A Tutorial on MS Access

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1. Goals

This tutorial is for students to learn and practice basic database operations with MS Access. Particularly, after the tutorial, students will know the basics of:

- How to define tables in MS Access;
- How to create forms for data browsing and data entry;
- How to customize a form for better user/data interaction;
- How to create SQL/queries for search and retrieval.

2. Data

In this tutorial, we will work on two tables, i.e., Department and Employee, as shown in Figure 1. There is a one-to-many relationship between Department and Employee. That is, a department can have multiple employees while each employee belongs to one department (through the foreign key DNO).

One possible database state for the COMPANY relational database schema.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

Figure 1: Two Tables

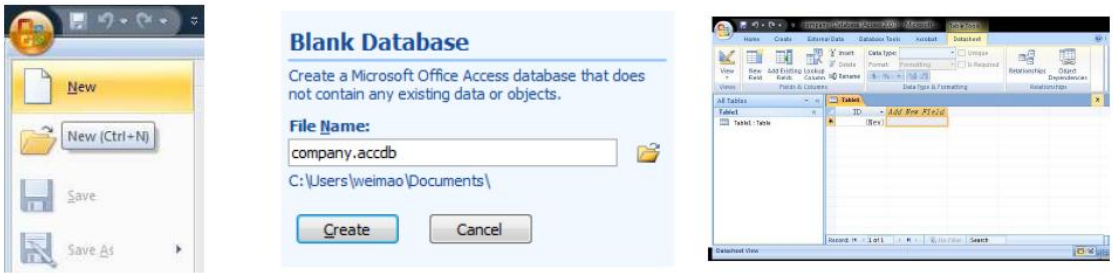
3. Database Creation

3.1. Start MS Access

To start Access, select START -> All Programs -> Microsoft Office -> Microsoft Office Access 2007.

3.2 New a Database

Now follow Figure 2 (a), (b), and (c) to create a new blank database. Please close the Table1 automatically created (shown in Figure 2 (c)).

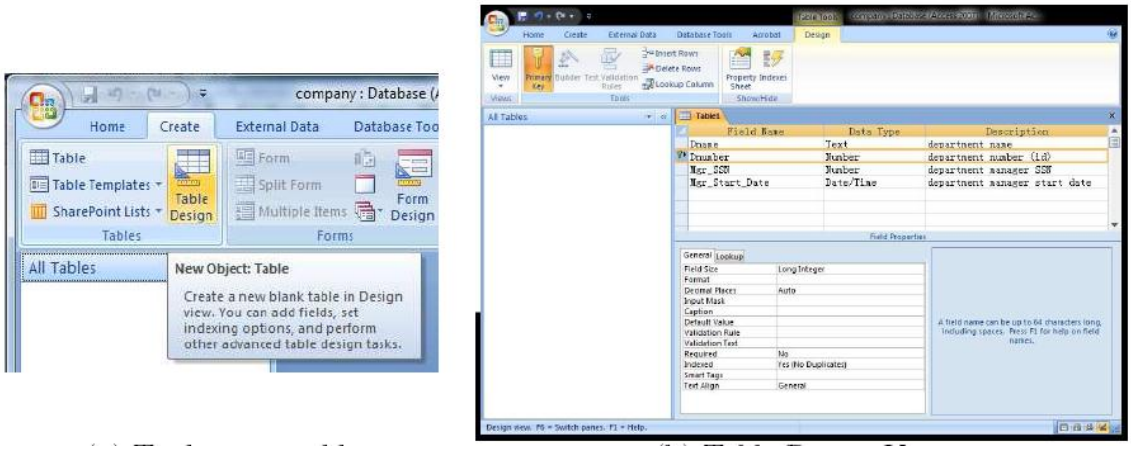


(a) To new a database (b) Database name & path (c) Database created

Figure 2: New Database

4. Table Definition

Now follow Figure 3 (a), (b) to create and define a new table, e.g., the Department table. To define a primary key, select the filed/attribute you want and click the Primary Key button, as shown in Figure 3 (b).



