# Course Code: CIT 221 & 222 Course title: Information System Analysis and Design (Theory & Lab.)

By
Golam Md. Muradul Bashir
Professor
Dept. of CCE

- -From Greek word systema
- -Means an organized relationship among functioning units or components

# **Body Language and Proxemics**

- Form of nonverbal communication that
- We all use & are usually unaware of
- By research
  - Verbally-7 % (in word)
  - Tone of voice- 38 %
  - Facial & Body expressions- 55%
- If you hear only word you will miss what you want to say

# • Three aspects of Body Language

- Facial disclosure
  - One of the most controlled parts of body
- Eye contact
  - Direct eye contact can cause strong feelings, either positive or negative
- Posture (attitude)
  - Least controlled aspect of the body
  - A good analyst will watch the audience for changes In posture that could Indicate anxiety, disagreement, or boredom (ekgheyemy)

# **Body Language and Proxemics**

Body language is all of the nonverbal information being communicated by an individual. Body language is a form of nonverbal communications that we all use and are usually unaware of.

Proxemics is the relationship between people and the space around them. Proxemics is a factor in communications that can be controlled by the knowledgeable analyst.

# **Spatial Zones**

- Intimate zone—closer than 1.5 feet
- Personal zone—from 1.5 feet to 4 feet
- Social zone—from 4 feet to 12 feet
- Public zone—beyond 12 feet





# REQUIREMENTS DISCOVERY

- A system requirement (also called a business requirement) is a description of the needs and desires for an information system.
- A requirement may describe functions, features (attributes), and constraints.

# **Types of Requirements**

A functional requirement is a function or feature that must be included in an information system in order to satisfy the business need and be acceptable to the users.

A nonfunctional requirement is a description of the features, characteristics, and attributes of the system as well as any constraints that may limit the boundaries of the proposed solution.

# **Types of Nonfunctional Requirements**

Requirement Type	Explanation	
Performance	Performance requirements represent the performance the system is required to exhibit to meet the needs of users.	
	· What is the acceptable throughput rate (rate at which a system achieves its goa	
	· What is the acceptable response time?	
Information	Information requirements represent the information that is pertinent (relevant) users in terms of content, timeliness, accuracy, and format.	
	<ul> <li>What are the necessary inputs and outputs? When must they happen?</li> </ul>	
	What is the required data to be stored?	
	How current must the information be?	
	What are the interfaces to external systems?	
Гооному	Economy requirements represent the need for the system to reduce costs or increase profits.	
Economy	<ul> <li>What are the areas of the system where costs must be reduced?</li> </ul>	
	<ul> <li>How much should costs be reduced or profits be increased?</li> </ul>	
	What are the budgetary limits?	
	What is the timetable for development?	
Control (and Security)	Control requirements represent the environment in which the system must	
	Must access to the system or information be controlled?	
	What are the privacy requirements?	
	Does the criticality of the data necessitate the need for special handling (backups, offsite storage, etc.) of the data?	

Requirement Type	Explanation	
Efficiency	Efficiency requirements represent the systems ability to produce outputs with minimal waste.	
	Are there duplicate steps in the process that must be eliminated?  Are there ways to reduce waste in the way the system uses it reso	
	•	
Service	Service requirements represent needs in order for the system to be reliable, flexible, and expandable.	
	<ul> <li>Who will use the system and where are they located?</li> </ul>	
	<ul> <li>Will there be different types of users?</li> </ul>	
	<ul> <li>What are the appropriate human factors?</li> </ul>	
	<ul> <li>What training devices and training materials are to be included in the system?</li> </ul>	
	<ul> <li>What training devices and training materials are to be developed and maintained separately from the system, such as stand- alone computer based training (CBT) programs or databases?</li> </ul>	
	· What are the reliability/availability requirements?	
	<ul> <li>How should the system be packaged and distributed?</li> </ul>	
	· What documentation is required?	

# **Criteria to Define System Requirements**

- Consistent (reliable)
- Complete
- Feasible
- Required
- Accurate
- Traceable
- Verifiable

# The Process of Requirements Discovery

- Problem discovery and analysis
- Requirements discovery
- Documenting and analyzing requirements
- Requirements management

# **Requirements Discovery**

Fact-finding is the formal process of using research, interviews, questionnaires, sampling, and other techniques to collect information about problems, requirements, and preferences. It is also called information gathering.

# **Seven Fact-Finding Methods**

- Sampling of existing documentation, forms, and databases.
- Research and site visits.
- Observation of the work environment.
- Questionnaires.
- Interviews.
- Prototyping.
- Joint requirements planning (JRP).

### **Questionnaires**

Questionnaires are special-purpose documents that allow the analyst to collect information and opinions from respondents.

- Advantages?
- Disadvantages?

### **Questionnaires**

- Advantages
  - Can be answered quickly
  - Inexpensive means
  - Real facts expressed
  - Responses can be tabulated and analyzed quickly

#### **Questionnaires**

- Disadvantages
  - Respondents often low
  - No guarantee to get answer or expand all question
  - No opportunity for voluntary information
  - Not possible to read body language
  - Good questions are difficult to prepare

# **Types of Questionnaires**

Free-format questionnaires offer the respondent greater latitude in the answer. A question is asked, and the respondent records the answer in the space provided after the question.

Fixed-format questionnaires contain questions that require selection of predefined responses from individuals.

# **Types of Fixed-Format Questions**

- Multiple-choice questions
- Rating questions
- Ranking questions

- 1. Determine what facts and opinions must be collected and from whom you should get them.
- 2. Based on the needed facts and opinions, determine whether free- or fixed-format questions will produce the best answers.
- 3. Write the questions.
- 4. Test the questions on a small sample of respondents.
- 5. Duplicate and distribute the questionnaire.

#### Interviews

Interviews are a fact-finding technique whereby the systems analysts collect information from individuals through face-to-face interaction.

- Advantages?
- Disadvantages?

- Opportunity to motivate the interviewee
- More feedback from the interviewee
- Permit system analyst to adapt or reward questions for each individual
- possible to read body language

# **Disadvantages**

- Disadvantages
  - Time consuming
  - Success highly depends on system analysts' human relation skill
  - May be impractical due to location

# **Types of Interviews**

Unstructured interviews are conducted with only a general goal or subject in mind and with few, if any, specific questions. The interviewer counts on the interviewee to provide a framework and direct the conversation.

In structured interviews the interviewer has a specific set of questions to ask of the interviewee.

# **Types of Interview Questions**

Open-ended questions allow the interviewee to respond in any way that seems appropriate.

Closed-ended questions restrict answers to either specific choices or short, direct responses.

### Procedure to Conduct an Interview

- 1. Select Interviewees
- 2. Prepare for the Interview
  - 1. An interview guide is a checklist of specific questions the interviewer will ask the interviewee.
- 3. Conduct the Interview
- 4. Follow Up on the Interview

- Types of Questions to Avoid
  - Loaded questions(do you have to have both of these columns on the report)
  - Leading questions(you are agree with it. Are you?)
  - Biased questions(how many money for this project. I think 100000)
- Interview Question Guidelines
  - Use clear and concise(short) language.
  - Don't include your opinion as part of the question.
  - Avoid long or complex questions.
  - Avoid threatening questions.
  - Don't use "you" when you mean a group of people.

# **Sample Interview Guide**

Interview	ee: Jeff Bentley, Accounts Receivable Manager
Date:	Tuesday, March, 23, 2000

1:30 P.M. Time:

Place: Room 223, Admin. Bldg.

