

INDE499B: Information Systems

Course Review

Autumn 2000

- WHAT did we cover?
- HOW did we cover it?
- WHY did we cover it?
- And the exam,
what's on it...

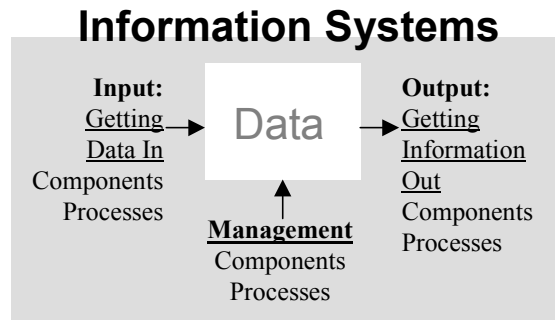
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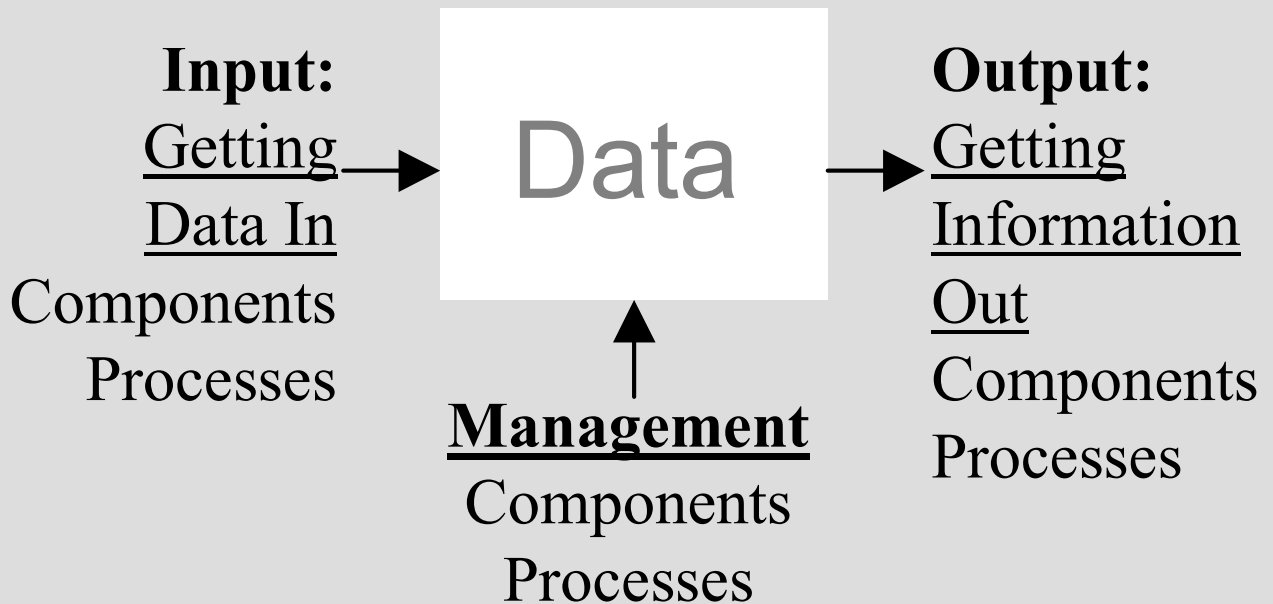
WHAT DID WE COVER?