(a) To design a table (b) Table Design View

Figure 3: Table Definition

To decide what data type you should use for each field, look at Table 1 for basic data types in MS Access and Table 2 for various Number types in Appendix.

After you are done with the table design, click the Save button or simply press Ctrl + S to save the design. Now you can click the Home tab and then the View button for browsing and/or entering data, as shown in Figure 4.

5 Relationship and Constraint Definition

Select the Database Tools tab and then click on the Relationships button. When shown a popup window with a list of tables, select each table at a time and click Add button to include both tables in the relationships view, as shown in Figure 5. Close the popup window.

Now, to define a relationship between two tables, drag the related field from one table to the other. For example, table Employee should have a foreign key referring to Department. Hence, we can drag the field DNo of table Employee to the field DNumber of table Department. Now, the system will pop up an Edit Relationships window, shown in Figure 6 (a), which allows you to select additional options,

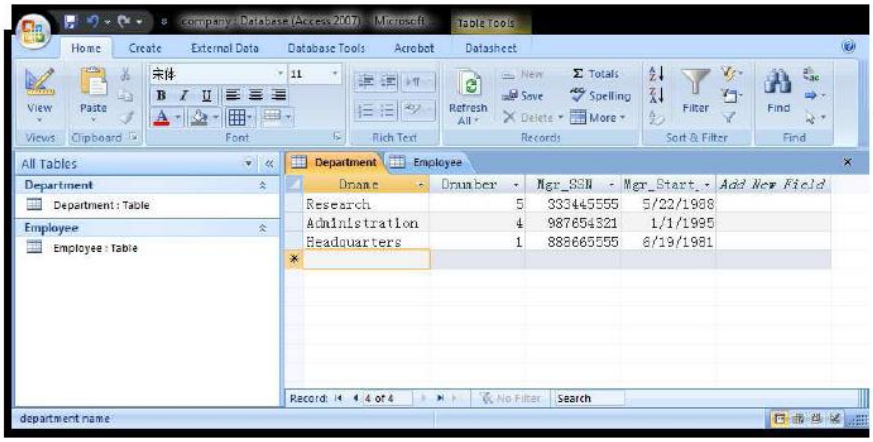


Figure 4: Table Data Browsing/Entry

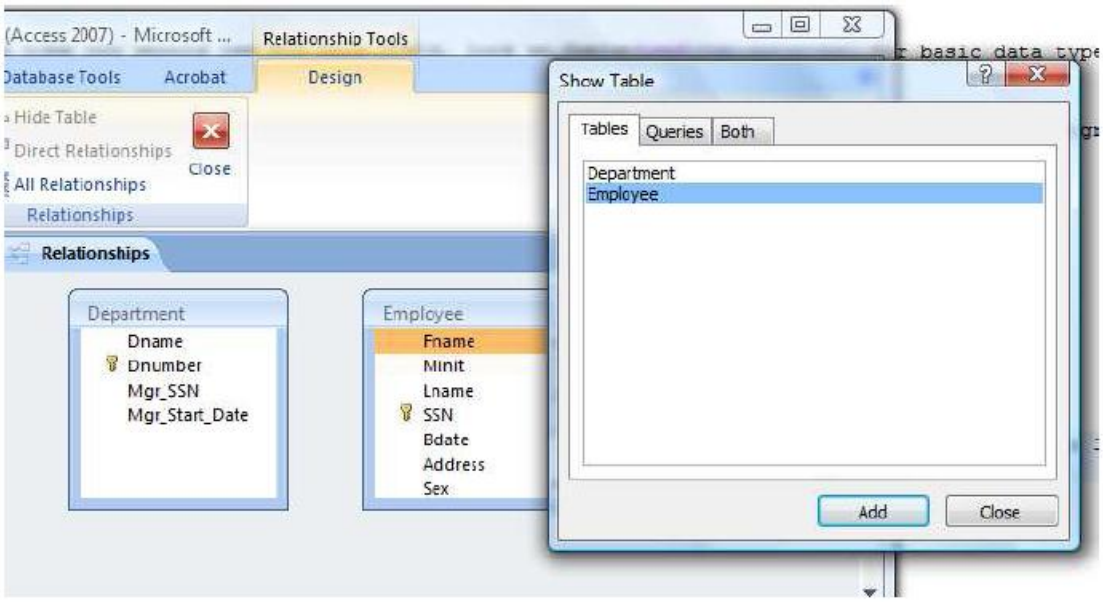


Figure 5: Add Tables to Relationships

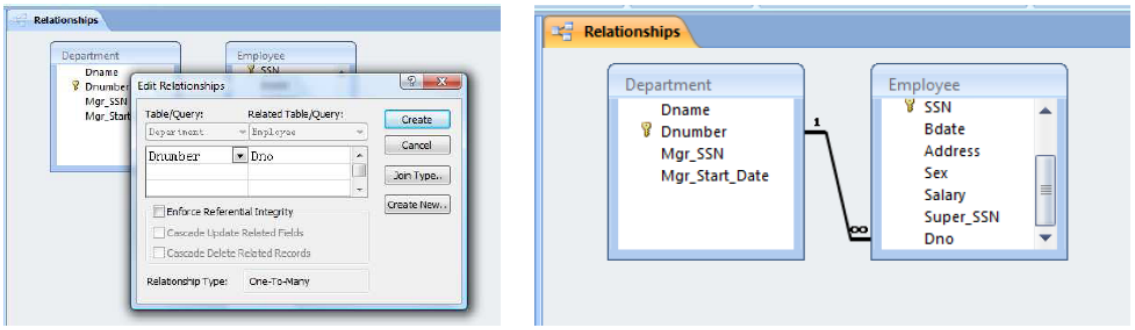
