

Developing Databases with Access 97

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1. Preface

Purpose of the course: Strengthening the theoretic fundamentals of Access 97 and knowledge of efficient methods of developing databases.

Duration of the course: Full day (9:30 a.m. – 6:00 p.m.)

Audience: Information Coordinators having the following skills:

- fluency in Windows 95, MS Word and MS Excel;
- assertive use of Access 95/97 with the ability to use complete databases (view, search, output, new data input); and
- basic knowledge of the principles of developing databases.

The theses presented reflect the entire topic of the course. The courses will be held for groups that differ in their background level. The level of details with respect to various sections of the materials will vary depending on the background level.

Database examples used: Address Book, Contact Management, Household Inventory, Developer Solutions, Northwind, Orders (MS), WWC/BC Database (AIHA).

Information messages: At the end of the course, Information Coordinators experienced in the use/development of databases in their respective organizations will deliver their information messages.

Additional sources:

- MS Access 97 Help – Contents and Index;
- MS Access 97 Help – What’s This?;
- MS Office Assistant;
- MS Office 97 Pro CD-ROM:\VALUPACK\ACCESS\Openbook.htm;
- <http://officeupdate.microsoft.com/downloadcatalog/dldAccess.htm>;
- “Microsoft Access 97 в подлиннике”, Р. Дженнингс, ВHV -- Санкт-Петербург, 1997
- “Microsoft Access 97: Наглядно и конкретно”, Microsoft Press, 1997 (to be handed out to the students before the course)

2. Introduction

MS Word, MS Excel and MS Access are various applications designed for developing and modifying sets of databases.

The key features of MS Access are as follows:

- ability to store virtually unlimited volumes of data;
- useful tools for data input/output;
- ability to check data being input for correctness;
- support for data integrity;
- data protection;
- relative ease of use for non-professionals;
- ability to develop professional-grade desktop multi-user and client/server databases;

- high integratability with MS Office applications and Windows 95/NT;
- ability to import/export data into other applications; and
- integration with the World Wide Web.

3. Database Structure

Main components of a database:

- tables for storing data;
- relationships among tables to ensure data integrity;
- forms for inputting and viewing data on screen;
- reports for printing out data;
- queries for searching for necessary data by a criterion;
- modules for storing procedures in Visual Basic for Applications; and
- macros for automating the operation of the database. Microsoft recommends that VBA be used instead of macros. Macros are only stored for compatibility with previous versions of Access.

3.1. Table

A **table** consists of fields determining the names of table columns and type of data. Each row of a table contains a new data array and is called a record.

Types of data used in a table.

Data type	Used for	Size
Counter	Automatic insertion of sequential (those with an increment of 1) or random numbers when adding a record. Often used in a key field.	4 bytes
Text	<ul style="list-style-type: none"> • Text or a combination of text and numbers. • Numbers that don't need calculations (e.g. telephone numbers). 	Up to 255 characters
MEMO field	Long text or numbers, e.g. marks or a description.	Up to 64,000 characters
Numerical	Numerical data used for mathematical calculations, except for those calculations including currency operations (in which case the currency type should be used instead).	1, 2, 4 or 8 bytes
Date/time	Date and time	8 bytes
Logical	Fields containing only one or two values such as Yes/No, True/False, On/Off.	1 bit
Currency	Currency values. Used to prevent rounding during calculations. May contain up to 15 characters in the	8 bytes

	integer portion and up to 4 characters in the fractional portion.	
Substitution Wizard	Creates a field that allows choosing the value from another table or from a list of values by using a field with a list. The Substitution Wizard is loaded when this parameter is selected in a list of data types for determination.	Usually 4 bytes
OLE objects	Objects (e.g. Microsoft Word documents, Microsoft Excel spreadsheets, pictures, sounds and other data types) created in other applications that use the OLE protocol. OLE objects can be linked to or embedded into a Microsoft Access table.	Up to 1 gigabyte (limited by the disk capacity)
Hyperlinks	A field that stores hyperlinks (e.g. URLs).	Up to 64,000 characters

Numerical, currency and logical data types and date/time provide for predefined mapping formats. To select a format for each data type, define the Format property. You can also create a custom mapping format for all data types other than OLE objects.