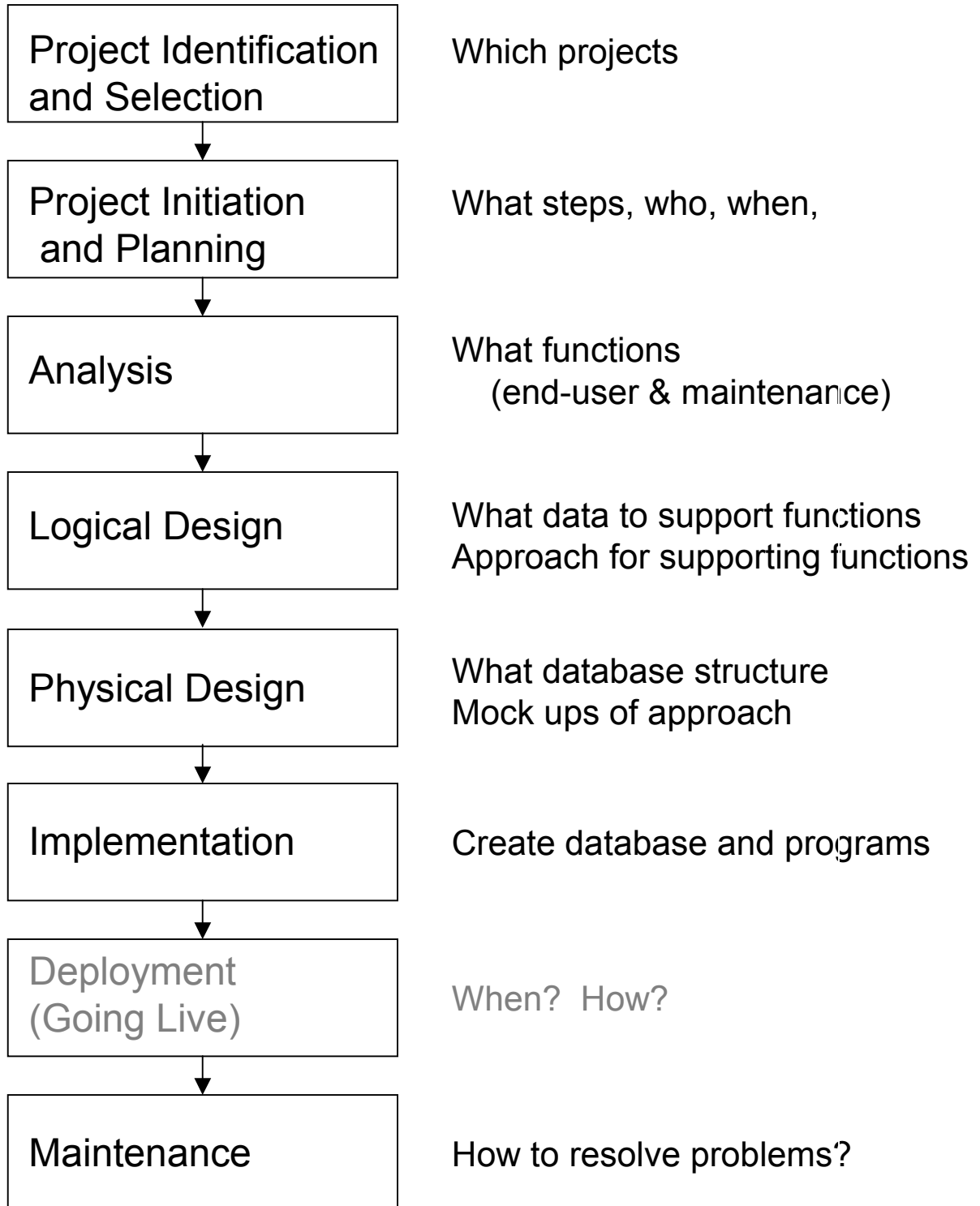
- Phase 1: Scope and Design of Information Systems
 - Information systems
 - Database approach
 - Design of information/database systems – SDLC
 - Relationship of Information Systems to IE
 - Differences between data and information
- Phase 2: Describing and Designing Data
 - Conceptual Design and ER Diagrams
 - *What is the important data?*
 - Logical Design and Relational Data Schemas
 - *How should we organize it in a database?*
 - Physical Design and Access Databases
 - *Creating the actual database*
 - Special Case: Data Warehouse
- Phase 3: Interacting with Data
 - Getting data in and out (processes)
 - *SQL (Chapter 9, Some of Chapter 10)*
 - Getting data in and out (components)
 - *Client Server Architecture (Chapter 8)*
 - Managing Data –
 - *Database Administration (Chapter 13)*

1 Characterizing an Information System

An information system can be defined as a set of components and processes for aggregating, managing and using information toward some end.



1 Systems Development Life Cycle



2

Conceptual Design

ER Modeling

- Problem 3c: A laboratory has several chemists who work on one or more projects. Chemists also may use certain kinds of equipment on each project. Attributes of CHEMIST include Employee_ID (identifiers), Name, and Phone_No. Attributes of PROJECT include Project_ID (identifier) and Start_Date. Attributes of EQUIPMENT include Serial_No and Cost. The organization wishes to record Assign_Date – that is, the data when a given equipment item was assigned to a particular chemist working on a specified project. A chemist must be assigned to at least one project and one equipment items. A given equipment item need not be assigned, and a given project need not be assigned either a chemist or an equipment item.
- PROCESS:
 - What are entities?
 - Name?
 - Attributes?
 - Identifiers?
 - What are relationships?
 - Name?
 - Attributes?
 - Cardinality?
 - Final Check – Ensure that model agrees with Description

2

ER Modeling Problem 4

- The figure shows a Grade Report that is mailed to students at the end of each semester. Prepare an ER diagram reflecting the data contained in Grade Report. Assume that each course is taught by one instructor.

Millennium College
Grade Report
Fall Semester 199x

NAME:	Emily Williams	ID: 268300458
ADDRESS:	208 Brooks Hall	
MAJOR:	Information Systems	

Course ID	Title	Instructor Name	Instructor Location	Grade
IS 350	Database Mgmt	Codd	B104	A
IS 465	System Analysis	Parsons	B317	B

- Process:
 - Entities
 - Relationships

2

Part 2:

Describing & Managing Data

- **Starting Point: Data Scope /System Functions**
 - Scope of Data:
 - Functions of System:
- **Conceptual Design of Data (Chapter 3)**
 - What is scope of data & relationships among data
 - For us: Model w/ ER (Entity Relationship) Diagrams
- **Logical Design of Data (Chapter 6)**
 - What tables (“relations”) to create?
 - What constraints on data (“integrity constraints”)?
 - For us: Transform ER Diagrams to Table Specs.
- **Physical Design of Data (Chapter 7)**
 - How to specify fields / create tables
 - For us: Transform Table Specs to Access database
- **End Goal: Physical database created**