e.g., for referential integrity (foreign key constraint) and cascading update/delete (triggers). Please check the Enforce Referential Integrity option only and click the Create button. Figure 6 (b) shows a defined relationship between Department and Employee. Click the Save button or press Ctrl + S to save. Close the Relationships view.

6. Forms

Form is a useful tool for data browsing and manipulation. It provides various tools for the design/customization of user-data interactions. Forms can run on Tables directly, or on Queries, which we will discuss in Section 7.

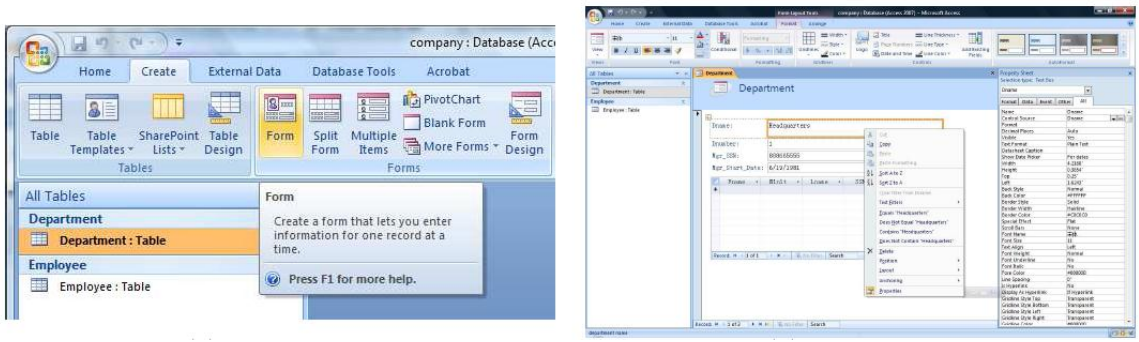
6.1 Form Basics

The easiest way to create a form is to use the automatic form tools or wizards. As shown in Figure 7 (a), select the table (or query) you want the form to be based on and click the Create -> Form button. Figure 7 (b) shows a form thus created based on the Department table. Click the Save button or press Ctrl + S to save the design. Click the View button (to the very left) to browse existing data. Note that on the Department form just created, related Employee records are also attached – the system knows the one-to-many relationship we defined earlier. Once a form is opened, you can switch between three views by using the View button, e.g., the Form view (which shows data and allows user interactions), the Design view (which allows you to redesign the form), and the Layout view (which offers both interaction and design functionality).