What you can do with data in the table mode: find (and replace), sort, filter (by selection/by form), save a filter as a query.

Field indexing. Index is a Microsoft Access tool that speeds up searching and sorting in a table. The key field in a table is indexed automatically. Indices for MEMO, Hyperlink or OLE fields are not allowed.

Viewing and Editing Indices

Indexing by several fields (compound indices). If frequent sorting or searching in two or more fields at the same time is anticipated, a compound index can be created. If, for example, a criterion for the “First Name” and “Last Name” fields is often set for the same query, it would be useful to create a compound index for these two fields.

3.2. Relationships among Tables and Data Integrity

Main table: A table representing the “one” in an established “one-to-many” relationship with an external table with a key.

“One-to-one” relationship: A relationship between two tables whereby:

- The value of the key field of each record in the main table corresponds to the value of the relevant field(s) of a single record in the related table.
- The value of the key field of each record in the related table corresponds to the value of the relevant field(s) of a single record in the main table.

“One-to-many” relationship: A relationship between two tables whereby:

- The value of the key field of each record in the main table corresponds to the value of the relevant field(s) of several records in the related table.

- The value of the key field of each record in the related table corresponds to the value of the relevant field(s) of a single record in the main table.

Cascade refreshing: This parameter is used to support data integrity in two related tables. It helps to ensure that modification of the key field of a record in the main table result in automatic refreshing of the key field in the related records of one or several related external tables with keys.

Cascade deletion: This parameter is used to support data integrity in two related tables. It helps to ensure that deletion of a record from the main table result in automatic deletion of all related fields from one or several external tables with keys.

3.3. Forms

Main functions of forms: data input/output and control. The main switchboard as an example of the control function.

Form control elements (fields, inscriptions, lists, switches, buttons, lines, etc.). Types of control elements: attached, free and calculatable.

3.4. Reports

A report is a flexible and efficient data organization tool for printing. With a report, you can output the necessary data in the required form. Various functions of forms and reports.

Report control elements.

3.5. Queries

A query is created for searching for and selecting data matching certain criteria. Queries also make it possible to simultaneously refresh or delete several records and to perform embedded or special calculations.

Various types of query and how to create them. Dealing with queries.

Connection of Access queries with the SQL language.

Creating additional queries to an existing database

3.6. Modules – VBA

A module is a set of declarations and procedures written in Visual Basic for applications integrated into a single program unit.

Modules are associated with a certain form or report. Modules often contain event processing procedures that are run in response to an event in a form or report. Event processing procedures are used to control the behavior of a form or report and their response to events such as the pressing of a button.

3.7. Processing of Events

Microsoft Access responds to a lot of various events such as a mouse click, change in data, opening/closing of forms, etc. Usually, events occur as a result of some actions taken by the user.

Relation between form control elements and event processing procedures written in VBA.

Using events to ensure cooperation among database objects.

3.8. Expressions

An expression is a combination of characters (identifiers, operators and values) that produces a certain result. Expressions are a key tool to perform many Microsoft Access operations.

4. A Review of the Database of the Women's Wellness Center/Breast Health Clinic (AIHA Program)

The database in question has been developed by Mariella Tefft for the American International Health Alliance (AIHA).

THE PURPOSE OF DEVELOPING THE DATABASE

The database in question is intended to keep patient records and manage the Clinic, including resource allocation and marketing. It will help clinics better know their patients: their characteristics (demography and medical anamnesis), which services they use, etc. It will also help them get a concise report on analyses, procedures/treatment, medicines/devices, training/recommendations, and referrals offered (Outcome of Visit). Furthermore, this database gives clinics an opportunity to evaluate the degree of satisfaction of the patients with the services provided.

At a later stage, the database can serve as a valuable source of answers to specific questions of interest to each particular clinic.