Subject:	Current Credit-Checking Policy	
Time Allocated	Interviewer Question of Objective	Interviewee Response
1 to 2 min.	Objective Open the interview: Introduce Ourselves Thank Mr. Bentley for his valuable time State the purpose of the interviewto obtain an understanding of the existing credit-checking policies	
5 min.	Question 1 What conditions determine whether a customer's order is approved for credit? Follow-up	
5 min.	Question 2 What are the possible decisions or actions that might be taken once these conditions have been evaluated? Follow-up	
3 min.	Question 3 How are customers notified when credit is not approved for their order? Follow-up	

(continued)

1 min.	Question 4 After a new order is approved for credit and placed in the file containing orders that can be filled, a customer might request that a modification be made to the order. Would the order have to go through credit approval again if the new total order cost exceeds the original cost?  Follow-up	
1 min.	Question 5 Who are the individuals that perform the credit checks? Follow-up	
1 to 3 mins.	Question 6 May I have permission to talk to those individuals to learn specifically how they carry out the credit-checking process? Follow-up	
1 min.	Objective Conclude the interview:  • Thank Mr. Bentley for his cooperation and assure him that he will be receiving a copy of what transpired during the interview	
21 minutes	Time allotted for base questions and objectives.	
9 minutes	Time allotted for follow-up questions and redirection	
30 minutes	Total time allotted for interview (1:30 p.m. to 2:00 p.m.)	
General Comments and Notes:		

## **Interviewing Do's and Don'ts**

#### Do Avoid

- Be courteous (polite)
- Listen carefully
- Maintain control
- Probe (inquery)
- Observe mannerisms and nonverbal communication
- Be patient
- Keep interviewee at ease
- Maintain self-control

- Continuing an interview unnecessarily.
- Assuming an answer is finished or leading nowhere.
- Revealing (express) verbal and nonverbal clues.
- Revealing your personal biases.
- Talking instead of listening.
- Assuming anything about the topic and the interviewee.
- Tape recording -- a sign of poor listening skills.

# **Communicating With the User**

- Listening "To hear is to recognize that someone is speaking, to listen is to understand what the speaker wants to communicate." (Gildersleeve – 1978)
- Guidelines for Communicating
  - Approach the Session with a Positive Attitude
  - Set the Other Person at Ease
  - Let Them Know You Are Listening
  - Ask Questions
  - Don't Assume Anything
  - Take Notes

ODS 5th Edition Whitten Bentley Dittman

# **Brainstorming**

Brainstorming is a technique for generating ideas during group meetings. Participants are encouraged to generate as many ideas as possible in a short period of time without any analysis until all the ideas have been exhausted.

# **Brainstorming Guidelines**

- Isolate the appropriate people in a place that will be free from distractions (diversion) and interruptions
- Make sure that everyone understands the purpose of the meeting
- Appoint one person to record ideas
- Remind everyone of the brainstorming rules
- Within a specified time period, team members call out their ideas as quickly as they can think of them
- After the group has run out of ideas and all ideas have been recorded, then and only then should the ideas be analyzed and evaluated
- Refine, combine, and improve the ideas that were generated earlier

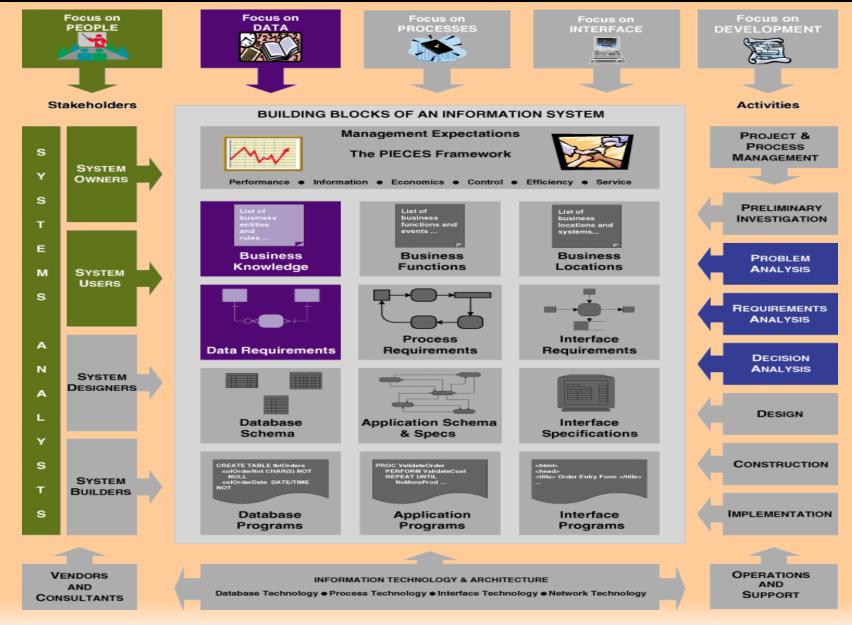


# DATA MODELING AND ANALYSIS

# **Data Modeling and Analysis**

- Define systems modeling and differentiate between logical and physical system models.
- Define data modeling and explain its benefits.
- Recognize and understand the basic concepts and constructs of a data model.
- Read and interpret an entity relationship data model.
- Explain when data models are constructed during a project and where the models are stored.
- Discover entities and relationships.
- Construct an entity-relationship context diagram.
- Discover or invent keys for entities and construct a key-based diagram.
- Construct a fully attributed entity relationship diagram and describe all data structures and attributes to the repository or encyclopedia.
- Normalize a logical data model to remove impurities that can make a database unstable, inflexible, and nonscalable.
- Describe a useful tool for mapping data requirements to business operating locations.

#### **Chapter Map**



- •A model is a representation of reality.
  - -Logical models
  - -Physical model
- •Logical models show what a system is or does. They are implementation independent; that is, they depict the system independent of any technical implementation.
- •Physical models show not only what a system is or does, but also how the system is physically and technically implemented.

# **Data Modeling**

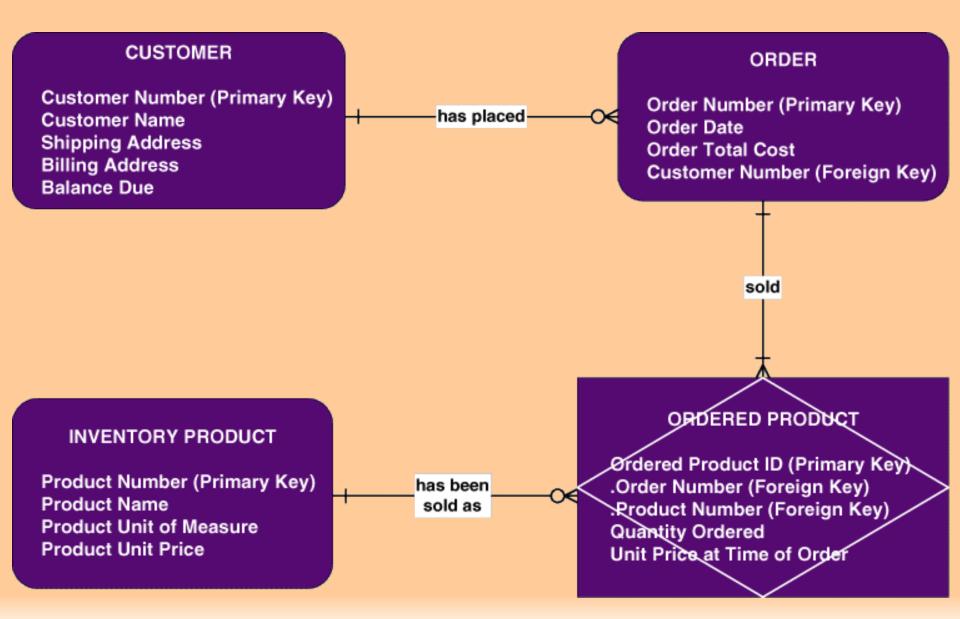
Data modeling is a technique for organizing and documenting a system's data.

