

Microsoft Access in the Questioned Document Laboratory

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Microsoft Access is a readily available database program suited to assist questioned document examiners with extended writing cases, especially those involving voluminous exhibits. Questioned and known samples are scanned into a Microsoft Access database table. Access sorts the handwriting characters into charts and organizes the groups into the questioned and known samples. Once the database table is populated, an infinite variety of comparison charts are easily prepared. Charts may be used for the examination process and as demonstrative evidence. As an example, Microsoft Access is capable of easily preparing a comparison chart of all the words which end with "ing," all the words which begin with a "B," and all the words containing "th." Any characters or combinations of characters are easily sorted and printed in a comparison chart. In addition to organizing voluminous exhibits, the program's flexibility allows the examiner to remake charts on the eve of trial in cases in which some of the exhibits cannot be used in trial.

Forensic document examiners are often called upon to compare documents containing extended handwriting. Extended handwriting may include threatening letters, bank robbery notes, holographic wills, suicide notes, and anonymous letters. These examinations are often complicated by the lack of known handwriting specimens in the same wording as the questioned document. The document examiner is compelled to manually search known specimens for comparable characters.

Document examiners have traditionally examined such documents by spreading them out and performing a side-by-side comparison. The examiner manually searched for and visually compared similar letter combinations between questioned and known specimens. Some examiners prepared photographs of the documents and cut out similar words and letter combinations for side-by-side comparison. These procedures were time consuming and increased the probability of overlooking an important feature of the handwriting. The advent of the photocopy machine facilitated the process of reproducing copies of documents for cutting and arranging the excerpts of questioned and known specimens.

The personal computer, flat bed scanner, and digital image processing software further eased the process of arranging similar words and letter combinations for side-by-side comparison. The

questioned document and known specimens were scanned into a computer. Images were manually searched and cut-and-pasted into handwriting charts using a digital image processing program such as Adobe PhotoShop or PhotoShop Elements. However, searching for the same words and letter combinations remained a manual process. The 1st automatic program was introduced a few years ago by Pikaso software with its Write-On program¹.

This article describes another procedure to automate the comparison process by generating handwriting comparison charts from an inexpensive computer database program. The software used in this project was Microsoft Access 2003, a readily available database application.

Microsoft Access is widely used in business, industry, and government. Several step-by-step tutorials are available, and Access classes are taught in many communities^{2,3}.

Databases usually contain several tables which are linked or related through common fields. These applications are described as relational databases. This exercise utilizes a non-relational, or flat, database.

A Microsoft Access handwriting chart is created in several distinct steps. These steps involve the use of the following software applications:

- Digital imaging software, such as PhotoShop or PhotoShop Elements. The image

processing software is used to import the scanned images of the handwriting specimens, crop, adjust the contrast, and save the images in JPEG files other image files.

- Word processing software, such as Microsoft Word or WordPerfect. The word processing program is used to prepare a text file of the wording of the questioned and known specimens to add to the database table.
- Database software, such as Microsoft Access. This program is used to prepare a database containing the images and text of questioned and known specimens. The text and images are sorted and arranged in comparison charts to view on screen or be printed for use in examinations and court.

A Microsoft Access database has the capability to sort scanned images of large numbers of handwriting specimens and locate similar words and letter combinations. The questioned and known images may be arranged for side-by-side comparison on screen or on paper. An endless variety of letter combinations may be depicted using the database.

The Exhibits

The exhibits used in this exercise consist of the following documents:

- Q1 Questioned Document: One page of original hand-printed entries written in pencil and dated Wednesday, November 30, 2004. This document is depicted in Illustration 1.
- K1 Known Handwriting Specimen: A partial page of original hand-printed entries written in pencil. This specimen consists of the wording of the London Business letter. This specimen is depicted in Illustration 2.

Getting Started With Microsoft Access

A step-by-step tutorial for utilizing Microsoft Access in the above case follows.

1. Open Access by clicking the icon on the computer desktop.
2. Click File in the Menu and select New from the drop-down menu. This step is seen in Illustration 3.
3. Access requires that the new database be given a name. This database is named London Letter. Enter the name in the File Name line in the New Database screen, as seen in Illustration 4. If a name is not selected, Access will name the database db1, db2, etc.

4. The opening screen of the London Letter database file will resemble Illustration 5.

5. Refer to the left side of the opening screen as depicted in Illustration 5. Four objects are used in questioned document cases:

- Tables. The Access storage area or filing cabinet. This is where all the data and images are maintained for use in the database.
- Forms. The fill-in-the-blank computer form used to speed the entry of data and images into the table. While no form was created for this exercise, it is a good idea to use forms in voluminous cases, especially if one intends to utilize clerical assistance in the data entry process.
- Queries. The Access component used to sort and arrange the data and images.
- Reports. The handwriting chart used to display the images and data. The report may be viewed on-screen or printed and used for examination notes or courtroom charts.

6. The 1st step is to prepare a table. Select Tables in the Object column. The table contains all the scanned images of the handwriting specimens. The table also contains the information regarding the exhibit number. Exhibit numbers are assigned by the document examiner and designate the scanned image as a questioned or known specimen.