A REVIEW OF THE DATABASE ORGANIZATION

The database contains **7 main tables**. All the tables but one are linked to each other by a Patient ID:

- ❑ **Patient Registration Card/Demographics** (*demo*)
- ❑ **Medical Anamnesis** (*medhx*)
- ❑ **Patient Survey for Pregnancy Test** (*pgtestas*)
The database may contain multiple records on pregnancy test results for the same patient.
- ❑ **Outcome of Visit** (*visit*)
The database may contain multiple records on outcomes of visits for the same patient.
- ❑ **Patient Satisfaction Review** (*ptsatisf*)
- ❑ **Patient Data** (*brscku*)
The database may contain multiple records on preventive examinations for breast cancer for the same patient.
- ❑ **Data on Patient Suffering from Breast Cancer**

The database contains **5 detailed tables** linked to the Outcome of Visit Table as

described above. Physicians fill in these detailed tables simultaneously with filling in the Outcome of Visit Card after every visit of a patient to the Clinic:

- ❑ **Analysis/Analyses Performed**
The database may contain multiple records on procedures/treatment events for each visit to the Clinic by a patient.
- ❑ **Procedures/Treatment Events Provided?**
The database may contain multiple records on procedures/treatment events for each visit to the Clinic by a patient.
- ❑ **Medicines and/or Drugs Prescribed and/or Provided?**
The database may contain multiple records on medicines/drugs for each visit to the Clinic by a patient.
- ❑ **Training/Consultation Provided?**
The database may contain multiple records on training/consultation provided to a patient during her visit.
- ❑ **Referral**
The database may contain multiple records on referrals for each visit to the Clinic by a patient.

The database contains **32 substitution tables in English** and **27 substitution tables in Russian**. Each substitution table represents a drop-down list of options for each particular field. This helps save space on the electronic form and facilitates the operator to fill in these fields. The operator, however, is not restricted to the proposed list: he or she is free to enter his/her own option.

DATA TYPES REPRESENTED IN THE DATABASE

This database combines three main data types: text, numerical and calendar. For text fields, the field length must be indicated. Numerical data mostly belong to the integer subtype. Questions like “Yes/No,” which allow to simply tick the positive answer, are a special subtype of numerical data. Calendar data are displayed in the “day/month/year” format so that the operator can easily discern dates back to 1930 and after 2000. The name of each month is restricted to three characters. Data, however, can be input in a special format or in the traditional American style (when the U.S. regional settings are chosen). But if you want to enter a birthday of a person who was born before 1930, you will have to type all four digits of his/her birth year.

USING THE AUTOMATED MENU SYSTEM

Actually, there are two separate databases for the Women’s Wellness Center/Breast Health Clinic. The first one, “WH98act2.mdb,” is an active databases. It is that database where you enter new or correct existing data on a patient and print out selected records. In addition, this database can help you find answers to simple questions.

The second database, “WH98bf2.mdb,” is a “twin” of the active database in terms of its structure, but it is empty. It is used to print out blank forms, which can then be reproduced with a copier and manually filled in by patients and/or physicians.

The active database has a “Main Menu,” which enables you to choose between the “English menu” and “Russian menu.” From that menu, you can move to other menus depending on the functions you choose:

- “Add New Records,”
- “Edit/View Records,”
- “Print Selected Records on Black-and-White Forms,”
- “Go to Patient Satisfaction Review Menu,”
- “Return to English/Russian Menu,”
- “Register Patient,”
- “Medical Anamnesis,”
- “Medical Anamnesis: Add-on for Those Older than 40,”
- “Patient Survey for Pregnancy Test,”
- “Outcome of Visit,”
- “Patient Data,”
- “Data on Patient Suffering from Breast Cancer,”
- “Go to Patient Satisfaction Review Menu,”
- “Add New Opinion,”
- “Edit/View Opinions,”
- “Print Selected Opinions on Black-and-White Forms.”