(a) To define a Relationship (b) Relationship defined

Figure 6: Relationships of Tables



(a) Form wizards (b) Form created

Figure 7: Creating Forms

6.2 Form Customization

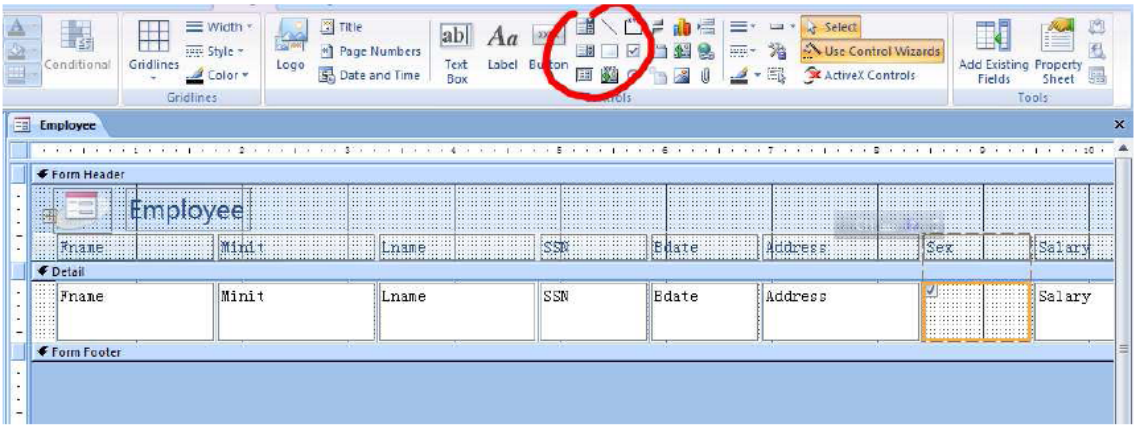


Figure 8: Form Design View

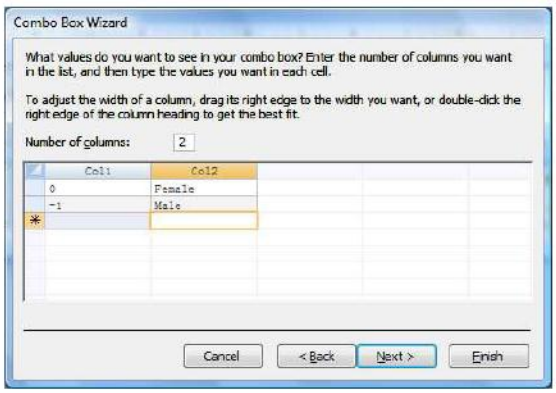
Forms provide much richer tools for user-data interaction. For example, in the Employee table, we use data type Yes/No for the Sex field. Technically, this is okay and saves data space. However, it is not intuitive (and not making sense) to use Yes/No to represent Male/Female in the data view.

A better alternative to this is, without changing the data type, to show Male/Female to the user and to allow the user to select Male or Female in data entry. Now let's see how we can use Form to do this.

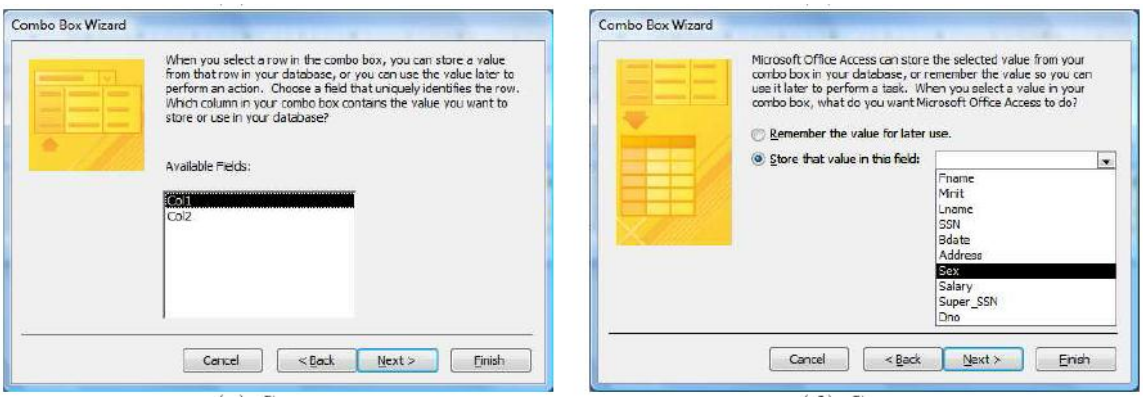
1. select the Employee table in the list of tables;