Preparing a Database Table

7. Microsoft Access stores data in fields. The fields are contained in a table.

8. Referring again to Illustration 5, the right side of the opening screen displays 3 ways to prepare a database table. These choices are:

- Create a table in design view. Design view creates a custom table to fit the individual needs of the user. The table used in this exercise will be created in design view.
- Create a table using wizard. The wizard guides the user in the preparation of a table utilized in many commonly applied database applications; for example, an address or contact list, a photography log, a wine list, a diet list, a database of a collection of books, memorabilia, log of cases, property room items, homeowners association members, and many other collections of data.

WEDNESDAY 11-3-01
 SCORE 140 4th Ave W
 LOB-8702
 What info will bank need?

 How to obtain complete financial picture of present operation?
 Mike - Retail - Wholesale - Market
 Skip - Project management for DePort
 Bob - tax work - oil company
 Paid 1.3 Million
 Offered 3.4 Million
 Selling Price ① look up assessed value & point out
 ② Retain duty - ~~tax~~ for him to get tax returns
 ③ Profit
 Real estate taxes - what is he paying in RE taxes
 ④ City duty - is it zoned for MHA Park - what is the zone -
 ⑤ All the cond. - what was paid
 ⑥ Assessed value

Illustration 1.

Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Zermatt St. and then goes to Turin and Rome and will join Col. Parry and arrive at Athens, Greece, Nov. 27th or 2 Dec. 2nd letters there should be addressed: King James Bld. 3580. We expect Chas. E. Fuller Tuesday, D. L. McQuaid and Robt. Unger, Esq., left on the "X. Y." Express tonight.

Illustration 2.

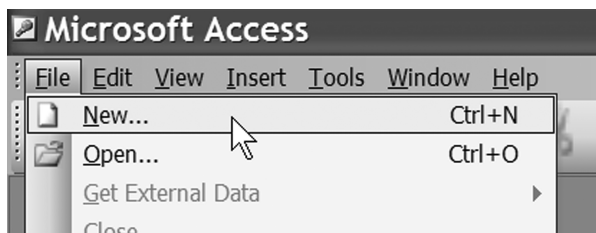


Illustration 3.

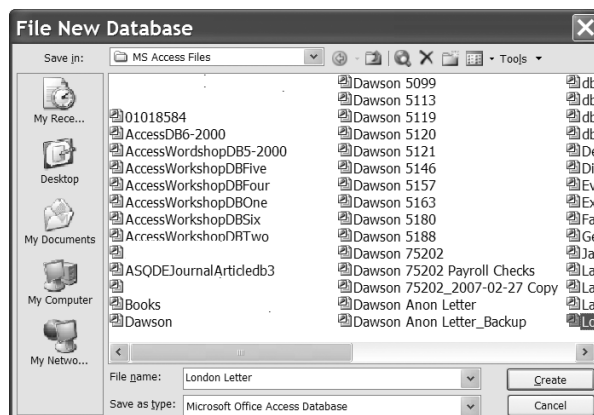


Illustration 4.

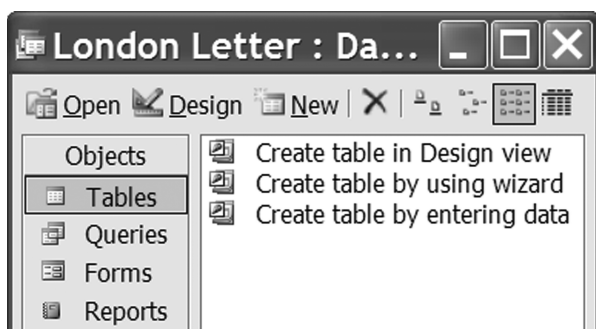


Illustration 5.

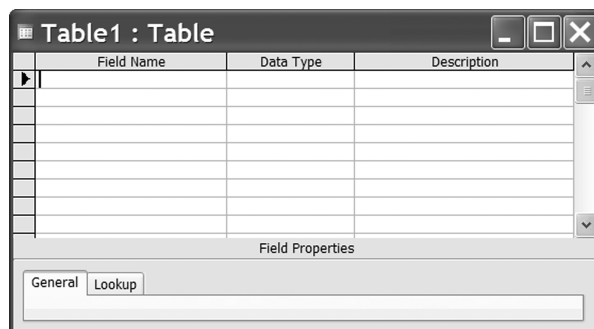


Illustration 6.

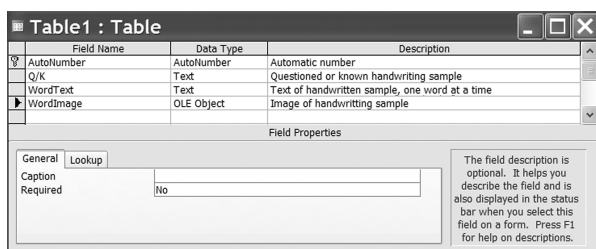


Illustration 7.

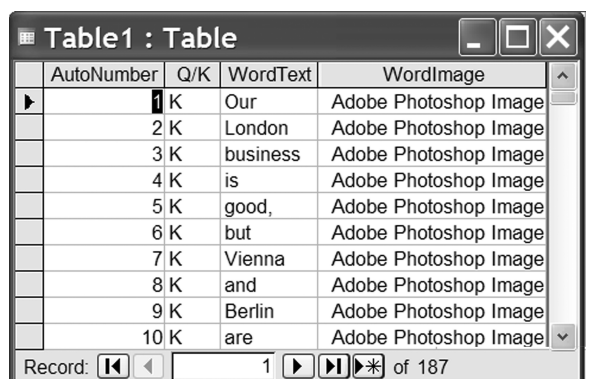


Illustration 8.

