Informatics, Public Health Informatics and Database Management Systems (DBMS)

Chapter V

Computer Science Department

- Data, Information, Knowledge
- The disciplines that make up Informatics
- Importance of Domain Knowledge
- Example: Referral management

Data,

o Observations, measurements, or symbols

```
X              Y
13.58801       11.0956
 9.878124      12.55918
14.65398       10.18044
15.22057        9.993003
13.16265       12.96319
13.80617        8.889046
13.10214       10.56081
11.00403       11.86713
.....
```

- **Information**,
  - Data + meaning/context
- **Knowledge**
  - Protocols
  - Policy
  - Practice

- The disciplines that make up Informatics:
  - **Cognitive Sciences**
  - **Computer Science**
  - **Domain Knowledge**

Public Health Informatics

- Public Health Informatics is "the *systematic application* of information and computer science and technology to public health practice, research, and learning"

- **Public Health Informatics at The University of Manchester, UK**

-
  "Public Health Informatics is the study of systems for creating information and managing knowledge to understand, protect and improve health in society."

Public Health Informatics PHI

- As a discipline, PHI focuses on the information science and technology applications that are relevant to public health, while _always keeping in mind_ that:

  1. The primary focus of public health is to promote the health of _populations_ and not the health of specific individuals.

  2. The primary strategy of public health is _prevention_ of disease and injury _by altering the conditions or the environment that put populations at risk_.

  3. Public health interventions must reflect the _governmental context_ in which public health is practiced.

Database Management Systems (DBMS)

Topics :

- how related tables avoid the problems of lists and spreadsheets

- Learn the components of database system

- Learn the purpose of the database management system (DBMS)

Database Management Systems (DBMS)

- Problems with Lists: Redundancy
- In a list, each row is intended to stand on its own. As a result, the same information may be entered several times (*i.e.,* **redundancy**)

SALES_ORDERS					
SO_Number	Item_Number	Item_Name	Qty_Ordered	Cust_Code	Cust_Name
1010	2010-0050	Formed Handlebar	2	WHEEL	Wheelaway Cycle Center
	1000-1	20 in. Bicycle	5	WHEEL	Wheelaway Cycle Center
1011	1002-1	24 in. Bicycle	5	ETC	Bikes Et Cetera
	1001-1	26 in. Bicycle	10	ETC	Bikes Et Cetera
1012	1003-1	20 in. Bicycle	5	WHEEL	Wheelaway Cycle Center
	1001-1	26 in. Bicycle	10	WHEEL	Wheelaway Cycle Center
1013	1001-1	26 in. Bicycle	50	IBS	Inter. Bicycle Sales
1014	1003-1	20 in. Bicycle	25	ETC	Bikes Et Cetera
1015	1003-1	20 in. Bicycle	25	WHEEL	Wheelaway Cycle Center
1016	3961-1041	Tire Tube, 26 in.	5	ETC	Bikes Et Cetera
	3965-1050	Spoke Reflector	50	ETC	Bikes Et Cetera
	1003-1	20 in. Bicycle	5	ETC	Bikes Et Cetera
	1000-1	20 in. Bicycle	4	ETC	Bikes Et Cetera

Database Management Systems (DBMS)

Problems with Lists: Multiple Themes

In a list, each row may contain information on more than one "theme". As a result, needed information may appear in the lists only if information on other themes is also present

SALES_ORDERS					
SO_Number	Item_Number	Item_Name	Qty_Ordered	Cust_Code	Cust_Name
1010	2010-0050	Formed Handleba	2	WHEEL	Wheelaway Cycle Center
	1000-1	20 in. Bicycle	5	WHEEL	Wheelaway Cycle Center
1011	1002-1	24 in. Bicycle	5	ETC	Bikes Et Cetera
	1001-1	26 in. Bicycle	10	ETC	Bikes Et Cetera
1012	1003-1	20 in. Bicycle	5	WHEEL	Wheelaway Cycle Center
	1001-1	26 in. Bicycle	10	WHEEL	Wheelaway Cycle Center
1013	**1001-1**	**26 in. Bicycle**	**50**	**IBS**	**Inter. Bicycle Sales**
1014	1003-1	20 in. Bicycle	25	ETC	Bikes Et Cetera
1015	1003-1	20 in. Bicycle	25	WHEEL	Wheelaway Cycle Center
1016	3961-1041	Tire Tube, 26 in.	5	ETC	Bikes Et Cetera
	3965-1050	Spoke Reflector	50	ETC	Bikes Et Cetera
	1003-1	20 in. Bicycle	5	ETC	Bikes Et Cetera
	1000-1	20 in. Bicycle	4	ETC	Bikes Et Cetera