Data modeling is sometimes called database modeling because a data model is eventually (finally) implemented as a database.

It is sometimes called information modeling.

The actual model is frequently called an entity relationship diagram (ERD) because it depicts data in terms of the entities and relationships described by the data.

# Sample Entity Relationship Diagram (ERD)



An entity is a class of persons, places, objects, events, or concepts about which we need to capture and store data.



- Persons: agency, contractor, customer, department, division, employee, instructor, student, supplier.
- Places: sales region, building, room, branch office, campus.
- Objects: book, machine, part, product, raw material, software license, software package, tool, vehicle model, vehicle.
- Events: application, award, cancellation, class, flight, invoice, order, registration, renewal, requisition, reservation, sale, trip.
- Concepts: account, block of time, bond, course, fund, qualification, stock.

An entity instance is a single occurrence of an entity.

Example: instances of the entity STUDENT may include

- **Betty Arnold**
- John Taylor
- Lisa Simmons
- Bill Macy
- **Heather Leath**
- Tim Wrench

#### **Data Modeling Concepts: Attributes**

An attribute is a descriptive property or characteristic of an entity. Synonyms include element, property, and field.

A compound attribute is one that actually consists of other attributes

#### **STUDENT** Na me .Last Name .First Name .Middle Initial **Address** .Street Address .City .State or Province .Country .Postal Code **Phone Number** .Area Code .Exchange Number .Number Within Exchange **Date of Birth** Gender Race Major **Grade Poin t Average**

# **Data Modeling Concepts: Domains**

The data type for an attribute defines what type of data can be stored in that attribute.

The domain of an attribute defines what values an attribute can legitimately (legally) take on.

The default value for an attribute is the value that will be recorded if not specified by the user.

### **Data Modeling Concepts: Identification**

A key is an attribute, or a group of attributes, that assumes a unique value for each entity instance.

A group of attributes that uniquely identifies an instance of an entity is called a concatenated key.

A candidate key is a "candidate to become the primary key" of instances of an entity.

### **Data Modeling Concepts: Identification**

A primary key is that candidate key that will most commonly be used to uniquely identify a single entity instance.

Any candidate key that is not selected to become the primary key is called an alternate key.

A subsetting criteria is an attribute (or concatenated attribute) whose finite values divide all entity instances into useful subsets.

#### STUDENT

Student Number (Primary Key)
Social Security Number (Alternate Key)
Name

.Last Name

.First Name

.Middle Initial

Address
.Street Address

.City

.State or Province

.Country

.Postal Code Phone Number

.Area Code

.Exchange Number

.Number Within Exchange

Date of Birth

**Gender (Subsetting Criteria 1)** 

**Race (Subsetting Criteria 2)** 

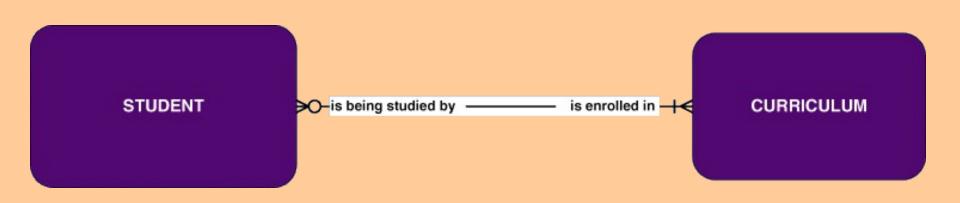
Major (Subsetting Criteria 3)
Grade Regist Average

**Grade Po int Average** 

Racejatigosthi

### **Data Modeling Concepts: Relationships**

A relationship is a natural business association that exists between one or more entities. The relationship may represent an event that links the entities or merely a logical affinity (similarity) that exists between the entities.



# **Data Modeling Concepts: Cardinality**

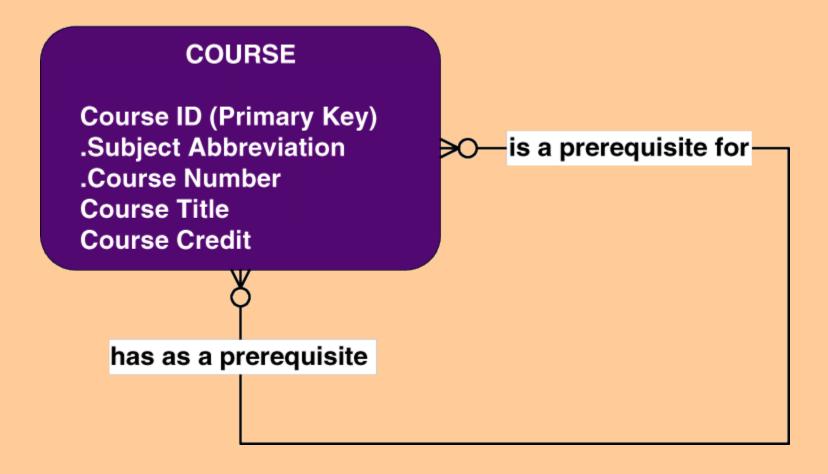
Cardinality defines the minimum and maximum number of occurrences of one entity that may be related to a single occurrence of the other entity.

Because all relationships are bidirectional, cardinality must be defined in both directions for every relationship.



The degree of a relationship is the number of entities that participate in the relationship.

A recursive relationship is a relationship that exists between different instances of the same entity



Relationships may exist
between more than two
entities and are called

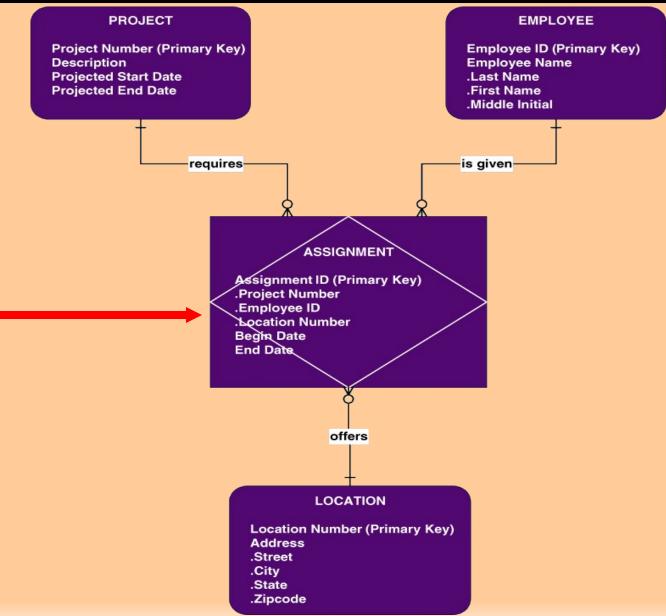
The example ERD depicts a ternary relationship.

N-ary relationships.

