# The microcomputer in historical research: accessing commercial databases

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# The Microcomputer in Historical Research: Accessing Commercial Databases

The objective of this essay is to describe the uses to which large automated information files may be put by historians who have access to microcomputers. The information files to which I am referring are generally bibliographic files that contain many thousands of citations relevant to the research interests of historians. Some of them exist in both printed and computerized, or "on-line" versions. However, since I want to discuss the use of these files in the context of such criteria as the speed and efficiency with which they can be used, I will discuss only the on-line version of any given file or information service.

## Access to Large Computers through Desktop Terminals

The practice of using an electronic computer terminal is familiar to anyone who has used an automatic bank teller or a "Touchtone" telephone. Moreover, by now most people have seen the personal desktop terminals that look rather like a typewriter with a television screen or a printing device and that are attached to a large computer. Such devices have been around college campuses and in such places as banks, police departments and military installations since the 1960s.

Even in the sixties computers were much faster at doing certain things than the human beings who used them or than many of the machines (such as printers and information storage devices) that were attached to them. It was obvious that, under proper control (programs and hardware), substantial increases in efficiency could be realized in some applications by making it possible for several human users to work with one machine simultaneously.

Of course, given the von Neuman "architecture" or internal structural characteristics of computers up until very recently, the experience of simultaneous use by several persons was really an illusion. In fact, the computer could only handle one task at a time; the illusion was produced because the tasks as defined by the users could be subdivided by the computer into a large number of segments each of which could be performed very quickly – quickly enough that blocks of small tasks could be performed for each of several users with no noticeable delay for any of them, and often in a highly complex series of alternative orders.

One could request access to, or loading and analysis of, many different bodies of data at the same time. On the same computer at apparently the

same time, a university budget could be processed, a problem in astronomy (if it wasn't too complex and so didn't require too much memory) could be run, student exams could be graded, and the social structure of, say, Salem, Massachusetts could be analysed. That is, each of several users could enter the relevant data to these problems together with instructions for their analysis at the same time. Alternatively, they could have entered the data (say, the Salem demographics) earlier, and then simply "call" them up from some storage location just as the university treasurer could call up previously entered budget figures for analysis.

The metaphor that comes to mind to illustrate this operation is not that of the one-man band, since the tasks are performed only apparently simultaneously. Rather one might imagine Charlie Chaplin in *Modern Times* rushing from position to position in the factory, performing first one little task and then another. Unlike Chaplin, however, the computer would not grow tired, fall behind, or give up in despair.

### Timesharing and On-Line Computing

In the early 1960s, IBM introduced its multiple user or timesharing system. This system supported (or recognized and operated with) certain groups of typewriter-style terminals (hardware) and instruction languages such as FORTRAN and BASIC (software). Thus, a large computer located, say, in Schenectedy, NY, could maintain large bodies of data useful to many different users in many different locations. By using certain commands in FORTRAN or BASIC these users could all access the same database or different databases.

An important feature of such systems, moreover, was that the communication link between the many individual users and the big computer could be a "common carrier." That is, it was not necessary for the user's terminal to be wired directly to the computer. With additional program instructions and a small amount of additional hardware, the terminal, say, in San Francisco or Toledo could use the big computer and its database in Schenectedy by sending and receiving the information over a simple telephone line.

More than twenty years ago, the experiences outlined above were reorganized into a modified approach to simultaneous access by several users. It was recognized that individual, large organizations – say a research-oriented think tank or the Internal Revenue Service – made use of many different types of data but that, often, these data had much in common broadly speaking in spite of their differences in detail. Thus, it seemed reasonable that, if these different bodies of data could be formatted for use in the computer

in a way that was highly similar from one body to the next, it ought to be possible to integrate them all into a single data system common throughout the organization.