2 Logical Design and Relational Data Model

- **Essential Elements**

- **Data structure** - data are organized in the form of tables (relations) with rows and columns
- **Data integrity** - Facilities are included to specify (business) rules that maintain the integrity of the data when they are manipulated.
- **Data manipulation** - Powerful operations (using the SQL language) are used to manipulate data stored in the relations

- **How will this help you?**

2 Logical Design

Transforming ER Diagrams into Relations

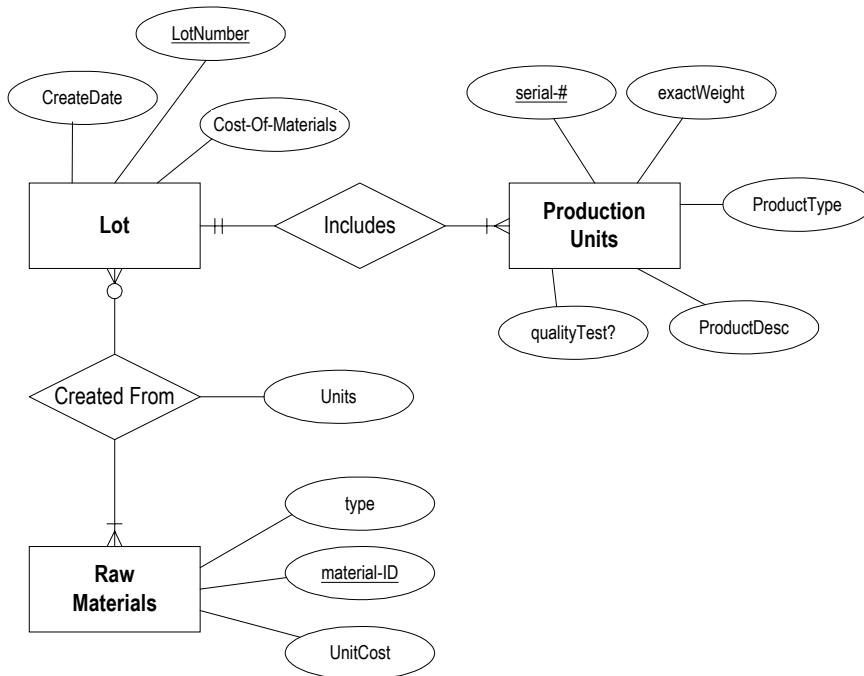
- **Step 1: Map Regular Entities**
 - Step 1a: Composite attribute
 - Step 1b: Multi-valued attributes
- **Step 2: Map Weak Entities**
- **Step 3: Map Binary Relationships**
 - Map One-to-Many
 - Map Many-to-Many
 - Map One-to-One
- **Step 4: Map Associative Entities**
 - Proceed as with Many-Many Binary relationship
- **Step 5: Map Unary Relationships**
 - Map Unary One-to-Many
 - Map Unary Many-to-Many
- **Step 6: Map Ternary (and n-ary) Relationships**

2

Logical Design

QUESTION 3: CREATING A RELATIONAL DATABASE SCHEMA (37 points).

Production tracking is important in many manufacturing environments (e.g., the pharmaceuticals industry, children's toys, etc.). The following ER diagram captures important information in the tracking of production. Specifically, the ER diagram captures relationships between production lots (or batches), individual production units, and raw materials.



- a. Please convert the ER diagram into a relational database schema. Be certain to indicate primary keys and referential integrity constraints. (25 pts)

Solutions:

Production Units

<u>Serial#</u>	ExactWeight	ProductType	ProductDesc	QualityTest?	<u>LotNumber</u>
----------------	-------------	-------------	-------------	--------------	------------------

Lot

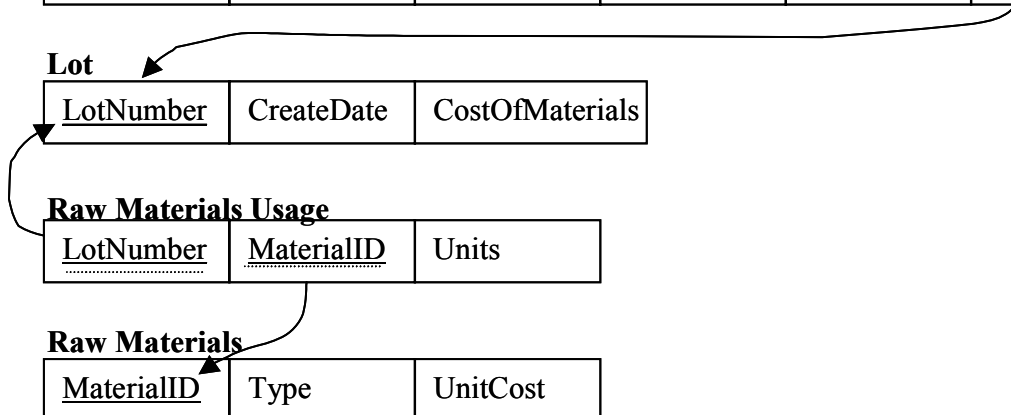
<u>LotNumber</u>	CreateDate	CostOfMaterials
------------------	------------	-----------------