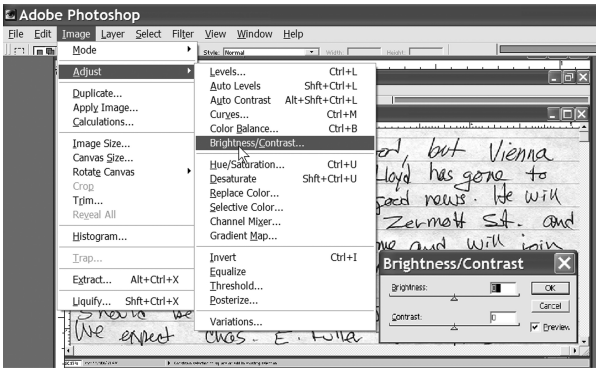


Illustration 10.

Table1 : Table				
	AutoNumber	Q/K	WordText	WordImage
▶	1		Our	
	2		London	
	3		business	
	4		is	
	5		good,	
	6		but	
	7		Vienna	
	8		and	
	9		Berlin	
	10		are	
	11		quiet.	
	12		Mr.	
	13		D.	
	14		Lloyd	
	15		has	
	16		gone	
	17		to	
	18		Switzerland	
	19		and	
	20		I	
	21		hope	
	22		for	
	23		good	
	24		news.	
	25		He	
	26		will	
	27		be	
	28		there	
	29		for	
	30		a	

Illustration 12.

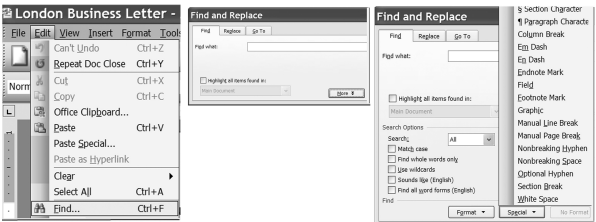


Illustration 11.

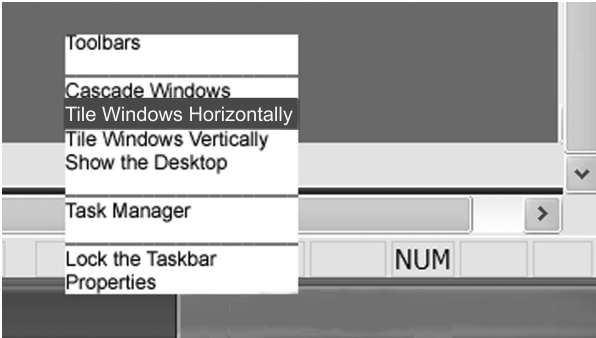


Illustration 13.

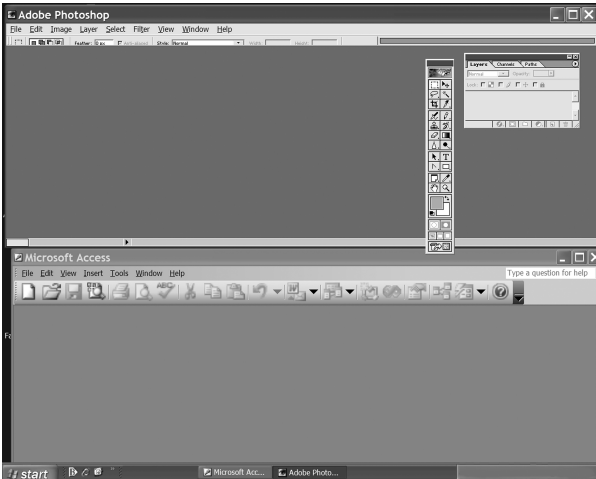


Illustration 14.

- **Number.** Used when the numbers are intended for computation, such as adding or subtracting. Otherwise, numbers are treated as text. Exhibit numbers, check numbers, telephone numbers, and zip codes are treated as text. A case log with a field containing the number of exhibits submitted would be treated as a number so that the number of exhibits can be added up later for statistical purposes.
- **Date/Time.** For date and time.
- **Currency.** Used for money.
- **AutoNumber.** Sequentially numbers records.
- **Yes/No.** A choice of yes or no.
- **OLE.** Object linked embedded, in document cases will indicate an image of handwriting, typewriting, or other items on documents.
- **Hyperlink.** Links to a web site.
- **Lookup Wizard.** Allows the user to create a drop-down list of entries to insure accurate repetitive entries.

Input Mask

An input mask allows the user to create a form within the database field for certain types of data such as dates and telephone numbers. The same date may be written in several patterns, "12/20/07," "12/20/2007," or "December 20, 2007." An input mask insures that dates are entered in the same pattern. A uniform pattern for these entries allows Access to search the fields for the information requested by the user. An input mask may be used for data types such as text, number, date/time, and currency. The input mask is accessed in the General tab under Properties in the lower half of the screen. Select the General tab and click in the cell adjacent to Input Mask. This opens a small box with several dots to the right of the Input Mask cell. A click in this box will activate the Input Mask Wizard. The wizard guides the user in selecting an input mask.