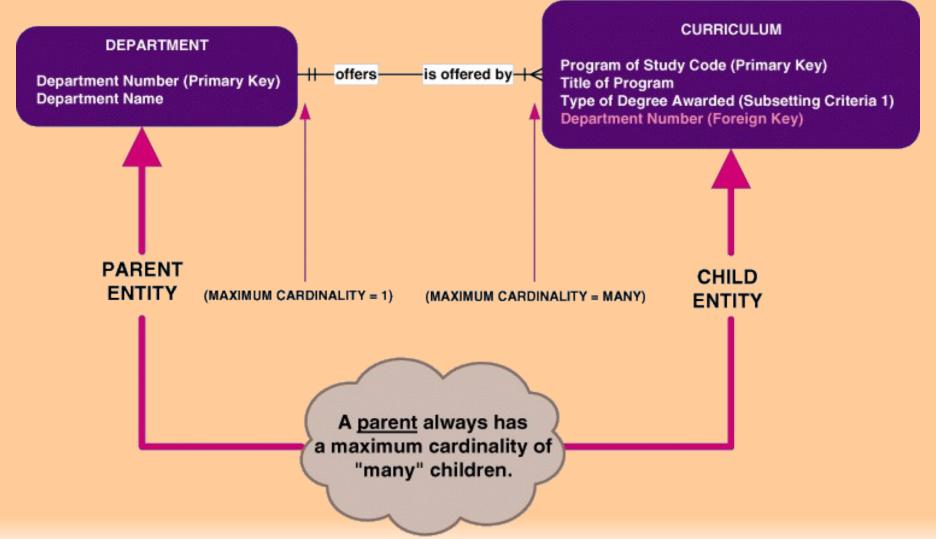
**EMPLOYEE** Employee ID (Primary Key) Employee Name .Last Name .First Name .Middle Initial is givenrequires-ASSIGNMENT Assignment ID (Primary Key) .Project Number .Employee ID Location Number Begin Date **End Date** offers LOCATION Location Number (Primary Key) Address .Street .Citv .State .Zipcode

An associative entity is an entity that inherits its primary key from more than one other entity (called parents).

Each part of that concatenated key point to one and only one instance of each of the connecting entities.



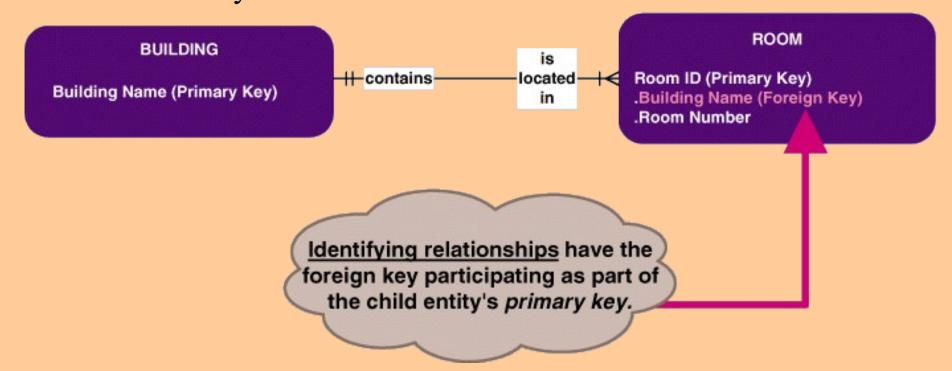
A foreign key is a primary key of one entity that is contributed to (a) (duplicated in) another entity to identify instances of a relationship.



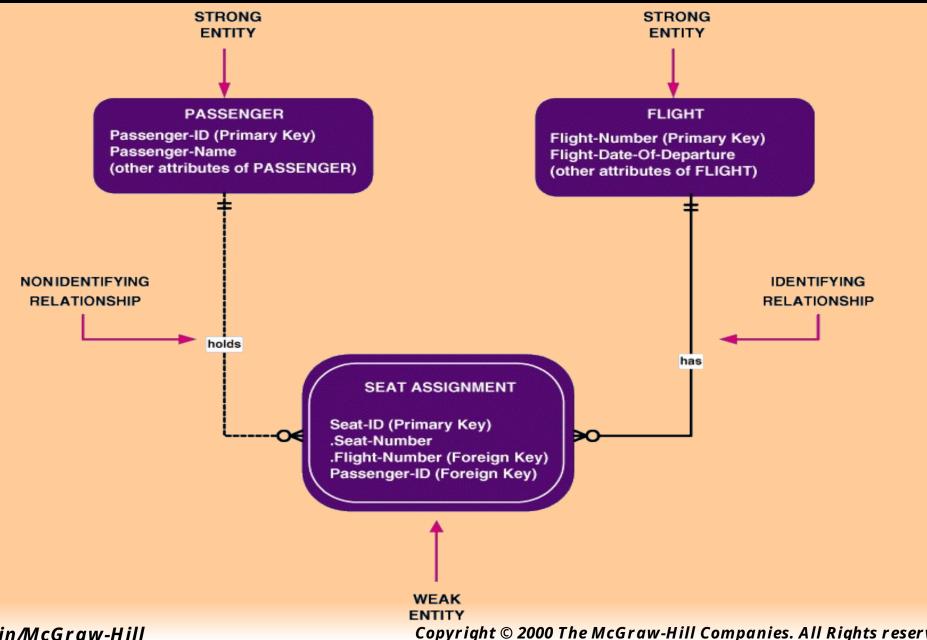
#### **Data Modeling Concepts: Foreign Keys**

Nonidentifying relationships are those in which each of the participating entities has its own independent primary key, In other words, none of the primary key attributes is shared.

Identifying relationships are those in which the parent entity contributes its primary key to become part of the primary key of (b) the child entity.



# **Data Modeling Concepts: Foreign Keys**



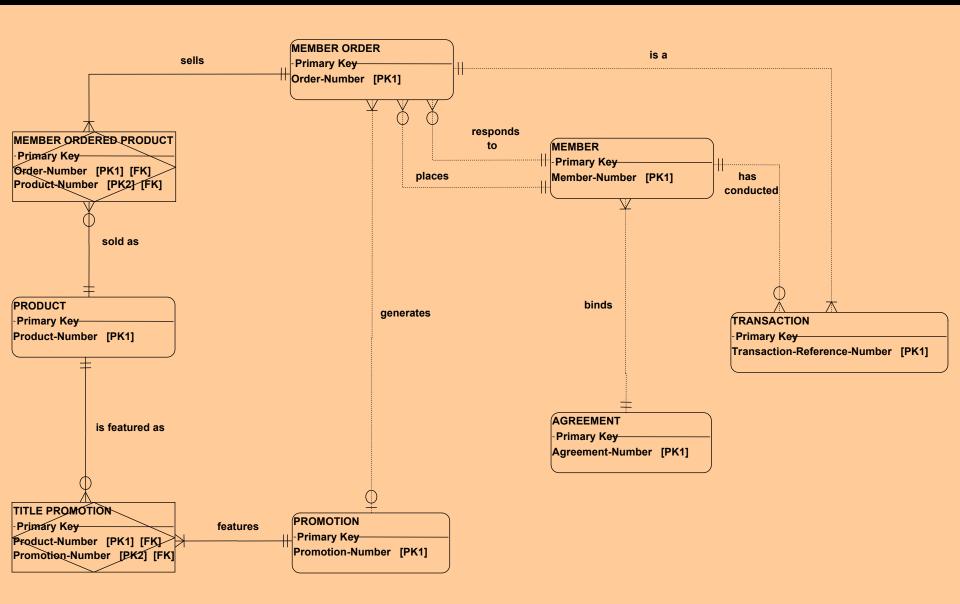
### Data Modeling Concepts: Generalization

Generalization is a technique wherein the attributes that are common to several types of an entity are grouped into their own entity, called a supertype.