Raw Materials Usage

<u>LotNumber</u>	<u>MaterialID</u>	Units
------------------	-------------------	-------

Raw Materials

<u>MaterialID</u>	Type	UnitCost
-------------------	------	----------



2 Physical Design

- Defining Indices
- Defining Data Formats
- Defining Relationships
- Defining Tables

Data Design Process

Revisiting the System Development Life Cycle (SDLC) Focusing specifically on Data Design

Phase Name and Description	Key Issue(s)	Input(s)	Output(s)
1. Identification and Selection
2. Project Initiation and Planning	...	- Commitment to do project	o Project plan o ...
3. Analysis	...	- Information from client about what system reqmts.	- Functional specifications
4. Data Design			
a. Conceptual Design Create model that captures major entities, relationships among entities, and attributes of entities required for a particular system.	- Capturing all data - Capturing relationships - Data integrity	- Functional specs - General understanding of problem	- ER diagram
b. Logical Design Transform the major entity/attribute /relationship requirements into high level specification for database	- Providing location for all data - Data integrity	- ER diagram	- Relational database schema
b2 Improving Logical Design Improve the high-level database specification.	- Minimizing redundancy - Minimizing ambiguity - .	- Relational database schema	- Relational database schema
c. Physical Design Transform the high-level specifications for database into detailed specifications for how to construct actual database in a specific relational database software.	- Performance - Data integrity	- Relational database schema - Meaning of data	- Technical specifications for construction of the database
4. Design – Interacting w/ Data			
5. Implementation		- Technical specs from physical design	- - Actual database

3 SQL

Structured Query Language

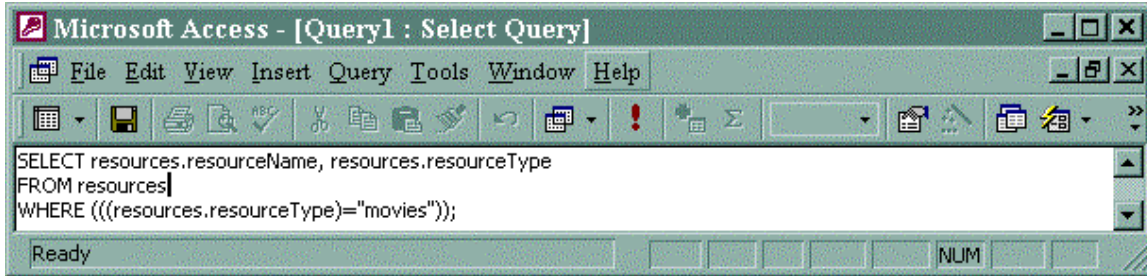
- Specifically, commands used to maintain and query a database, including...
 - Insert ... into ...
 - Delete .. from...
 - Update ...
 - Select ... from ...

CLASS PREPARATION GUIDE – WEEKS 8 AND 9 SQL (Structured Query Language)

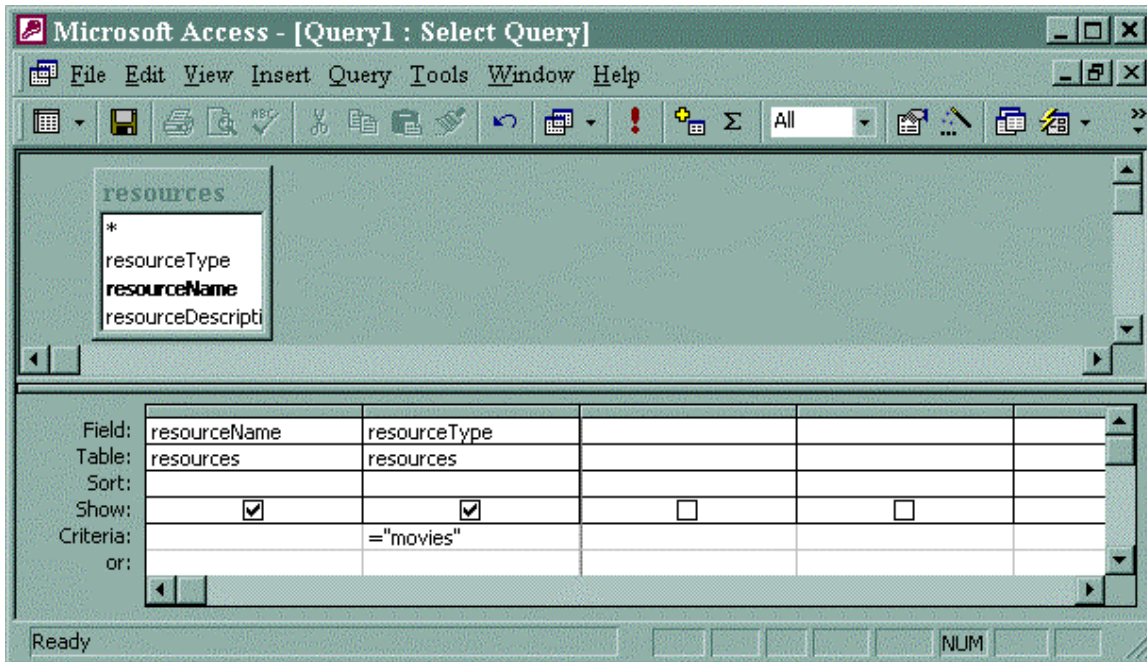
Date	Monday, 11/13	Wednesday, 11/15	Friday, 11/17	Monday, 11/20	Wednesday, 11/22
Class, Part 1 Application	<i>Discuss Organization of Class for Last Four Weeks</i>	Discuss Class Prep Activity on SQL “Select” Single Table Basic Syntax	Discuss Class Prep Activity on SQL “Select” Single Table Advanced Syntax	Discuss Class Prep Activity on SQL “Select” Multi table “Join” Syntax	Discuss Class Prep Activity on SQL “Insert, Update, Delete” SQL “Create”
Class, Part 2 Theory	SQL “Select” Single Table Basic Syntax	SQL “Select” Single Table Advanced Syntax	SQL “Select” Multi table “Join” Syntax	SQL “Insert, Update, Delete” SQL “Create”	Review