Lookup Wizard

The Lookup Wizard allows the user to establish a list from which an entry may be selected. Document examiners will find this helpful in establishing a database in voluminous cases such as large embezzlements. If funds were embezzled from 10 different checking accounts, the Lookup Wizard prepares a drop-down list of account numbers. The account number needed is selected from this list. This eliminates repetitive typing. The

same process may be used for any entries which must be entered many times, such as names of cities in voter fraud cases.

Fields and Records

Referring again to Illustration 8, the horizontal rows in this table are records. Each record contains data regarding a single item. In this exercise, the item is a handwritten word from a questioned or known specimen. The vertical columns are fields and contain similar data from each record. One field indicates whether a handwritten entry is a questioned or known specimen. Another field contains the wording of the specimen. Still another field pinpoints the location of the specimen. Another field contains an image of the specimen.

It is important to remember that Access sorts fields. The program cannot read the images of handwritten specimens. The fields containing the text of the images are sorted.

A database designed for a check case requires a number of fields to record the data. A sample check is contained in Illustration 9.

Referring to Illustration 9, a check case should contain the following fields:

- The account number
- The date
- An image of the handwritten date
- The text of the payee
- An image of the handwritten payee entry
- The amount of the check
- An image of the handwritten numerical amount
- The text of the written amount
- An image of the handwritten written amount
- The text of the memo entry
- An image of the handwritten memo entry
- The text of the signature
- An image of the handwritten signature
- The text of the endorsement
- An image of the handwritten endorsement

Cases containing hundreds of questioned checks are commonly submitted to questioned document laboratories and frequently involve multiple accounts, several suspects, the possibility of multiple authors on each check, and multiple jurisdictions. In a voluminous case such as this, it is relatively easy to design a database to allow the examiner to produce handwriting charts sorted by exhibit number, by date, and grouped

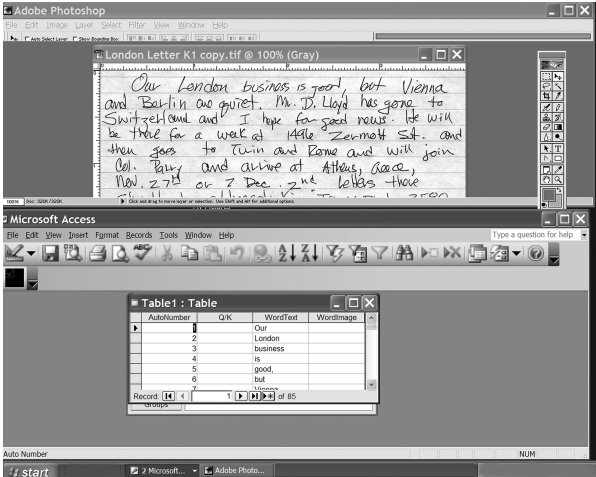


Illustration 15.

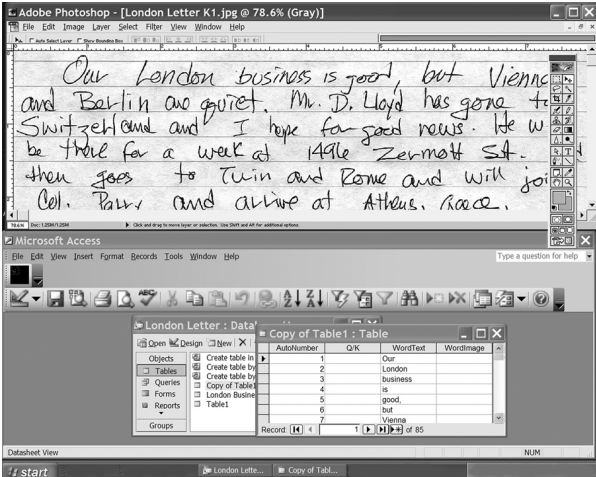


Illustration 16.

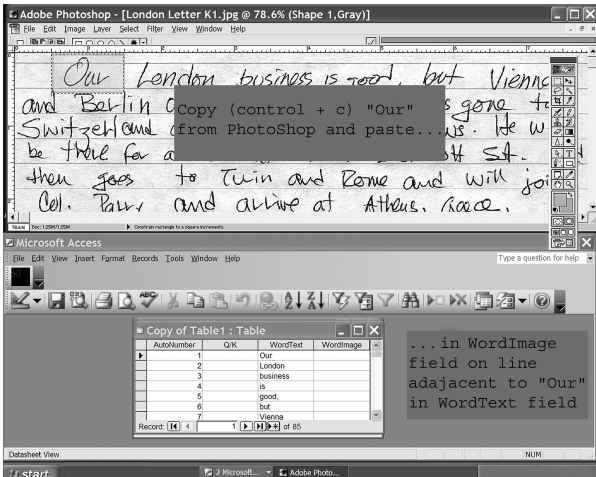


Illustration 17.



Illustration 18.