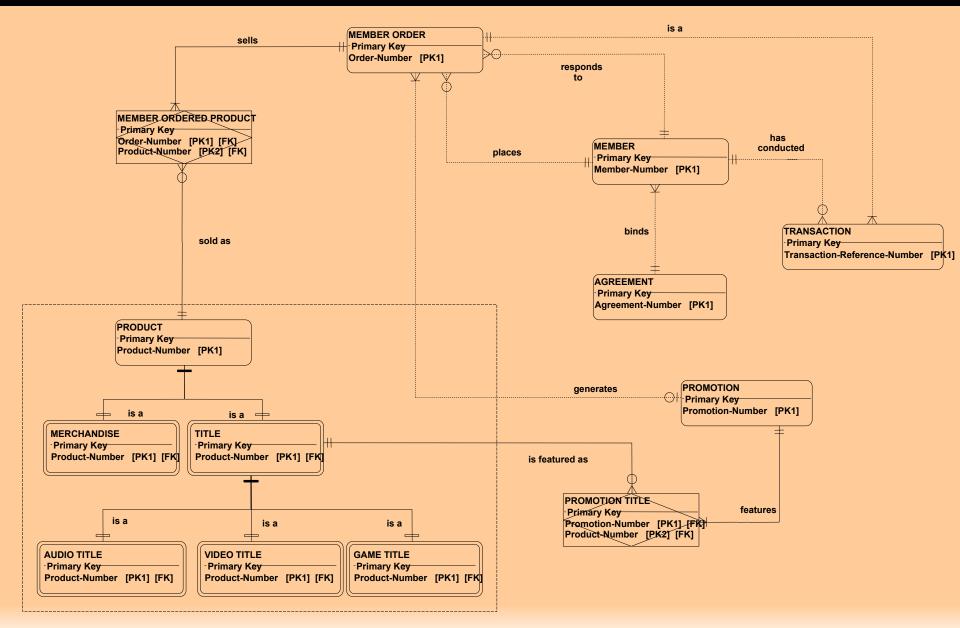
An entity supertype is an entity whose instances store attributes that are common to one or more entity subtypes.

An entity subtype is an entity whose instances inherit some common attributes from an entity supertype and then add other attributes that are unique to an instance of the subtype.

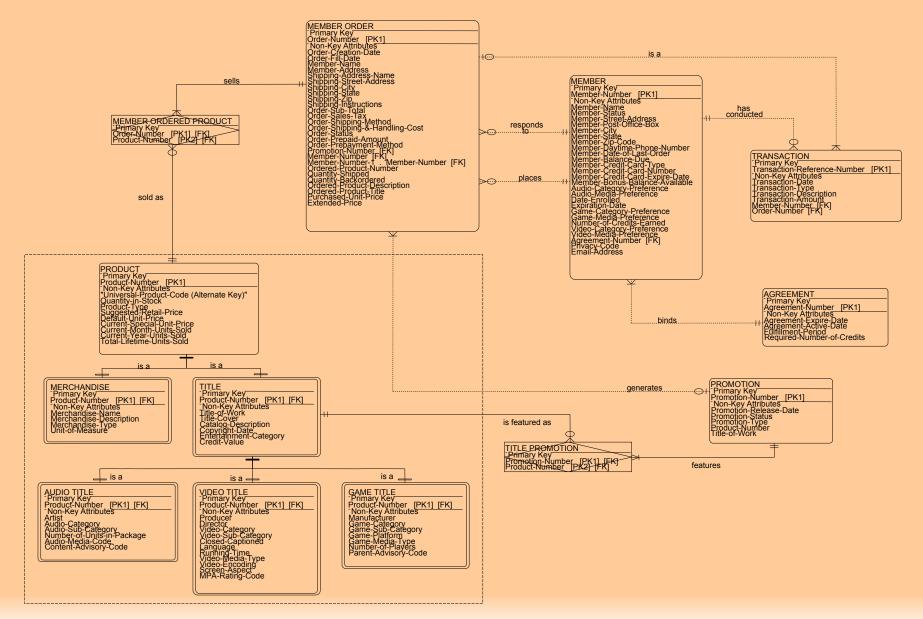
#### The Key-based Data Model



#### The Key-based Data Model With Generalization



#### The Fully-Attributed Data Model





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PROCESS MODELING

#### **Models: Logical and Physical**

A **model** is a representation of reality. Just as a picture is worth a thousand words, most models are pictorial representations of reality.

Logical models show what a system is or does. They are implementation independent; that is, they depict the system independent of any technical implementation.

Physical models show not only what a system is or does, but also how the system is (to be) physically and technically implemented. They are implementation dependent because they reflect technology choices.

### **Process Modeling and DFDs**

Process modeling is a technique for organizing and documenting the structure and flow of data through a system's processes, and/or the logic, policies, and procedures to be implemented by a system's processes.

A data flow diagram (DFD) is a tool (and type of process model) that depicts the flow of data through a system and the work or processing performed by that system.

DFDs have become a popular tool for business process redesign.

#### **External Agents**

- An external agent defines a person, organization unit, or other organization that lies outside of the scope of the project but that interacts with the system being studied.
  - External agents define the "boundary" or scope of a system being modeled.

External Agent

#### **Data Stores**

- A data store is an inventory of data.
  - Frequently implemented as a file or database.
  - A data store is "data at rest" compared to a data flow that is "data in motion."
  - Almost always one of the following:
    - Persons (or groups of persons)
    - Places
    - Objects
    - Events

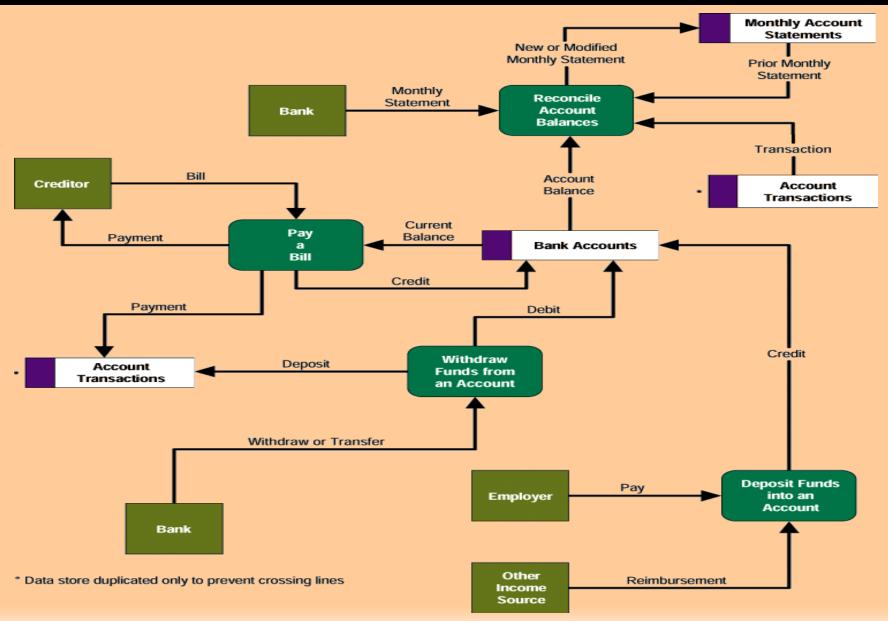
       (about which data is captured)
    - Concepts

       (about which data is important)
  - Data stores depicted on a DFD store all instances of data entities (depicted on an ERD)



# • Three symbols and one connection:

- Round rectangles represent processes or work to be done-process color
- Square represents external agentsinterface color
- Open ended boxes represent data stores (sometimes called files or databases)
- Arrows represent data flows, i/p and o/p to and from the process



#### **Differences Between DFDs and Flowcharts**

- Processes on DFDs can operate in parallel (at-the-same-time)
  - Processes on flowcharts execute one at a time
- DFDs show the flow of data through a system
  - Flowcharts show the flow of control (sequence and transfer of control)
- Processes on one DFD can have dramatically different timing
  - Processes on flowcharts are part of a single program with consistent (regular) timing

