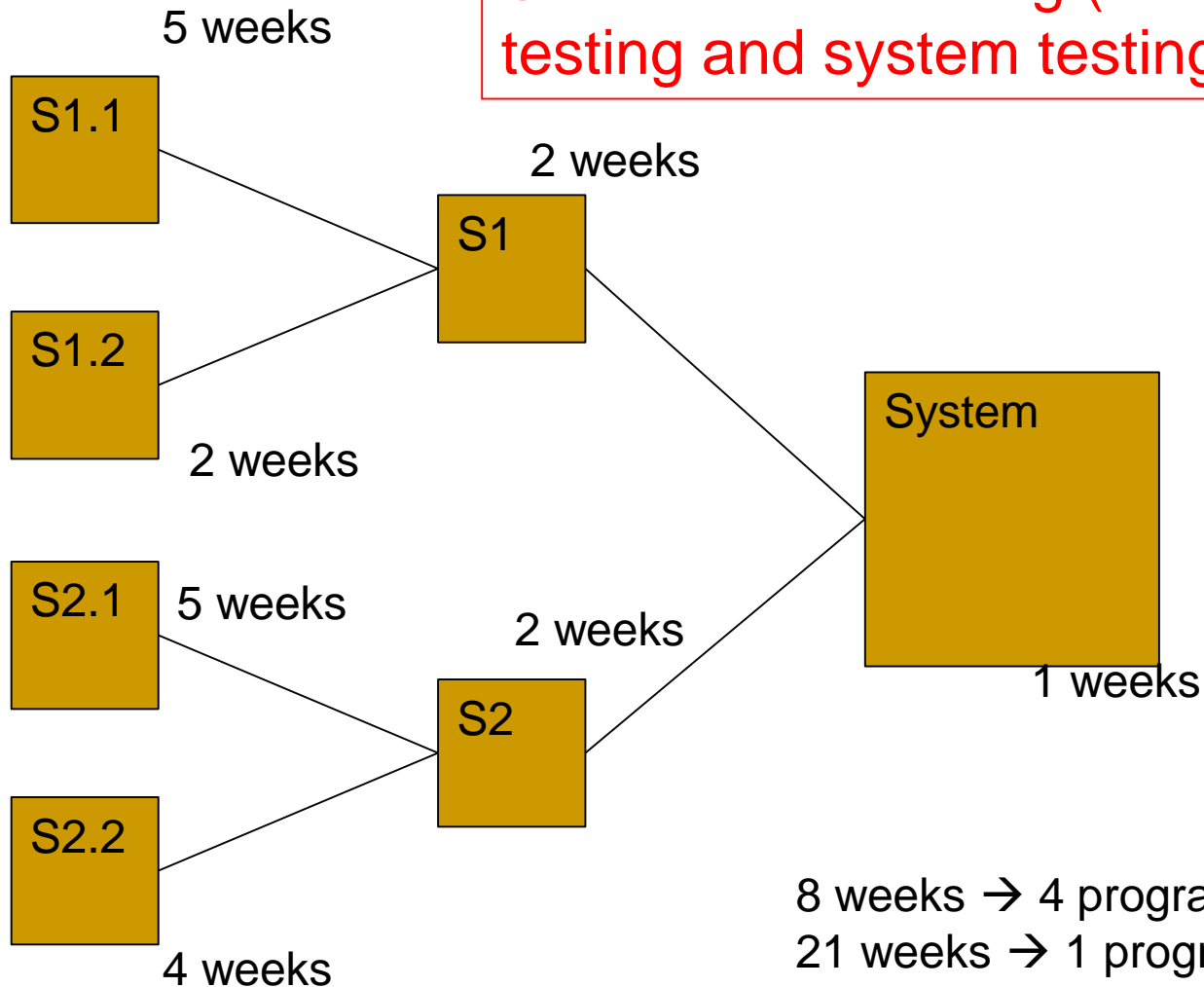
From Analysis to Design

-Exception situation
-System control
-Maintenance

Business Req.

Function core

Exceptional Handling

Add something support if system has problem

If it has problem

Machine Program

System

User

Extra program

Subsys tem

Backend

Frontend

interface

From Analysis to Design

- **Analysis Stage**
  - Business process → Core functions to be implemented
  - Additional functions to handling human errors (exceptional handling)
  - System = Core + Additional

- **Design Stage**
  - System → Sub-systems
  - Each sub-system is realized by a single program (not enough)
  - Add. programs to handle data comm. amongst sub-systems
  - Add. programs to handle system testing (unit test, system test)
  - Big program = Prog + Prog(Comm.) + Prog(Test)

5 weeks

S1.1

2 weeks

S1

S1.2

2 weeks

System

S2.1 5 weeks

2 weeks

S2

1 weeks

S2.2

4 weeks

8 weeks → 4 programmers
21 weeks → 1 programmer
13 weeks → 2 programmers