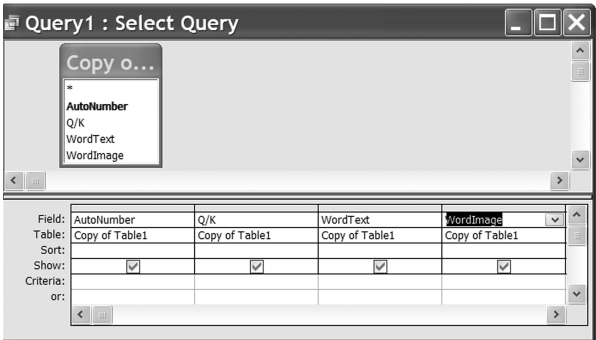


Illustration 19.

for each jurisdiction. If an exhibit is not admitted into evidence, new charts may be prepared in a few minutes.

Scanning Images in Adobe PhotoShop

Images of the questioned and known handwriting specimens are scanned into the digital image processing program, Adobe PhotoShop, in the following steps:

1. Place the documents on a flat bed scanner and scan them into PhotoShop at 300 dpi resolution.
2. Save the images as JPEG files in PhotoShop.
3. Duplicate the JPEG files. The duplicate files will be used in this project.
4. Adjust the image files for contrast and brightness in PhotoShop, as shown in Illustration 10.

Creating a Microsoft Word File of the Text

Next, type the text of the questioned and known specimens in a Microsoft Word file. Enter the text into the WordText field of the database table in the following steps:

1. Open Microsoft Word, type the text of the questioned and known documents into a Word document, and save.
2. Use the Find and Replace function to replace all white spaces with line breaks. These steps can be seen in Illustration 11.
3. This will configure the Word document into a 1-word column.
4. Select and copy the text in the File menu in Word.

Transferring the Text to the Database Table

Next, transfer the text of the questioned and known specimens to the database table in the following steps:

1. Open the Microsoft Access database to Table 1.
2. Place the cursor in the WordText field at the top of the table. This activates a black arrow.
3. Click the black arrow to highlight the field.
4. Open the Edit menu. Highlight and click Paste Append from the drop-down menu.
5. This transfers the text of the questioned and known documents from Microsoft Word to Table 1 in Microsoft Access.

6. The WordText field should resemble Illustration 12.
7. The text of the questioned document has been entered in the WordText field of the Access database table.
8. This process is repeated with the known text. The London Letter database contains 187 records, or 187 words.

Transferring the Images to the Database

Next, enter the scanned images of the questioned and known specimens into the database table in the following steps:

9. Open PhotoShop to the scanned image of the questioned document.
10. Open Access to Table 1.
11. Configure the computer desktop to display PhotoShop and Access at the same time utilizing the Tile Windows Horizontally function in Windows.
12. Right click in a clear space on the taskbar at the bottom right of the computer screen. Select Tile Windows horizontally. This step is contained in Illustration 13.
13. Arrange the window sizes for PhotoShop and Access to resemble Illustration 14.
14. In PhotoShop, open the image file containing the known specimen as seen in Illustration 15.
15. Arrange the known specimen image large enough for comfortable viewing. It is suggested that the image be enlarged to the full width so all the writing may be observed from border to border.
16. In Access, open the London Letter file. Highlight Table 1 and click Open in the London Letter window.
17. The 2 programs with the open files should resemble Illustration 16.
18. The size of the largest word in the handwriting specimens was measured and found to be 0.5" high and 1.5" wide.
19. In PhotoShop, activate the rectangular marquee tool in the tool pallet. Draw a box approximately 0.5" tall and 1.5" wide around "Our," the 1st word in the known specimen.
20. Copy "Our" from Photoshop using ^C (Control + C).
21. Paste the copied image in the WordImage field of Access. Place the cursor in the WordImage

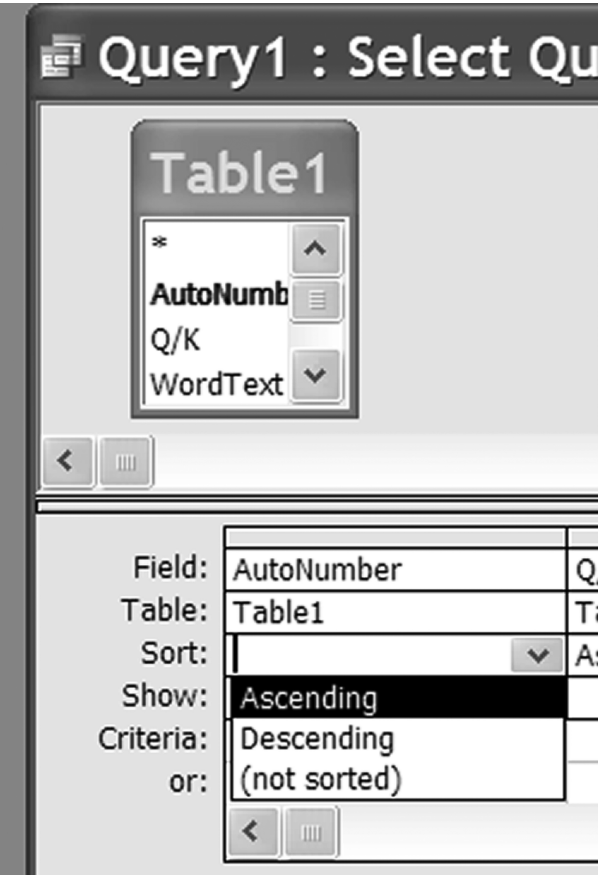


Illustration 20.