FULFILLING QUERIES

To fulfill predefined or create new queries, you should exit the automated menu system. After that, you will find yourself in the Access system itself. Left click on the Queries shortcut. A screen will appear showing all queries developed for this database. Select your preferred query. Enter the dates of interest to you. The query system will automatically run and display the results.

5. Developing a New Database

A new database (on a topic to be proposed by the students) will be developed by the entire group under the guidance by the tutor.

5.1. *Developing a Database*

Before creating tables, forms and other objects in Microsoft Access, you must specify a structure for your database. A good database structure forms a basis for developing an efficient database according to existing requirements.

Described below are the main stages of the database development process as recommended by Microsoft.

5.1.1. *Specify the Purpose for Developing a Database*

At the first stage of the database development process, you should specify the purpose for developing your database, which functions your database should perform and what information it must contain. That is you should define the main topics for the database tables and the information that the table fields must contain.

Your database must meet the requirements of those who will directly use it. Toward this end, you should:

- specify the topics your database should cover;
- specify the reports your database should generate (if necessary);
- review the forms currently used for data recording; and
- compare the database to be developed with a similar well-developed database.

5.1.2. Specify the Tables Your Database Should Contain

One of the most difficult stages of the database development process is developing tables as the results your database should produce (reports, output forms, etc.) not necessarily give the complete idea of the table structure.

In developing tables, you don't need to use Microsoft Access at all. First, you better draw your preferred structure on paper.

In developing tables, you are recommended to be guided by the following principles:

- No duplications in the table or among tables.

If certain information is only stored in a single table, any changes in it should also be made in a single place. This makes your work more efficient and prevents the information in different tables from misalignment.

- Each table must only contain information on a single topic.

Information on different topics is much easier to process if it is contained in different tables. In this case, deleting a record on one topic will not result in lost information on another topic.

5.1.3. Specify the Fields Needed in the Table

Each table contains information on a separate topic and each field in a table contains separate information on the topic of that table. In developing fields for each table, you should remember that:

- Each field must be related to the topic of the table.
- It is not recommended to include in a table a result of an expression (calculatable value).
- The table must contain all necessary information.
- The information should be split into smallest possible logical units (e.g. "First Name" and "Last Name" fields instead of the general "Name" field).

In selecting the **data** type to be used in a field, you should answer the following questions:

- Which values should be reflected in this field? For example, you cannot enter text in a field designed to store numerical data.
- How much space is needed to store these values in this field?
- Which operations are to be performed with the values contained in this field? For example, you can sum values in numerical and currency fields and cannot do it in text or OLE objects fields.

- Whether sorting or indexing of this field is needed? You cannot sort or index MEMO fields, hyperlinks and OLE objects.
- How values in this field should be sorted? Numbers in text fields are sorted as rows of numbers (1, 10, 100, 2, 20, 200, etc.) rather than numerical values. To sort numbers as numerical values, use numerical or currency fields. Furthermore, many date formats cannot be duly sorted if they are input in a text field. Use “Date/Time” field for sorting them.

5.1.4. Specify the Main Key for Each Table

For Microsoft Access to be able to link data among different tables, each table must contain a field (or a group of fields) to set an individual (unique) value for each record in the table. This field or a group of fields is called the **main key**.

Specifying the key field for a table.

The possible data types for the key field are as follows:

- Counter (AutoNum);
- Numerical (Number); and
- Text.

5.1.5. Specify the Relationships among Tables

Once the data has been allocated among tables and key fields specified, you must choose a pattern for cross-linking data contained in different tables. For this purpose, you should specify relationships among tables.

It would be desirable to study the relationships among the tables in an existing database most close to the new database to be developed in terms of its topic.

5.2. Choose a Method of Developing Your Database

You can:

- develop your database manually (Blank Database);
- use Wizards; or
- use one or more existing database templates.

5.3. Choose a Method of Creating Tables in Your Database

The possible methods of creating tables are as follows:

- Design View.
- Datasheet View.
- Table Wizard.
- Import Table.
- Link Table.

You are recommended to specify the key field yourself in the Design View mode rather than let the Wizard do it for you.