This table includes information on the Sales Order, Items, and Customer

Inter. Bicycle Sales information would not be available without SO #1013

Computer Skills

Database Management Systems (DBMS)

List Modification Issues

- Redundancy and multiple themes create modification problems

  ✖ Deletion problems

  - *If we delete SO #1013 we lose our customer IBS*

  🔄 Update problems

  - *If customer "Bikes Et Cetera" changes its name we have to make sure we change it in every single row.*

  ➕ Insertion problems

  - *If we want to add a new customer, we must either wait until they place an order or (worse) make up a bogus sales order*

Database Management Systems (DBMS)

- List Modification Issues

SALES_ORDERS					
SO_Number	Item_Number	Item_Name	Qty_Ordered	Cust_Code	Cust_Name
1010	2010-0050	Formed Handleba	2	WHEEL	Wheelaway Cycle Center
	1000-1	20 in. Bicycle	5	WHEEL	Wheelaway Cycle Center
1011	1002-1	24 in. Bicycle	5	ETC	Bikes Et Cetera
	1001-1	26 in. Bicycle	10	ETC	Bikes Et Cetera
1012	1003-1	20 in. Bicycle	5	WHEEL	Wheelaway Cycle Center
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1015	1003-1	20 in. Bicycle	25	WHEEL	Wheelaway Cycle Center
1016	3961-1041	Tire Tube, 26 in.	5	ETC	Bikes etc.
	3965-1050	Spoke Reflector	50	ETC	Bikes etc.
	1003-1	20 in. Bicycle	5	ETC	Bikes etc.
	1000-1	20 in. Bicycle	4	ETC	Bikes etc.
					New (& rich) Customer

DELETE
No SO #1013,
no IBS

UPDATE
Need to
change
Et Cetera
to etc.

INSERT
Blank
fields may
cause
problems
later

Computer Skills

Relational Databases

- A relational database stores information in tables. Each informational theme is stored in its own table

- In essence, a relational database will break-up a list into several parts. One part for each theme in the list

- This is similar to a Web page

  – Rather than paste the information from another source into our page, it can be linked instead.

 – The updates are done on the linked page. We just need to make sure that our link to it is valid

Database Management Systems (DBMS)

DBMS Benefits

- Though a relational database is more complicated than a list, it protects us from data anomalies (insert, update, and delete)

- Furthermore, a relational database provides a solid foundation for user forms and reports

Database Management Systems (DBMS)

Components of a Database System
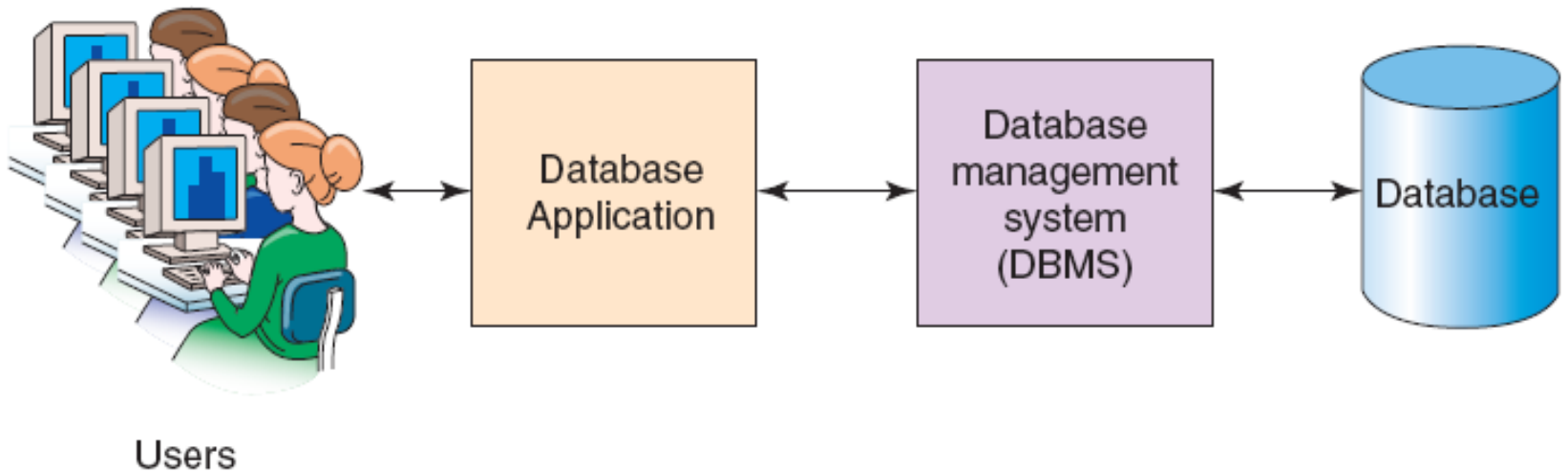
Database Management Systems (DBMS)

- "Key" terms
- An *entity* is something of importance to a user that needs to be represented in a database

- An entity represents one theme or topic and is represented by a table.