Field:	WordText
Table:	Table1
Sort:	
Show:	☒
Criteria:	Like "*th*"
or:	

Illustration 21.

Query1 : Select Query			
AutoNumber	Q/K	WordText	WordImage
90	Q	4th	Adobe Photoshop Image
175	Q	the	Adobe Photoshop Image
179	Q	the	Adobe Photoshop Image
28	K	there	Adobe Photoshop Image
37	K	then	Adobe Photoshop Image
51	K	Athens,	Adobe Photoshop Image
59	K	there	Adobe Photoshop Image
54	K	27th	Adobe Photoshop Image
82	K	the	Adobe Photoshop Image
* AutoNumber)			
Record: 1 of 9			

Illustration 22.



Illustration 23.

Report2 : Report			
Page Header			
Detail			
Page Footer			

Query1 th

AutoNumber
Q/K
WordText
WordImage

Illustration 24.

field on the same line as the WordText field containing the "Our" entry.

22. Paste the PhotoShop image into the table with the Control + V (^V).
23. Continue this process until images of all of the characters in the known and questioned specimens are transferred to the database.
24. Punctuation marks should be included with the adjacent words. Punctuation marks may be entered separately in a larger case.
25. Save the image files in PhotoShop and close the program.
26. Save the database table.
27. The Access database is now populated.

Sorting the Images in Access Queries

The queries function sorts the images and selects the letter combinations to use in a handwriting chart. Set up the query using the following steps:

1. Open a new query in Design view. Click Objects in the database opening screen. Click the Queries option in the Objects list.
2. Double-click Create Query in design view to open the Show Table screen and query grid.
3. Highlight in the Show Table screen and click Add. This transfers all the fields from the table to the query grid. Close the Show Table screen. The query grid should resemble Illustration 18.
4. Double-click the blue title bar of the field list to highlight the list of fields. Click and drag the highlighted list of fields and drop in the query grid. The fields will be distributed in the grid. The grid should now resemble Illustration 19.
5. Now it is time to configure the query grid to sort the images.
6. The query grid sorts from left to right. This means the AutoNumber field will be sorted 1st. Configure the AutoNumber field to sort in numerical order. Move the cursor to the right side of the cell on the Sort line. Click in this area, and click the down arrow. This activates a drop-down list containing the sort choices: Ascending, Descending, and no sort. Select Ascending to arrange the AutoNumber field in numerical order. See Illustration 20.
7. Next, configure the Q/K field. Sort this field in descending order to display the questioned specimens 1st. This is done in the same manner as the previous field. Activate the drop-down list and select Descending in the sort line.
8. Finally, sort the WordText field. In the Criteria line enter the expression, Like "*th*." See Illustration 21.
9. Entering this expression in the criteria will direct the database to sort those words containing the letters "th" and arrange them in order, with the questioned specimens appearing 1st.
10. Put a checkmark in the Show box in each field included in the search.
11. The asterisk is a wildcard expression. The position of the asterisk indicates the relative position of the "th" or any other character or characters in a word. The asterisk may be used in the following expressions.
 - The expression, Like "th*," would sort any word beginning with "th." Examples include "the" and "those."
 - The expression, Like "*th," would sort any word ending in "th." Examples include "month" and "mouth."
 - The expression, Like "*th*," would sort any word containing a "th." Examples include "the," "month" and "8th."
 - The expression, Like "th," would sort any word containing only "th." Examples include "7th" and "8th."
12. After configuring the query grid and entering the proper expressions, click on the exclamation point (!) in the tool bar to run the query. This will open a new table labeled Query 1.
13. Query 1 contains all the entries in the database which fit the criteria in the WordText field query. Query 1 tells the user that 9 words fit the criteria. The entries are sorted in numerical order, with the questioned entries listed before the known entries. The WordText data is linked to an Adobe PhotoShop Image containing the WordImage. The new table should resemble Illustration 22.
14. Save the query as Query1 th. The authors have made a practice of saving the queries with a descriptor such as "th" to assist in identifying the function of each query.

Preparing Handwriting Charts in Access Reports

The final operation is to prepare the handwriting charts in Access Reports by utilizing the following steps:

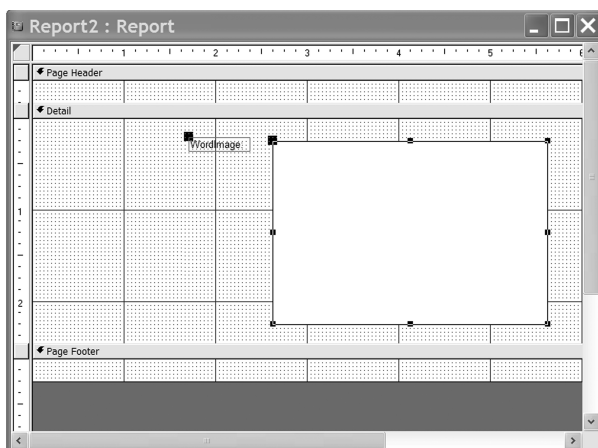


Illustration 25.