5.4. Review the Database Structure

Once the tables, fields and relationships have been developed, you should, once again, review the database structure to identify possible deficiencies. It is advisable to do that at this stage until the tables are not yet filled with data.

For checking purposes, you should enter several records in each table, then create draft forms for inputting and viewing information and, probably, reports. After that, you should check to see if the database works correctly and if data integrity is protected. In addition, you should exclude from the tables all possible data repetitions (normalization).

5.5. Add Data and Create Other Database Objects

If the table structures meet the existing requirements, then you can start entering all data. You can then create any queries, forms, reports, macros and modules. But you should also have in mind that any attempt to input full-scale data at this stage may result in wasted time.

To **create forms**, you can either:

- use Template Wizards; or
- manually add various control elements.

Do not create any special forms until the data (table) structure is well established. Correlation between form field names and table field names.

Creating the **Main Switchboard**.

5.6. Use the Analysis Tools in Microsoft Access

Microsoft Access offers two useful tools to improve your database structure.

Table Analysis Wizard reviews a table, offers a new structure and relationships for it, if necessary, and redesigns it.

Performance Analyzer examines the entire database, gives recommendations on how to improve it and implements these recommendations.

6. Special Issues

Creating Additional Menus and Special Help

Protecting Your Database. Hiding objects in the database window. Setting a password; user-level protection.

Shared Access to Your Database

Using Your Database in a Network Environment

If your computer is connected to a network, several users can have simultaneous access to your database.

Shared Access to the Entire Database

You can put your entire database on a network server or a public folder. This is the easiest way. Everybody will use the same data and apply the same forms, reports, queries, macros and modules. This is convenient when all users must use the database

in a similar way or when it is impossible to support those users creating their own objects.

Shared Access to Database Tables Only

You can put on a network the tables only and store the other database objects on user computers. In this case, access to the database will be faster as only data will be transmitted via the network. Users can modify forms, reports and other objects according to their specific needs without having any impact on the other users.

A Database Separation Wizard is used to separate tables from other database objects.

Creating a Replica of Your Database

When two computers, e.g. a desktop PC and a notebook, are used, it is possible to use the Microsoft Windows Portfolio to create replicas of a Microsoft Access database and synchronize these replicas. In this case, users in different locations will be able to simultaneously operate with their copies and then synchronize them via the network.

New Features in Microsoft Office

Many new features are shared by all users of Office 2000 programs. One of most important advances toward seamless Web collaboration is the improvement in creating and publishing HTML documents. Office 2000 provides many new Web-oriented improvements that provide a pathway for users to cross between current, often obscure, Web technologies and the more user-friendly environment required by today's audience.

Some of the improvements that are more obvious to Access users involve the Office workspace and the Windows desktop. Here are some examples of these improvements.

1. The new clipboard you to collect and paste up to 12 items.
2. Much more help is available in Office 2000. The Help topics are now in HTML format with hyperlinks that jump to other information.
3. All the Office 2000 programs are now Year 200-compliant
4. Menus are personalized. Office 2000 applications monitor usage patterns and personalize themselves for you by displaying just the commands you use often and hiding the ones you do not.

New features in Access 2000

1. The Database window has been rearranged

2. New Object – Data Access Page

- A data access page is a Web page that is connected to a Microsoft Access database
- In order to display a data access page, the user must be using Internet Explorer 5.0 or higher.
- A data access page is stored in a folder outside the database and has .htm file extension.

3. New features in Table

- The related data is displayed in a subdatasheet, which can be easily displayed. If the records shown in Datasheet view display a plus sign at the left end of the row, there is additional information in another table in the database that is related to that record.
- You can have as many subdatasheets expanded, as you want.

4. New features in Report

- Access 2000 offers a new type of report called a report snapshot. A report snapshot is a separate file with the .snp extension that contains a copy of every page of an Access report.
- You can send the report snapshot to others in electronic mail.

5. Unicode format

Creating Databases with Access 97

- There are no problems while creating database in Russian, because string data is stored in Unicode format.