2. select the Create tab and then the Mulitple Items form button;

(a) Step 1



(b) Step 2



(c) Step 3 (d) Step 4

Figure 9: Redesign the Sex Field with a Combo

3. now a form based the Employee table has been automatically created, shown in Figure;

4. click Home -> View -> Design View so that we can modify the form design;

5. Redesign the Sex field:

(a) remove the Sex field (check box) from the form;

(b) add a Combo Box (Form Control, from the red circled in Figure 8) in the form Detail area:

i. first, toggle select the Combo Box button;

ii. second, drag a (combo) box in the Detail area of the form;

(c) folow Figure 9 (a), (b), (c), and (d) to use a Combo Box for the Sex field;

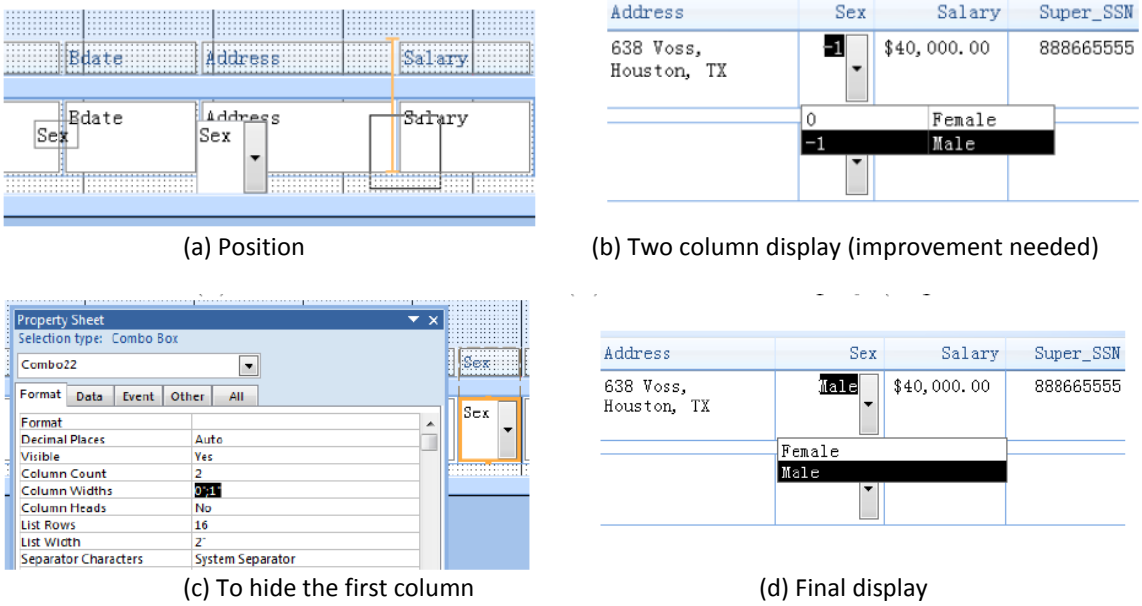
Move the Sex field (Combo Box) to a proper position (Figure 10 (a)). Now, if you switch to the Form view, the Sex field shows both the codes and labels (Male/Female) – still not what we expected (Figure 10 (b)).