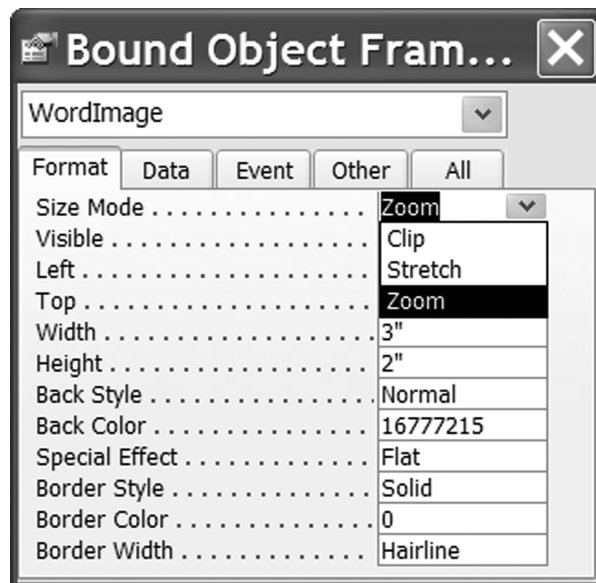


Illustration 26.

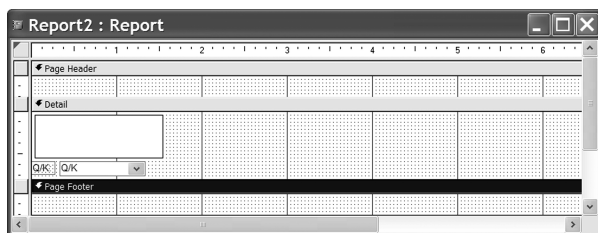


Illustration 27.

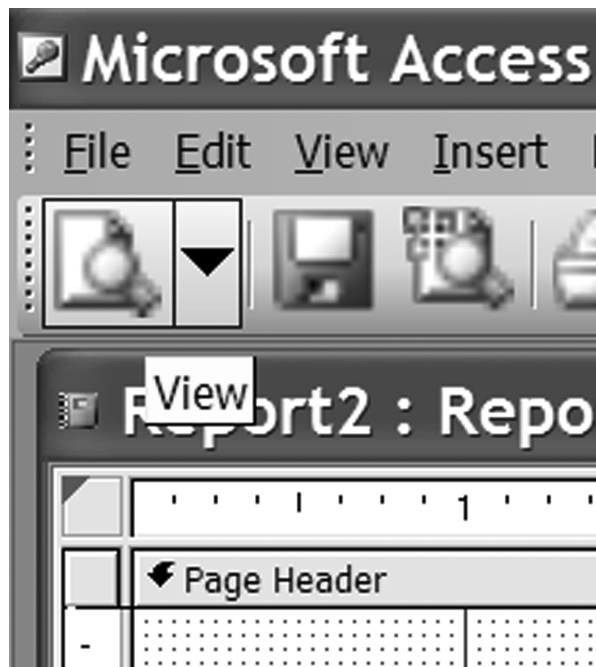


Illustration 28.

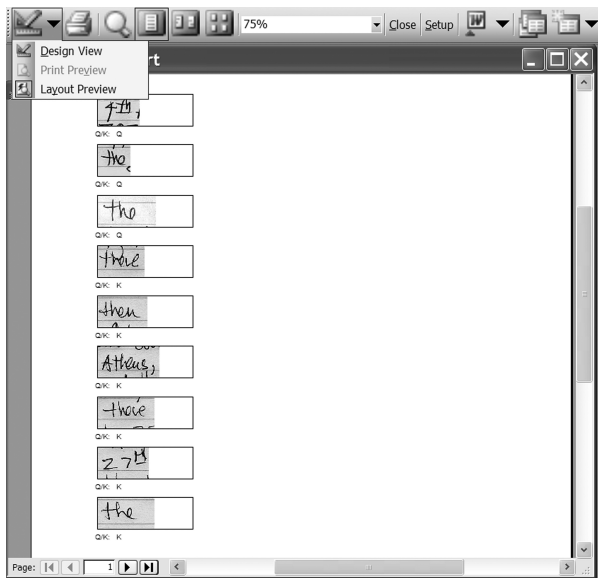


Illustration 29.