# Systems Thinking

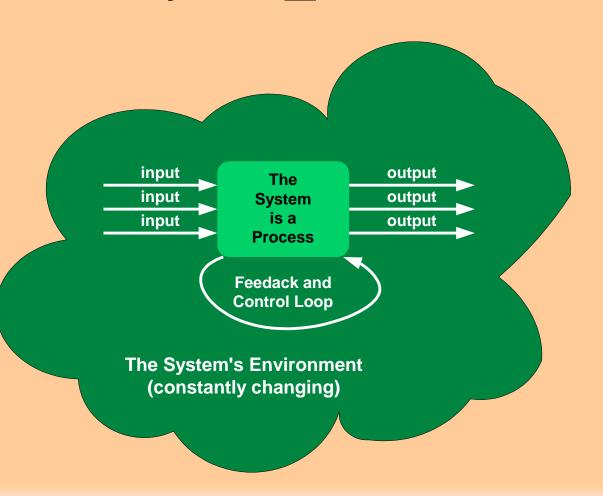
Systems thinking is the application of formal systems theory and concepts to systems problem solving.

DFDs are a tool that supports systems thinking.

A **process** is work performed on, or in response to, incoming data flows or conditions.

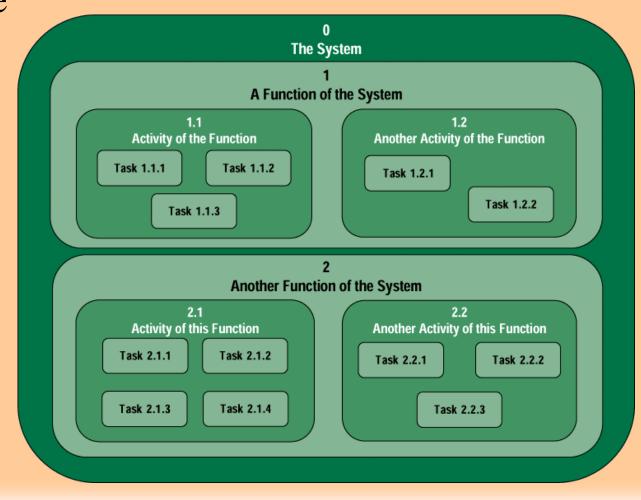
**Process** 

### A System is a Process

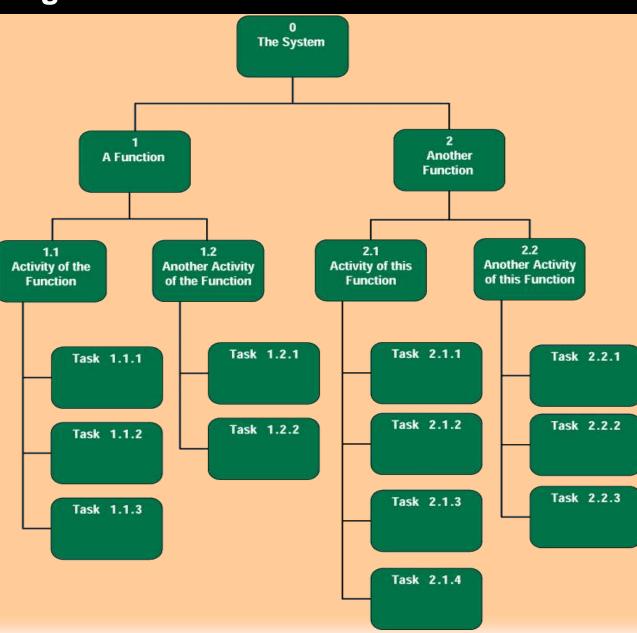


Decomposition is the act of breaking a system into its component subsystems, processes, and subprocesses.

# **System Decomposition**



A decomposition diagram or hierarchy chart shows the topdown, functional decomposition of a system.

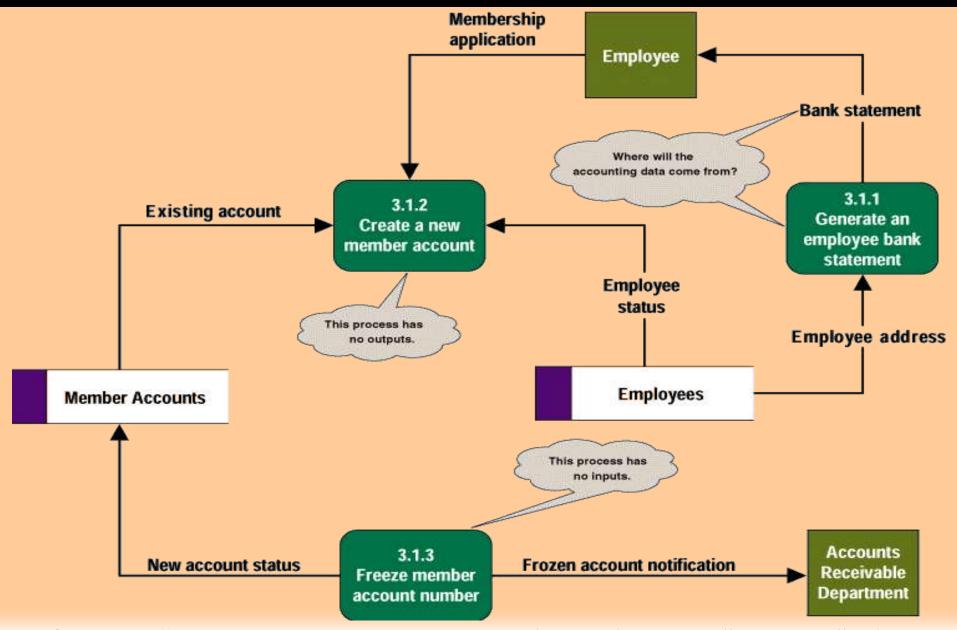


- A function is set of related and ongoing activities of a business.
- An event (or transaction) is a logical unit of work that must be completed as a whole (as part of a function).
- An elementary process (or primitive process) is a discrete, detailed activity or task required to respond to an event. Usually, several such tasks must be completed to respond to an event.

#### **Common Process Errors on DFDs**

- 3.1.2 has inputs but no outputs (it is called black hole because data enter the process and then disappear). In most cases the modeler simply forgot the output
- 3.1.3 has outputs but no inputs. Unless you are David Copperfield (most commercially successful magician in history) it's a miracle. In most cases the input flows were likely forgotten.
- 3.1.1 the inputs are insufficient to produce the o/p (it is called gray hole because
  - Misnamed process
  - Misnamed inputs and/or outputs
  - Incomplete facts
- gray holes are most common errors