3 SQL – Viewing in Access

SQL
View

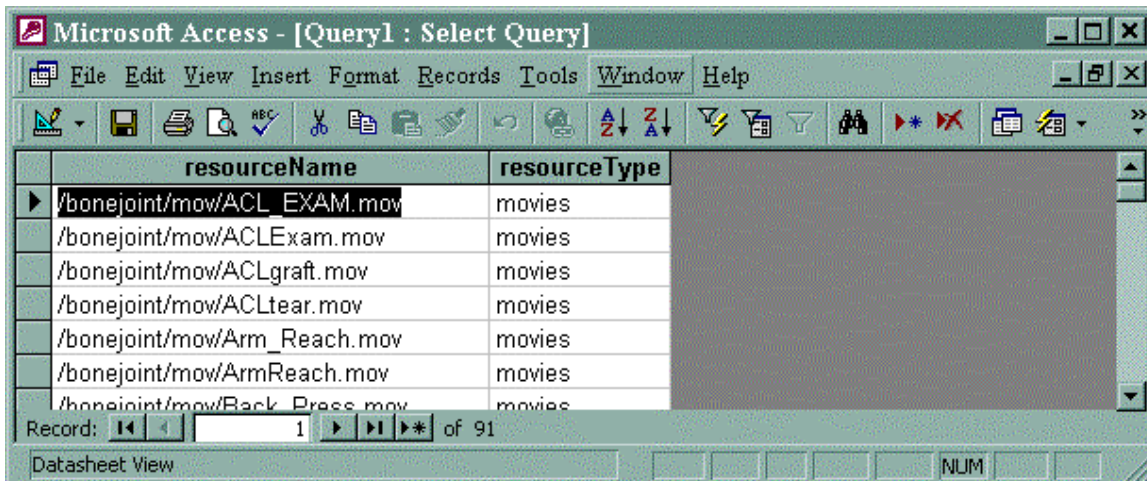


Design
View



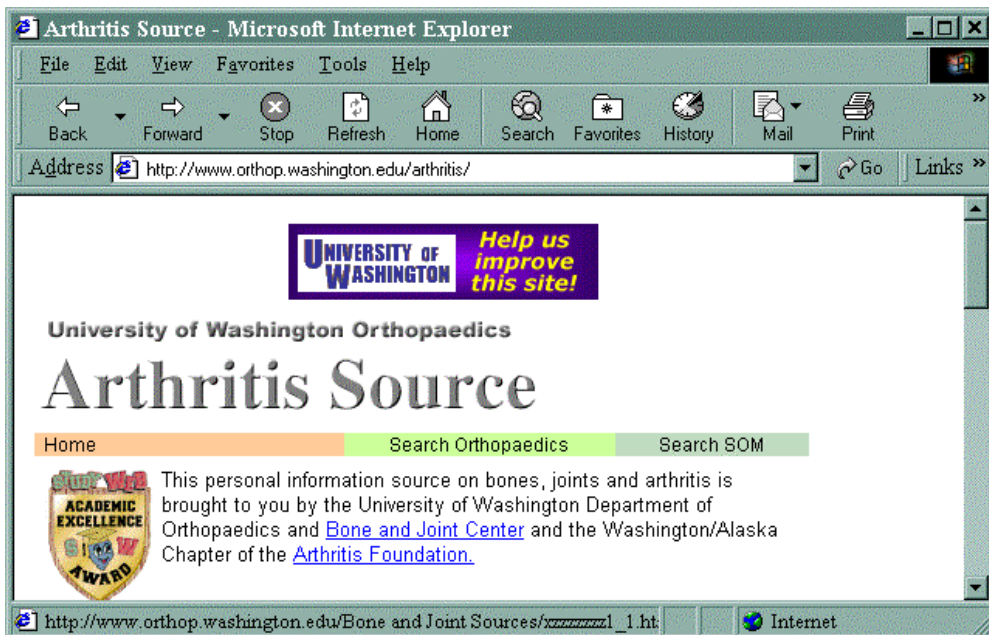
(QBE:
Query-by-
Example

Results
View



Log file Analysis: Putting it all together

- Some context/history:
 - Development of the Arthritis Source
 - Interview with designer
 - Logfile analysis to empirically explore some of the issues.
- Assertions from Interview with Designer
 - Concerning Users: “Arthritis is a chronic lifetime condition -- we hope users can create a lifetime relationship with the site.”
 - Concerning Timeframe: “Arthritis Source provides information to users regardless of time and place”
 - Concerning Resources: “The Arthritis Source provides information that will be valuable to people interested in Arthritis.”
- Challenge:
 - Finding log file evidence to support/discount assertions...
 - YOUR TASK: Choose a team, an assertion, and create a question and query...



<http://www.orthop.washington.edu/arthritis>

3

Information System Architectures

- **Questions:**
 - What is an information system architecture?
 - What alternatives are available?
 - What are tradeoffs among alternatives?
 - How would one choose?
 - What complicates architectures description/decisions?
 - What alternatives are prevalent in different circumstances?
- **Types:**
 - Stand-alone computers
 - Client-Server Architectures
 - File Server
 - Database Server
 - Three-tier

3

Comparing Architectures

Issues that Differ Across Architectures

ISSUES

1. Network Traffic / Communication Load: What are the demands on the network? Which has more information going across network? What are the risks that result? Which is more “tied” to the network (if it goes down, what can you still do?)
2. Software Issues: How many copies of the software are needed (DBMS or Application)? What are the impacts of software “upgrades”?
3. Hardware Requirements: What types of hardware are required in each scenario (e.g., memory, hard-drive size, processing power, etc.)?
4. Data issues – integrity, security, efficiency: Which scenarios make this easier? Harder?
5. Scalability: What happens when number of “clients” grows?
6. Technical Expertise Required: What types of technical expertise needed, which need more?
7. Technological Flexibility: What if client is a handheld or cell phone? What if end users have very different machines? What if you wish to use pre-existing modular code? What makes changes easy?
8. End User Issues: How much control do end users have? How much knowledge do they need? What if end users are highly distributed?

COST:

Cost is affected by each of these issues. For each issue, what type of cost is affected? Is overall cost more or less? Under what conditions?

And Making Recommendations...

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Instructional Approach

- Philosophy
 - Use a variety of learning and assessment activities.