1. In Objects, highlight and click Reports.
2. Highlight Create a Report in design view. Click New to open the New Report window.
3. Highlight Design View in the list.
4. Click the arrow on Choose the Table or Query to activate the drop-down list of data sources. Select Query1 th as the data source. The New Report window should resemble Illustration 23.
5. Click OK in the New Report window. This will open the report grid. There will also be a list of the fields in Query1 th. The new report grid will resemble Illustration 24.
6. The report grid allows the user to configure the layout of a report to his personal preference.
7. The Header section contains the title of the report and will be the same on every page of the report.
8. The Detail area contains the images of the questioned and known specimens and the exhibit number.
9. The Footer contains the page number and other information programmed by the user. The footer will appear on every page of the report.
10. The layout of a report will vary with the individual examiner. The layout used in this exercise is our preference for this type of case.
11. Highlight the WordImage field and drag near the upper-left corner of the Detail area of the report grid. The grid now contains a large image area in the shape of a box.
12. The image area also contains a smaller rectangle which is a label attached to the image. The label is needed in some fields but not in the WordImage. If left in the grid, the label would label each image as a WordImage. This label is not needed. Click on the label and remove with the delete key. Illustration 25 depicts the grid with label in place.
13. Click inside the box of the image area. This activates the Bound Object Frame.
14. The Bound Object Frame allows the user to configure the image.
15. Click the Format tab in the Bound Object Frame.
16. The 1st line is the size mode. Click to the right of the entry on this line and activate a drop-down list. Select Zoom from this list. The Bound Object Frame is depicted in Illustration 26.
17. If the images in a finished report are very large or contain only an enlarged portion of an exhibit, go back to design view and check the size mode in the Bound Object Frame. The size mode should be set for Zoom. This is a common mistake in preparing reports
18. In the Bound Object Frame, set the width to 1.5" and the height to 0.5". Change these settings by highlighting and entering the new settings.
19. The image box in the report grid should shrink to the above settings.
20. Items in the report grid may be repositioned. Put the cursor in the small black square or "handle" in the upper left corner of the image frame. The cursor changes into a finger. Click and drag the image frame to the upper left of the detail area of the grid.
21. Putting the cursor on the lines around a frame changes the cursor to a hand. The hand allows the user to drag the frame and the associated label at the same.
22. Highlight the Q/K field in the list and drag to the grid. Position the Q/K field in the upper left of the grid immediately beneath the image frame.
23. Click the page footer bar. The bar turns black. Position the cursor at the top of the bar; the curser changes into an up-and-down arrow. Drag the page footer bar up and position immediately below the Q/K field.
24. Move the bottom edge of the Report window up immediately below the bottom edge of the Footer grid. The Report window should now resemble Illustration 27.
25. Now it is time to view the rough draft of the handwriting comparison chart! Click on the View icon on the tool bar in the upper left corner of the Access screen. See Illustration 28.
26. This will open the preview view of the report. There will probably be an error report advising the section width is larger than the page width. This will be corrected later as the report is fine tuned. Click OK and view the report similar to Illustration 29.
27. To view the entire page of the report, select Fit if the computer displays Zoom in the task bar. Or click View on the menu, scroll down, and click Zoom. Select Fit from the list.



Illustration 30.

28. Click design view in the upper left to return to the grid.
29. Widen the report window until the right edge of the grid is visible. Click and drag the right edge to make the grid 6.5". This will allow a 1" border on each side of the report. This will eliminate the error message when viewing the report.
30. The toolbox icon is a crossed hammer and wrench. Click on this icon to open the toolbox. In the toolbox, select the label tool, "Aa" and draw an elongated box in the header area of the grid.
31. Click in the label box and enter a header for the chart. Enter Questioned and Known Entries Containing "th."
32. Click View to determine the appearance of the header.
33. Click design view to return to the grid and make any corrections needed to the header.
34. Move the header border down just below the bottom of the label box. Go back to the tool box and select the line tool. Draw a straight line from border to border in the header just below the label box. Check how it looks in the view.

35. In the footer, draw another line just below the top edge of the border.
36. Check how it looks in the view.
37. Click on Insert in the menu. Select Page Numbers. Configure the page numbers in the format desired. Position the page numbers in the bottom of the page centered in the footer. Check view to see how it looks.
38. Return to design view.
39. Remove the label associated with the Q/K field immediately below the image. Click on the label and delete.
40. Click in the image frame to open the Bound Object Frame. In the data tab, scroll down and click in the line for border style. Select Transparent from the list. Check view to see how it looks.
41. Click File in the menu and scroll down and select page setup. In the page setup window, select the columns tab. In the grid settings, set the number of columns to 4. Set the column spacing to 0.75". Set the column size to 1" wide and 0.5" height. Set the column layout to across then down and click OK.
42. Check the view to see how the chart looks.
43. Click on File and scroll down and select save. Name the chart Report1 th.
44. The settings in Page Setup may be tailored to the number and size of the images. The user is encouraged to experiment with different settings in the design view grid and page layout.
45. Other charts are easily prepared using the data in Table 1.
46. Prepared another chart to exhibit all the "a" and "A" entries in the exhibits.
47. Configure the page setup for 5 columns. Set the margins for 0.25" on the sides and 0.5" for the top and bottom. Set the grid width for 8". All the exhibits should fit on 1 page with these settings. See this chart in Illustration 30.

Summary

This article explains a method of scanning images of questioned and known handwriting samples to create a database in Microsoft Access. The database may be searched for letter combinations or words and to prepare conventional handwriting comparison charts for both examination purposes and court illustration.

Discussion

Access is ideally suited for preparing reports for examination and court in voluminous cases. One of the authors used Access in a voting case involving nearly 2,000 exhibits. In another case, several thousand questioned time sheet entries were used in a database. In an embezzlement case, over 250 questioned checks were submitted. Once the databases were populated, the queries and reports were easy to prepare.

Access is an excellent program, and training in its use is easy to obtain. There are internet forums, continuing education classes in many community colleges, and tutorials and instruction books are readily available. Document examiners should use the program and gain expertise in preparing relational databases.

Please feel free to contact the authors for suggestions and help.

Endnotes

¹Pikaso Software, Write-On. <http://www.pikaso.com/write-on/main.htm>.

²Wrothwell, Aileen, Editor (2004). *Microsoft Office Access 2003 Step by Step*. Redmond, WA: Microsoft Press.

³*Introduction to Microsoft Access*. Blue Ridge Community College, 180 West Campus Drive, Flat Rock, North Carolina 28731.