Access Database Design

Technical Support Services

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Table of Contents

Course Description

This is the second in a series of workshops about Microsoft Access 2007. It deals specifically with database design and maintenance.

The purpose of this installment is to expose you to the considerations involved in designing your databases and to introduce you to the various options that Access provides for importing and exporting data as well as the utilities provided for maintaining your databases.

Our goal is to assist you to learn the software, understand some basic concepts, and show you some tips and techniques so you can develop your database management/programming skills over time.

The six classes in the Access workshop series are:

- Introduction to Access
- Access Database Design
- Access Queries
- Access Form Design
- Access Reports
- Access Macros and Database Utilities

Thank you,

The OIT Technical Support Services Trainers

West Virginia University

Understanding Databases

A database management system (DBMS) is a computer application or program that is used to store, manage, and retrieve data in computer files. It is generally associated with large volumes of data or with files where selective retrieval is desired.

Microsoft Access is one example of a DBMS. While using Access is more complicated than using other components of Microsoft Office, such as Word, Excel, or PowerPoint, Access is nonetheless a relatively low-end DBMS. For larger databases requiring greater security and widely shared access, the University uses the Oracle or MySQL DBMS.

Data Organization

There is a hierarchy of components which constitute the collection of data maintained by any DBMS:

Database
Record
Field
Value

A **database** is the entire file or collection of files maintained as a unit by the DBMS. The University, like most large organizations, has several databases used to manage its operations: a human resources database of all employees, an inventory database of the organization's physical assets, a financial database of receipts and expenditures, and a student database containing information about students and the courses they take, among others. Individual departments may have their own databases for different purposes, just as individual faculty may have databases for information such as bibliographies of useful works in the faculty member's field or data collected during an experiment.

The database is composed of **records**, which are structured collections of closely related data. The nature of the relationship among the data in a record will depend on the purpose of the database. In a human resources database, each record will contain information about one employee. In a bibliographic database, a record would correspond to a book, journal article, or other written work.

The structure of a record is determined by the set of **fields** from which it is composed. Each field is a place where data with a particular meaning is kept. A human resources database record would include fields for name, address, social security number, date of employment, salary, and other information. A bibliographic database record would include fields for a work's title, authors, publisher, date of publication, and other information.

The content of each field in a record is its **value**—the specific text, number, date, or other information stored in that field of that record.

There are different types of databases, but we will be looking only at **relational databases**, since that is the type of database managed by Access. In a relational database, there is an additional level in the hierarchy of data organization:

Database
Table
Record
Field
Value

The records of the database are organized into **tables**, each of which expresses a particular relation among the data (hence the name relational database).

In our example of the human resources database, there might be a table for each employee and another for each department in the organization:

Employee_Name	Employee_SSN	Employee_Dept	Employee_HireDate
Smith	123456789	Accounting	11/12/1989
Jones	123456678	English	3/15/1992
Brown	123452233	Math	12/2/1997
Cooper	134263525	English	5/5/1994

Department_Name	Department_Location	Department_Authorized_FTE
Accounting	123 Penny Lane	6
English	456 Chaucer Ct.	8
Math	789 Plane St.	4

Table Design

An important part of designing a relational database, including Access databases, is determining what tables will be used to organize the data.

Consider the simple case of a class list and suppose that we wish to keep track of the class's name, number, and department; the name of the teacher; and the teacher's office number. We could include all of the information in one table, as shown below.

Class_Name	Class_No	Class_Teacher	Class_Dept	Class_Office
Calculus	200	Mr. Brown	Mathematics	G105
Interior Design	304	Ms Smith	Design	G103
Algebra	101	Mr. Brown	Mathematics	G105
Geometry	110	Mr. Jones	Mathematics	G107

However, if we do so, then repeated department and office information must be entered each time the same teacher is assigned to teach another class. If one bit of information changes (e.g., Mr. Brown moves from G105 to G110) then every occurrence of data containing Mr. Brown's information must be located and updated to avoid data inconsistency. A different problem arises if Mr. Brown takes a term off for any reason and so does not teach a class. We would either have to retain a record with Mr. Brown's office and department information but with no values in the class name and