 - Create a supportive learning environment.
 - Relate topics to a broader knowledge context.
 - Tie topics to student interests.
- Elements
 - Readings: Textbook, Websites
 - Lectures:
 - Projects:
 - Individual Pre-Project
 - Three-phase team project
 - Midterms
 - But also...

Class Preparation Activities

(15 on Web)

The screenshot shows a Microsoft Internet Explorer browser window. The title bar reads "Catalyst Tools WebQ: Class Preparation Activity - for 9/27 - Microsoft Internet Explorer". The address bar contains the URL "https://depts.washington.edu/ctl/catalyst/secure/webq/survey.cgi?user=iturns&survey=1". The main content area has a blue header "INDE 499 B" and a sub-header "Class Preparation Activity - for 9/27". Below the header is a paragraph of text explaining the survey's purpose. There are four questions, each followed by a large text input field. The status bar at the bottom shows "Done" and "Internet".

Catalyst Tools WebQ: Class Preparation Activity - for 9/27 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss

Address <https://depts.washington.edu/ctl/catalyst/secure/webq/survey.cgi?user=iturns&survey=1> Go Links >>

INDE 499 B

Class Preparation Activity - for 9/27

The purpose of this survey is to guide your reading of the syllabus and to collect information about stu the class. Responses are due by 8:00 am on Wednesday, 9/27. Responses will be be discussed in c first five questions of this survey are based on the syllabus content. A copy of this syllabus is located a <http://courses.washington.edu/infosysb/syllabus.pdf>.

Question 1. Using the "information system" definition in the syllabus as a guide, describe one inform system that you have worked with.

Question 2. Each of the first three objectives listed in the syllabus maps to a variety of work situ industrial engineers find themselves. For one of the first three objectives, please describe a work situ would be an instance of the objective. In other words, please describe a work situation that involves in diagnosis, or evaluation...

Question 3. For each of the following topics, please state (1) when the topic will be covered in the cl the objective(s) to which you believe the topic relates: (a) asking and answering data questions using different ways to describe and represent data, (c) important criteria for information systems develop client-server architecture and client "diversity."

Question 4. In this course, you will be asked do a variety of activities both within class and outside of Why?

Done Internet

Interactive In-Class Activities

“MEMORABLE WEBSITES”

A class community-building exercise

Step 1: Group Formation: Join a group, as directed by instructor.

Step 2: Individual Information: Take a few minutes to think about websites you have found to be memorable (i.e., funny, impressive, inspiring, irritating, etc.). Please record the information below.