- The *table* dimensions, like a matrix, consist of *rows* (tuples) and columns (*attributes*)

A Key

- A *(primary) key* is one (or more) columns of a relation that is (are) used to identify a row

- A *composite key* is a key that contains two or more attributes

  – For a key to be unique, it is sometimes necessary to use a composite key

  – Can also generate a set of unique values to serve as the key (for example University ID numbers)
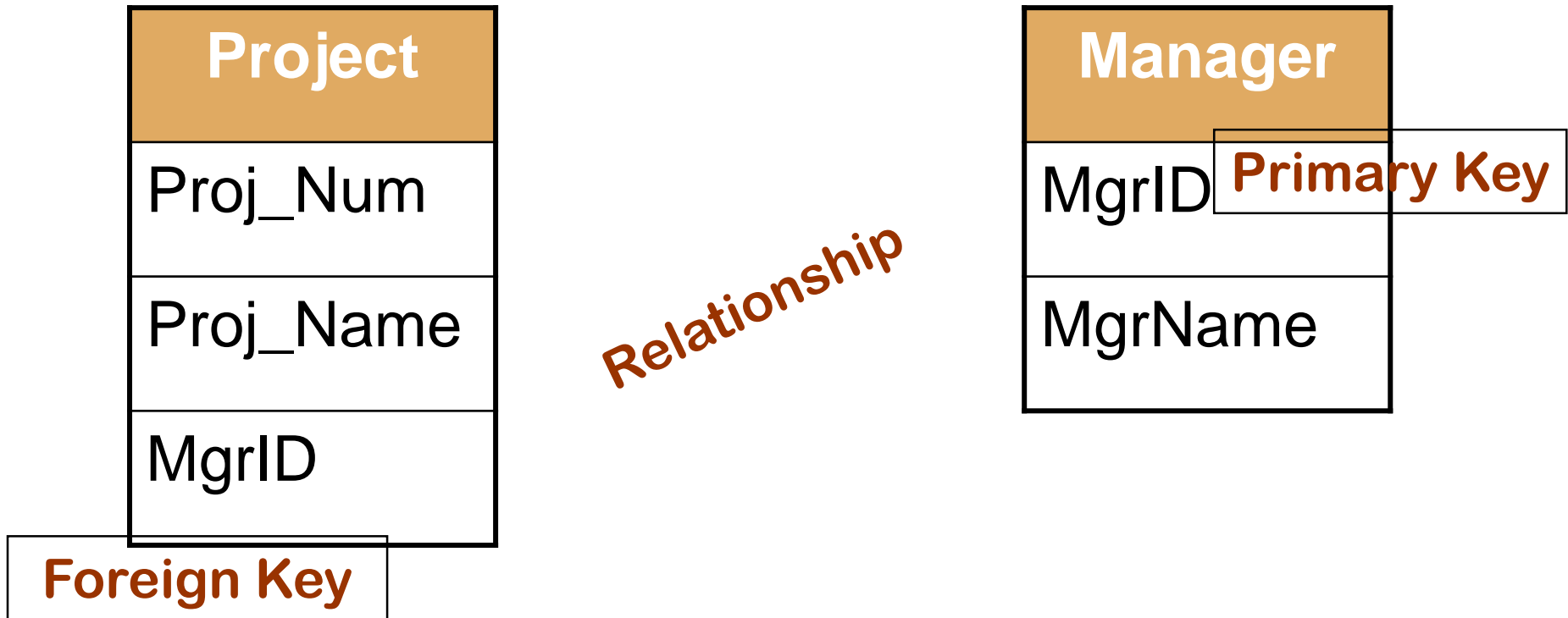
A Foreign Key

A table may be related to other tables (i.e., a *relationship*)

- To create relationships, you may need to create a *foreign key*

- A foreign key is a primary key from one table placed into another table

- *Referential integrity* - every value of a foreign key must match a value of an existing primary key

Foreign Key Example

Functional Dependency

- A relationship between attributes in which one or more attributes determines the value of another attribute(s) in the same table

  – The Proj_Num "determines" the Proj_Name