As a concept, this idea of common formatting is quite simple. As a specialist in Soviet history, I maintain several research files. Some are organized by the names of individuals – Sukharin, Trotsky, Dzerzhinskii, for example. Others are organized by subject – industrial administration, military organization, political parties. The reason why these files are organized so differently is because I assembled them at different times for somewhat different purposes. It is obvious that, so long as these files are maintained separately I will have to go through each of them in order to retrieve all of the information I have on, say, the competition between Trotsky and Bukharin in the industrialization debate of the mid-1920s. Even then, I may miss important pieces of information, since I can't be sure that I will find everything in the individual name file that is relevant to the topic of industrialization any more than I will be certain that I'll find everything in the subject file that is relevant to, say, Trotsky.

On the other hand, there is a way to sidestep the indexing problem. If all my files were organized in roughly the same general fashion (e.g. with authors in one place, titles in another) and if each had a short, descriptive paragraph attached, I might then develop a system of scanning the files, quickly looking for certain terms that were relevant to my specific research interest. When I came upon, or "hit" a card that contained those terms either in the title, say, or in the descriptive paragraph, I could pull it out for further examination and for comparison with other hits.

The problem with the procedure I have just described, of course, is that it will be time consuming if I do it carefully or highly uncertain if I do my scanning very rapidly. This is true even though I may speed things up a bit by placing each different type of information in the same location on all of my cards. This, of course, is the reason why all scholars try to guess what their research interests will be before they structure their data files: in the interests of search efficiency, they rely on indices.

On the other hand, for a computer, "reading" machine-readible data files, functionally indistinguishable from my written card files, is a comparatively fast process. Even in the early days of time-sharing on big computers and of on-line, multiple user databases, it was recognized that data files which were massive in the Department of Defense could be formatted so that they could be reduced to a few large files. It was also recognized that these files could be "read" by a computer that was looking for certain specific pieces of

information as identified by a given user whether or not that user's research interests were reflected in the index terms under which the file was organized.

For example, let us suppose that I was interested in the Korean War and that over five years I had amassed a research file consisting of 10,000 notes I had made during my library research and interviews. If I wanted to check that file for any information that might be relevant to the conflict between President Truman and his commanding general in the field, MacArthur, I would either have to have indexed the topic Truman-MacArthur Conflict when I created the file or I would have to go through each of my 10,000 notes trying to find cards that mention some aspect of the conflict – say Truman and MacArthur in the same context, civilian control over the military, Pentagon and White House, and so forth. In the one instance I would be using a pre-determined analysis structure and I would have to know in advance, what topics and combinations of topics I am likely to be interested in. In the second case I would only have to know that the likelihood is great that any note of relevance to my topic would be likely to mention certain aspects of the problem in the title of the note, other identifying material about the note, or in the body of the note itself. In the first instance I would have established a pre-defined index of the topics that I predict I will be interested in and I would have catalogued my file in terms of that index. In the second instance I would literally scan through the entire file looking for specific terms or combinations of terms (dates, names, events) that would lead me to believe that the note was relevant to my research problem. Most multiple user, on-line, interactive computer systems make use of both of these searching techniques.

Unified formatting and standardization of commands for controlling data stored in computers makes the kind of text searching that I have just described feasible because I could inform the computer, using a standard command language, that I was interested in a specific topic – Truman MacArthur conflict – and it could search each segment of the file items – because of the standard formatting – very rapidly. Obviously this can be done not only for files containing 10,000 items but for those containing hundreds of thousands and more. Indeed, the larger the file the more useful will be the computer.

Moreover, a user who has not actually created the file but who is familiar with the computer searching techniques and with the general pattern according to which the data are tagged or described can call the file up on his or her terminal and use it as though it were her/his own. What makes this sort of event possible is the technology upon which multiple user computer systems rest and the technology upon which uniformly formatted databases rest.