Name:

Memorable website:

Step 3: Group Form Exchange: Within your group, exchange forms so no one has their own.

Step 4: Group Insights: Within your group, you should take turns completing this step. When it is your turn, introduce one student in the group to the rest of the group by reading the information from step 1 above and then ...

Step 3a: “Insights” suggested by classmates: Ask group members to suggest what they think they might learn about the student based on his/her memorable website. Record ideas here.

Step 3b: The “real” reason: Ask the student to comment on the truth of the “insights” suggested by classmates, and also the “real” reason the website is memorable. Record ideas here.

Step 5: Class-wide Student Introductions: Students introduce other students to the class. When it is your turn, introduce the student by summarizing the information from steps 2 and 4 above -- the name, the memorable websites, classmate “insights”, and real reasons.

Website Interactions

Home Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss

Address <http://courses.washington.edu/infosys/> Go Links

Information Systems (INDE499B) - Autumn 2000

In this course, you will develop an understanding of information systems that will permit you to understand, use, and even design such systems in your future career as an industrial engineer. Because industrial engineering activities (e.g., plant layout, procurement, inventory mgmt,) typically require the management of large quantities of information, a working knowledge of information systems issues will enable you to more effectively accomplish your job as an Industrial Engineer and an engineering professional.

Instructor: Dr. Jennifer Turns
Contact Info: jturns@enr.washington.edu, 206-221-3650
Office: 225 Engineering Annex
Office Hours: Tuesday, 4:00-5:00; Wednesday, 12:30-1:30

Teaching Assistant: Lixin Chen
Contact Info: lxchen@u.washington.edu

Internet

Home Page - Microsoft Internet Explorer

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Address <http://courses.washington.edu/infosys/> Go Links

Class Preparation Materials

Project Deliverable #4

- Week 1 (9/25, 9/27, 9/29)
 - [Class Preparation Guide](#)
 - Classroom Preparation [Survey for 9/27](#) - Due at 8:00AM, [Results from Questions 1 and 2](#)
 - [Reading for 9/29 - Explanation of IE](#)
 - [Reading for 9/29 - What Employers Want](#)
 - [Lecture Notes from 9/29](#) - Includes Pie Diagram for Exploring Class Scope
- Week 2 (10/2, 10/4, 10/6)
 - [Class Preparation Guide](#)
 - [Lecture Notes for 10/2](#)
 - Classroom Preparation [Survey for 10/4](#) (due at 8:00AM), [Results](#)
 - [Lecture Notes for 10/4](#)
 - [Lecture Notes for 10/6](#)
- Week 3 (10/9, 10/11, 10/13)
 - [Class Preparation Guide](#)
 - Classroom Preparation [Survey for 10/9](#) (due at 8:00AM), [Results](#)
 - [Lecture Notes for 10/9 \(into 10/11\)](#)
 - [Lecture Notes for 10/11](#)
- Week 4 (10/16, 10/18, 10/20)
 - [Class Preparation Guide](#)
 - Classroom Preparation [Survey for 10/16](#) (due at 8:00AM), [Results](#)
 - Classroom Preparation [Survey for 10/20](#) (due at 8:00AM)
- Week 5 (10/23, 10/25, 10/27)
 - [Class Preparation Guide](#)

Internet

Class Preparation Guides

http://courses.washington.edu/infosysb/classPreparation-week4.pdf - Microsoft Internet...

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Address http://courses.washington.edu/infosysb/classPreparation-week4.pdf Go Links

CLASS PREPARATION GUIDE – WEEK 4
INDE499B: Information Systems
Dr. Jennifer Turns
Autumn 2000

For Monday, 16 October 2000:

Reading(s):

- *Chapter 3 – The Entity Relationship Model*. Textbook, p. 85-114. Please note that we will be covering this material on Monday, 10/16, and Wednesday, 10/18 (and possibly finishing on Monday, 10/23). A good reading of the material before Monday (10/16) will serve you well for the week.

Classroom Preparation Activity:

- Please respond to the survey located at:
<http://depts.washington.edu/ctl/catalyst/webq/survey.cgi?user=jturns&survey=4>
The goal of the survey is to ensure that you are prepared for a discussion of terminology and basic concepts.

This assignment is due by **8:00 AM** on 10/16.