#### **Common Process Errors on DFDs**

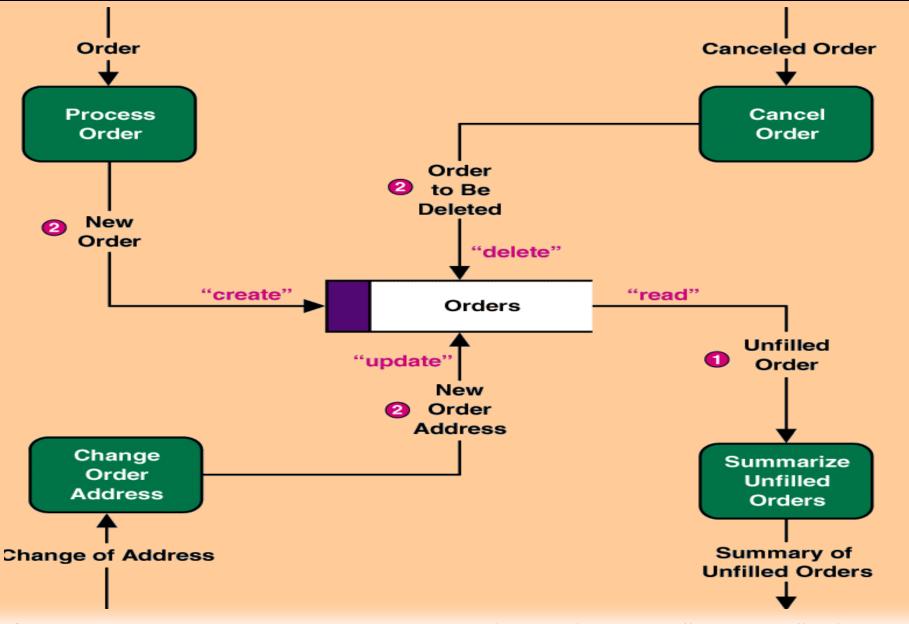


#### **Data Flows & Control Flows**

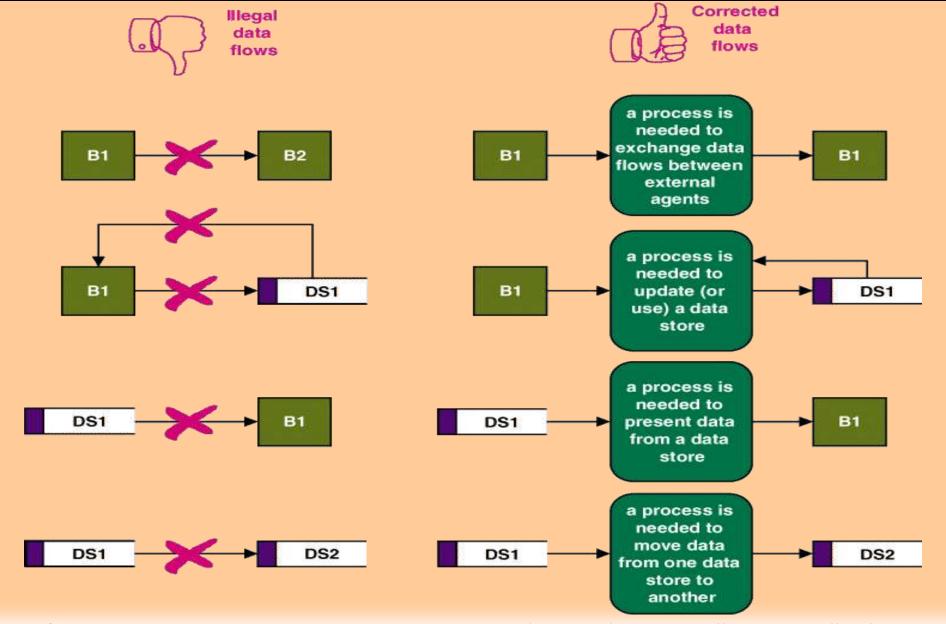
- A data flow represents an input of data to a process, or the output of data from a process.
  - A data flow may also be used to represent the creation, reading, deletion, or updating of data in a file or database (called a data store).

- A composite data flow is a data flow that consists of other data flows.
- A control flow represents a condition or nondata event that triggers a process.
  - Used sparingly (carefully) on DFDs.

#### **Data Flows to and from Data Stores**



## **Illegal Data Flows**



### **Data Types and Domains**

Data attributes should be defined by data types and domains.

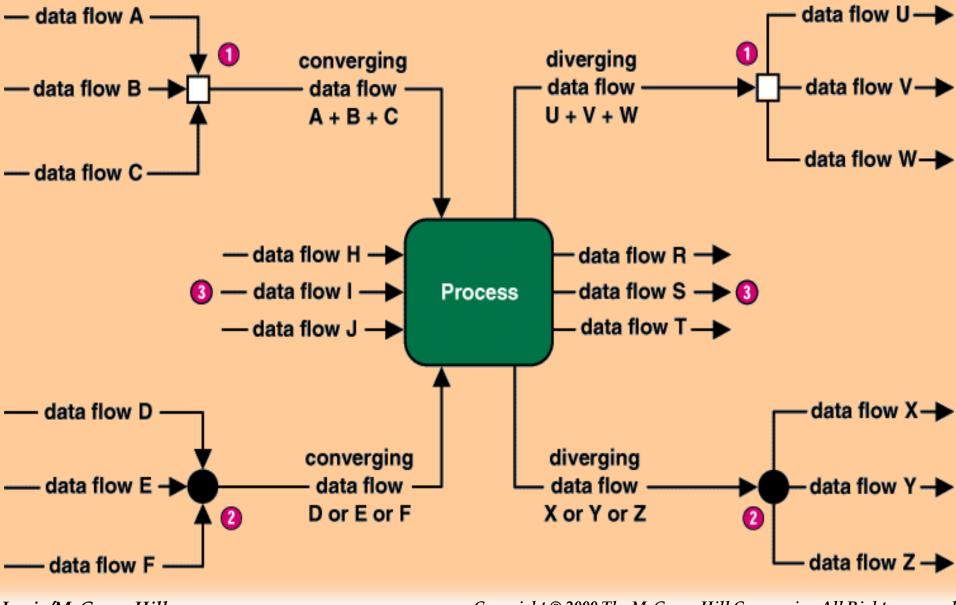
A data type defines what class of data can be stored in an attribute (e.g., character, integers, real numbers, dates, pictures, etc.).

A domain defines what values or range of values an attribute can legitimately (legally) take on.

#### **Diverging and Converging Data Flows**

- A diverging data flow is one that splits into multiple data flows.
  - Useful for illustrating data that starts out naturally as one flow, but needs to be routed to parallel processes.
  - Also useful for illustrating multiple copies of the same output going to different destinations.
- A converging data flow is the merger of multiple data flows into a single packet.
  - Useful for illustrating data from multiple sources that must come back together for some subsequent (consequent)processing

# Diverging and Converging Data Flows



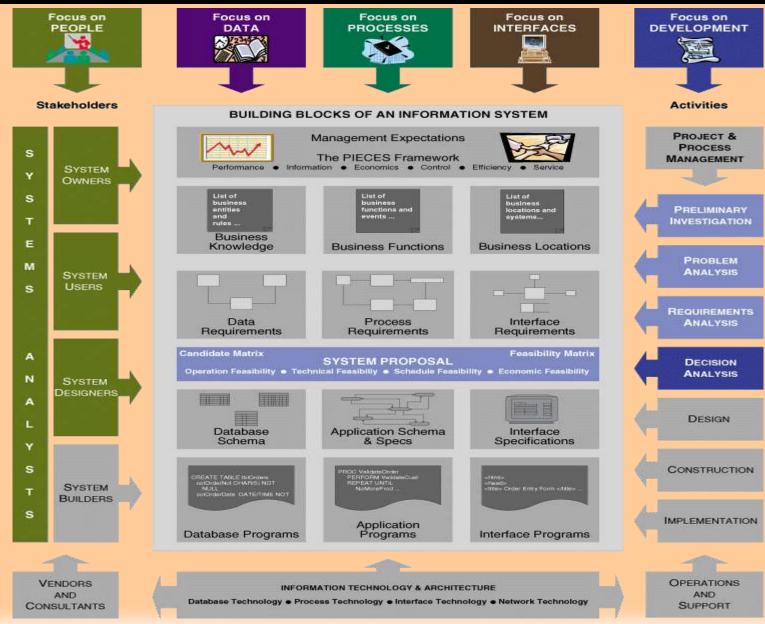




# **FEASIBILITY ANALYSIS AND** THE SYSTEM **PROPOSAL**

- Identify feasibility checkpoints in the systems life cycle.
- Identify alternative system solutions.
- Define and describe four types of feasibility and their respective criteria.
- Perform various cost-benefit analyses using timeadjusted costs and benefits.
- Write suitable system proposal reports for different audiences.
- Plan for a formal presentation to system owners and users.