Now, switch back to the Design view, select the Combo Box of the Sex field, click the Property Sheet button (top right), and change the Format -> Column Widths option to 0”; 1” (set the width of column 1 to 0 to hide it), as shown in Figure 10 (c). In the final display (Figure 10 (d)), only sex labels (Male or Female) are shown.

6.3 Easier Approach

There is an easier way to customize the Sex field with the table design view. First, open the design view for table Employee and then select the Sex field. On the properties panel (bottom), select the Lookup tab and enter the following property values:

- Row Source Type: Value List
- Row Source: 0; Female; -1; Male



(a) Position

(b) Two column display (improvement needed)

(c) To hide the first column

(d) Final display

Figure 10: Combo Box: Final Adjustment

- Bound Column: 1
- Column Count: 2
- Column Widths: 0";1"

Now when you switch to the Datasheet View or create a new form based on the table, the system will automatically use a Combo Box (with Male/Female labels) for the Sex field.

7. SQL Queries

Now let's assume that we need to retrieve all employees (Names and SSNs) in the department named Research, in the order of their last names.

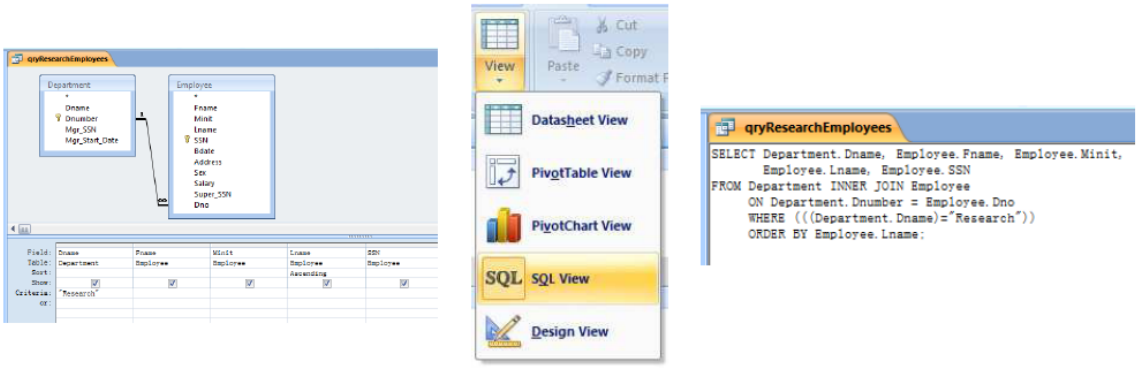
To create a query, click Create -> Query Design. Add both Department and Employee tables to the query design view. Because we've already defined the relationship between Department and Employee, a JOIN statement is automatically generated (i.e., the two tables are connected, as shown in Figure 11 (a)). Drag fields (to project Department.Dname, Employee.Fname, Employee.Lname, Employee.SSN) to the grid area. Put "Research" in the criteria for the Dname field and set the Sort property of the Lname field to "Ascending." (see Figure 11 (a)) for detail.

After query definition, you can click the Save button or press Ctrl + S to save it. Now you can switch between multiple views, as shown in Figure 11 (b). To see/edit the SQL script of the query, click SQL View and the codes will be shown (Figure 11 (c)).

To run the query, click the Datasheet View shown in Figure 11 (b).

8. Documentation

To document all you have created, click Database Tools -> Database Documenter. As shown in Figure 12, you can select tables, queries, forms, and relationships (under the Current Database tab) to generate a report. When the report is shown, you can export it to various formats including RTF (as shown in Figure 13).