For Wednesday, 18 October 2000:

Reading(s):

- *Chapter 3 – The Entity Relationship Model*. Textbook, p. 85-114. (continued)

Classroom Preparation Activity:

- None

** Project Deliverable 2 is due in class

For Friday, 20 October 2000:

Reading(s):

- *The Relational Data Model*, Textbook, p. 208-212
- *Integrity Constraints*, Textbook, p. 213-214 (up to, but not including, "operational

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Done Internet

INDE499B:

Information Systems

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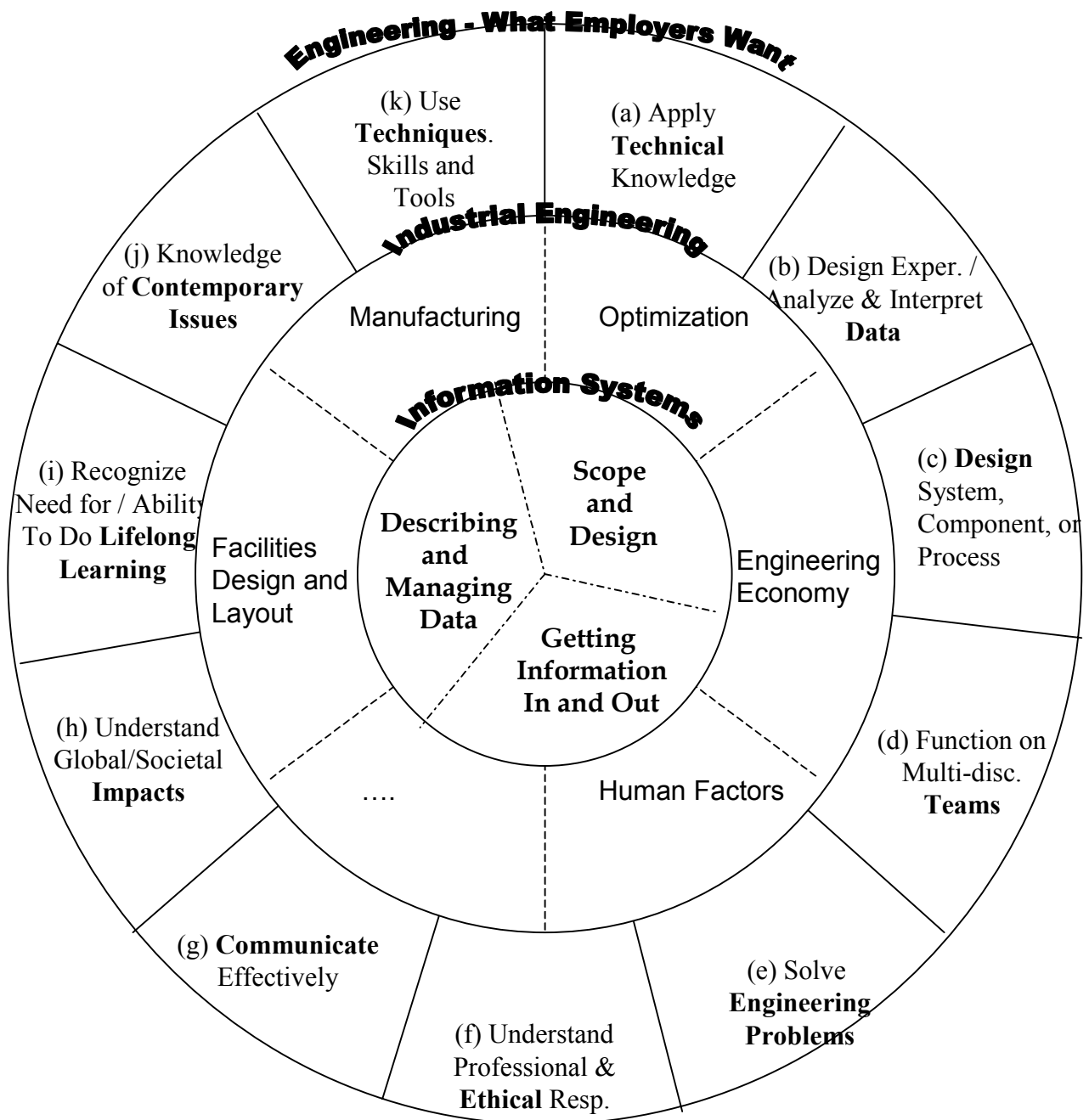
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Thinking about the Scope of INDE499B

The Problem Statement: The scope of this class involves the interaction of three elements: (1) the general topic of information systems, (2) the industrial engineering discipline and (3) the needed skills of graduating engineers. Please develop a picture or diagram that captures this relationship as you understand it.

A Solution: A possible solution is given in the diagram below:

- Understanding the “solution”: Information systems, with at least three sub-areas, is a subject learned by industrial engineers. Industrial engineering, which focuses on specific types of problems, is a type of general engineering, which implies specific skills of the engineer.
- Using the “solution”: Imagine the different wheels can spin/move. Then, places where three elements line up can be “read” and used to think of issues/generate questions. For example, one could align Ethical responsibility, manufacturing, and getting information in and out – and then think about what issues exist at such an intersection.



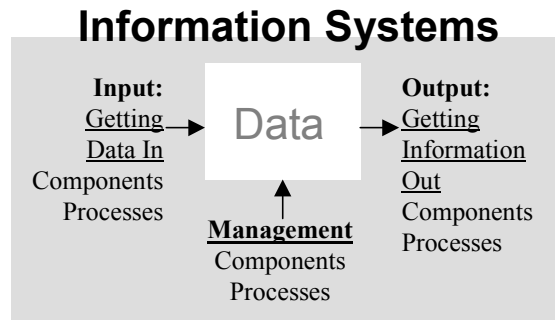
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