Whitten Bentley Dittman



### Feasibility Analysis

Feasibility is the measure of how beneficial or practical the development of an information system will be to an organization.

Feasibility analysis is the process by which feasibility is measured.

Creeping Commitment approach to feasibility proposes that feasibility should be measured throughout the life cycle.

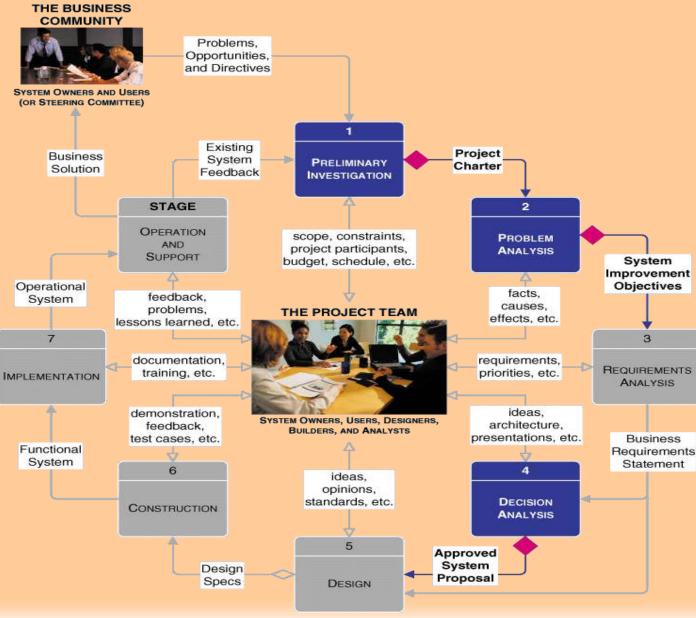
# Systems Development Life Cycle



## **Feasibility Checkpoints**

- Systems Analysis Preliminary Investigation
- Systems Analysis Problem Analysis
- Systems Design Decision Analysis

## Feasibility Checkpoints During Systems Analysis



### **Four Tests For Feasibility**

- Operational feasibility is a measure of how well the solution will work in the organization. It is also a measure of how people feel about the system/project.
- Technical feasibility is a measure of the practicality of a specific technical solution and the availability of technical resources and expertise.
- Schedule feasibility is a measure of how reasonable the project timetable is.
- Economic feasibility is a measure of the costeffectiveness of a project or solution.

#### **Cost-Benefit Analysis Techniques**

#### Costs:

- Development costs are one time costs that will not recur after the project has been completed.
- Operating costs are costs that tend to recur throughout the lifetime of the system. Such costs can be classified as:
  - Fixed costs occur at regular intervals but at relatively fixed rates.
  - Variable costs occur in proportion to some usage factor.

#### Benefits:

- Tangible benefits are those that can be easily quantified.
- Intangible benefits are those benefits believed to be difficult or impossible to quantify.

### **Costs for a Proposed Systems Solution**

#### **Estimated Costs for Client-Server System Alternative**

#### **DEVELOPMENT COSTS:**

#### Personnel:

		r ersonner,		
	2	Systems Analysts (400 hours/ea \$50.00/hr)	\$40,000	
	4	Programmer/Analysts (250 hours/ea \$35.00/hr)	\$35,000	
	1	GUI Designer (200 hours/ea \$40.00/hr)	\$8,000	
	1	Telecommunications Specialist (50 hours/ea \$50.00/hr)	\$2,500	
	1	System Architect (100 hours/ea \$50.00/hr)	\$5,000	
	1	Database Specialist (15 hours/ea \$45.00/hr)	\$675	
	1	System Librarian (250 hours/ea \$15.00/hr)	\$3,750	

#### Expenses:

4	Smalltalk training registration (\$3,500.00/student)	\$14,000

#### New Hardware & Software:

1	Development Server	\$18,700
1	Server Software (operating system, misc.)	\$1,500
1	DBMS server software	\$7,500
7	DBMS Client software (\$950.00 per client)	\$6,650

**Total Development Costs:** \$143,275

#### PROJECTED ANNUAL OPERATING COSTS

1 ersonner.		
2	Programmer/Analysts (125 hours/ea \$35.00/hr)	\$8,750
1	System Librarian (20 hours/ea \$15.00/hr)	\$300

#### Expenses:

200 100 100	and the second s		
1	Maintenance Agreement for Server	\$995	
1	Maintenance Agreement for Server DBMS software	\$525	
	Preprinted forms (15,000/year @ .22/form)	\$3,300	

**Total Projected Annual Costs:** 

\$13,870

#### Three Popular Techniques to Assess Economic Feasibility

- Payback Analysis
- Return On Investment
- Net Present Value

The **Time Value of Money** is a concept that should be applied to each technique. The time value of money recognizes that a dollar today is worth more than a dollar one year from now.

Payback analysis is a simple and popular method for determining if and when an investment will pay for itself.

Payback period in capital budgeting refers to the period of time required for the return on an investment to "repay" the sum of the original investment.

### **Payback Analysis**

For example,

A \$1000 investment which returned \$500 per year would have a two year payback period.

The time value of money is not taken into account.

$$PV_n = 1/(1 + i)^n$$

Where n is the number of years and i is the discount rate.

### Return-on-Investment Analysis (ROI)

Return-on-Investment compares the lifetime profitability of alternative solutions or projects.

The ROI for a solution or project is a percentage rate that measures the relationship between the amount the business gets back from an investment and the amount invested.

### **Lifetime ROI** = (estimated lifetime benefits – estimated lifetime costs) / estimated lifetime costs

**Annual ROI** = lifetime ROI / lifetime of the system

### **Formats for Written Reports**

	Factual Format		Administrative Format
l.	Introduction	I.	Introduction
II	Methods and procedures	II	Conclusions and recommendations
III	Facts and details	III	Summary and discussion of facts and details
IV.	Discussion and analysis of facts and details	IV.	Methods and procedures
V.	Recommendations	V.	Final conclusion
VI.	Conclusion	VI	Appendices with facts and details

Letter of transmittal

Title page

Table of contents

List of figures, illustrations, and tables

Abstract or executive summary

(The primary elements--the body of the report, in either the factual or administrative format--are presented in this portion of the report.)

**Appendices** 

## System Proposal – formal presentations

Formal presentations are special meetings used to sell new ideas and gain approval for new systems. They may also be used for any of these purposes:

- Sell new system
- Sell new ideas
- Head off criticism (disapproval)
- Address concerns
- Verify conclusions
- Clarify facts
- Report progress

- I. Introduction (one-sixth of total time available)
  - A. Problem statement
  - B. Work completed to date
- II. Part of the presentation (two-thirds of total time available)
  - A. Summary of existing problems and limitations
  - B. Summary description of the proposed system
  - C. Feasibility analysis
  - D. Proposed schedule to complete project
- III. Questions and concerns from the audience (time here is not to be included in the time allotted for presentation and conclusion; it is determined by those asking the questions and voicing their concerns)
- IV. Conclusion (one-sixth of total time available)
  - A. Summary of proposal
  - B. Call to action (request for whatever authority you require to continue systems development)