(a) Query Design (b) Views (c) SQL View

Figure 11: Query Definition

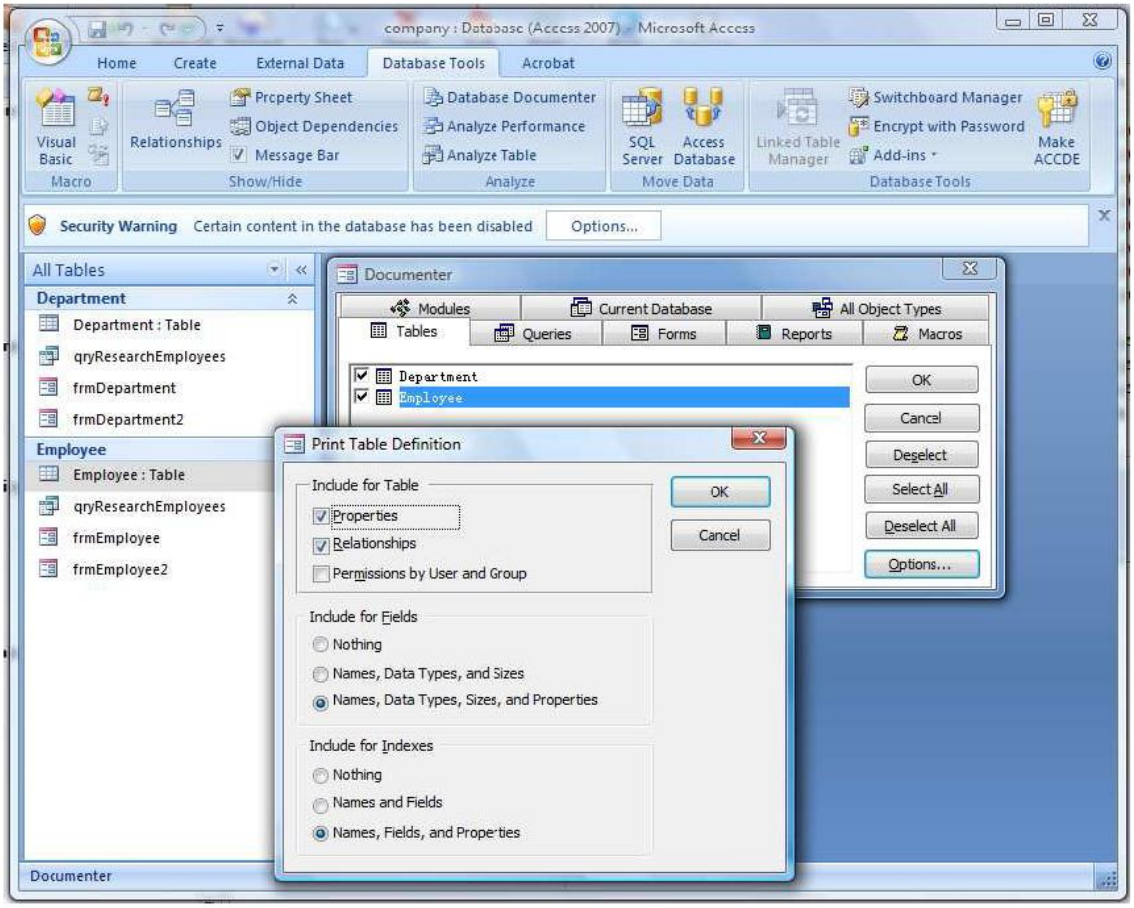


Figure 12: Database Documenter

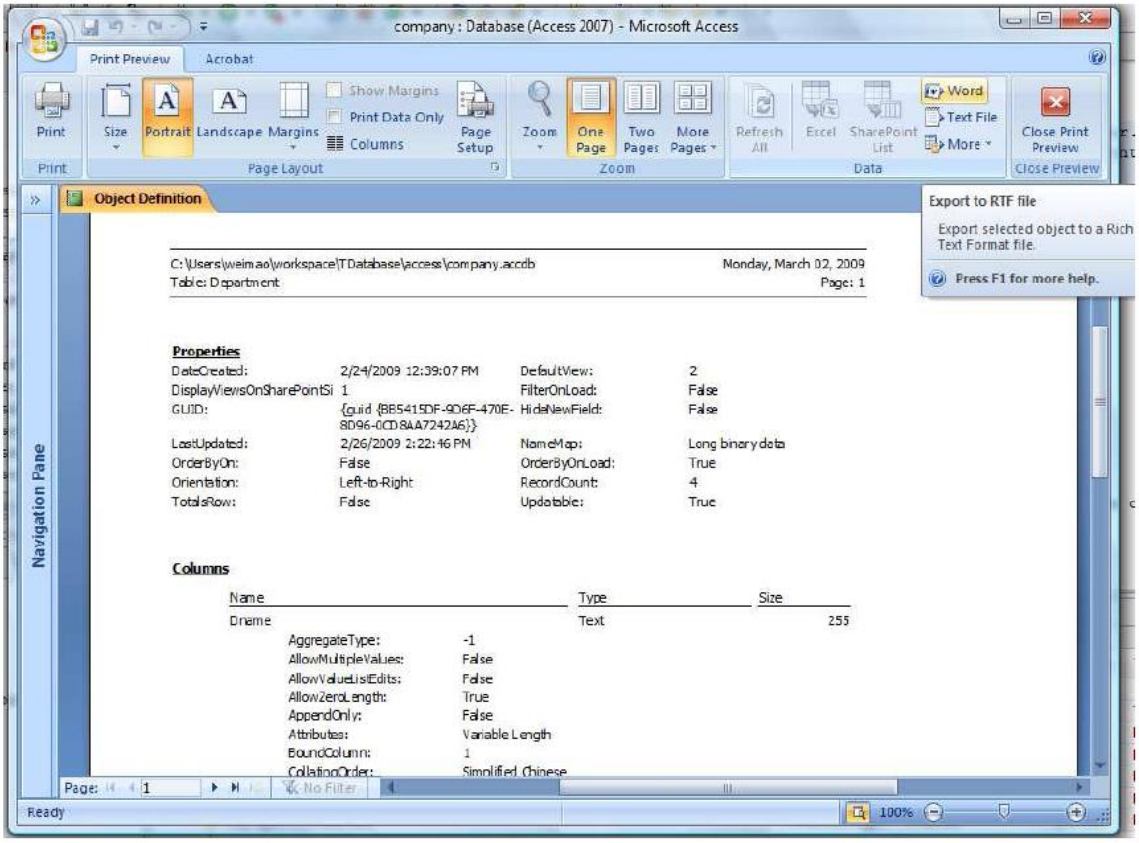


Figure 13: Database Documenter - Report Export

Appendix

Setting	Type of Data	Size
Text	(Default) Text or combinations of text and numbers, as well as numbers that don't require calculations, such as phone numbers.	Up to 255 characters or set by FieldSize, whichever is less.
Memo	Lengthy text or combinations of text and numbers.	Up to 63,999 characters.
Number	Numeric data used in mathematical calculations.	1, 2, 4, or 8 bytes
Date/Time	Date and time values for the years 100 through 9999.	8 bytes
Currency	Currency values and numeric data, accurate to 15 digits on the left side of the decimal separator and to 4 digits on the right.	8 bytes
AutoNumber	A unique sequential number or a random number for a new record. Can't be updated.	4 bytes
Yes/No	Yes and No values (Yes/No, True/False, or On/Off).	1 bit

Table 1: Some Data Types in MS Access

Setting	Description	Decimal precision	Storage size
Byte	Stores numbers from 0 to 255 (no fractions).	None	1 byte
Decimal	Stores numbers from $-10^{28} - 1$ through $10^{28} - 1$ (.mdb,.accdb)	28	2 bytes
Integer	Stores numbers from −32, 768 to 32, 767 (no fractions).	None	2 bytes
Long Integer	(Default) Stores numbers from −2, 147, 483, 648 to 2, 147, 483, 647 (no fractions).	none	4 bytes
Single	Stores numbers from −3.402823E38 to −1.401298E − 45 for negative values and from 1.401298E − 45 to 3.402823E38 for positive values.	7	4 bytes
Double	Stores numbers from −1.79769313486231E308 to −4.94065645841247E − 324 for negative values and from 4.94065645841247E − 324 to 1.79769313486231E308 for positive values.	15	8 bytes

Table 2: Number Types in MS Access