The existence of apparently simultaneous multiple user systems, moreover, has meant that different segments of large standardized databases can be called up by many different users simultaneously and put to several different uses simultaneously. Some of the earliest applications of these concepts were to be found in data-rich, computer-rich (and, of course, cash-rich) environments such as the Pentagon and defense-oriented organizations such as Lockheed Aerospace, Inc. It is thus not accidental that one of the earliest and best-known examples of large, standardized, computer accessible databases is DIALOG, a service of DIALOG Information Systems which is a subsidiary of Lockheed Aerospace.

### Databases and the Microcomputer. Some Examples

The advent of the microcomputer has added a new dimension to large, standardized databases. At the present time this is mainly because people who buy such machines for other purposes (e.g. word processing or game playing at home) find that with a little modification the same machine can also be used as a terminal to gain access to large, remote databases and computers. I will describe three of the most common applications of this sort, used by those who have access to terminals or modified microcomputers and telephone links to the appropriate facilities. Keep in mind that, with proper modification, terminals and microcomputers are interchangeable for these purposes.

First, there are the standard and long-established in-house (i.e. proprietary or non-commercial) systems. Most commonly, for academic researchers this application is designed to facilitate access to data that the user himself has stored and to other facilities such as sophisticated statistical packages that are available only via a large computer. Members of university communities often use their institution's computers working from terminals in their offices or even their homes.

Second, there are menu-driven commercial databases accessible via teletext "Teletex") or similar highly simplified conventional systems. These databases make blocks of comparatively well-defined information available to a user for a more-or-less fixed hourly fee depending upon the time of day that the service is used. One of the largest menu-driven systems in the United States is CompuServe, Inc., a service that operates out of Columbus, Ohio.

Generally, the databases in menu-driven systems run the gamut from aviation weather reports to Dow-Jones financial reports to daily summaries of the news appearing in national newspapers. They also include "network" features such as C-mail or computerized mail services in which one user is

able to send a message addressed to another user who is known to use the same database service. When the addressee enters into the system a symbol or message informs him that "mail" is waiting. Other features include shared computer programs, shared games, and billboards that are similar to mail but that scroll across the screen for any user to see.

As suggested above, different segments of such systems are accessible via a "menu", i.e. a short list of standard commands that will call up a specific data base or transfer one to additional menus.

Finally, and, for our purposes, most important there are research-oriented commercial or public database systems such as Mead Data Central, BRS (Bibliographic Retrieval Services), MEDLARS (National Library of Medicine), and DIALOG. In a reflection of their origins, these databases are oriented toward business, think-tank, government, and, recently, library applications rather more than toward individual users although about one year ago DIALOG introduced a non-primetime service called "Knowledge Index" that is attempting to attract individuals.

These research oriented databases are enormous. They include dozens or scores of files in literally hundreds of fields and thousands upon thousands of individual items. Their potential as sources of information to historians, humanists, and social scientists working independently and in universities is astounding.

The reasons why this is so may be summarized rather simply. First, the information equivalent of a huge – truly exceptional – reference library is available to any scholar regardless of where he or she is, provided only that there are a telephone and an appropriately equipped microcomputer available.

Second, the nature of the on-line system is such that searching is both extremely fast and thorough by comparison with searching many printed sources. In sharp contrast to searches of printed sources, one runs out of ideas, strategies, or paradigms for searching long before the fatigue and ennui associated with plowing through indexes sets in. As a consequence, searches that formerly would consume one or more days can now be completed, literally, in minutes.

Third, searches conducted in conjunction with appropriately equipped microcomputers have the enormous advantage of automatically saving the content of the search. This means that the most time-consuming and laborious part of the bibliographic research process – taking careful notes – now occurs at the rate of thirty or more characters a second without the intervention of the researcher. These stored notes or records can be entered into a permanent data file on the computer, printed for direct entry into a

bibliography, or treated in one of several other ways. Recently, for example, I needed to assemble a bibliographic file consisting of the publications of a dozen active Soviet historians. I assembled the necessary information in my own study in less than two hours by instructing the host DIALOG computer to search several thousand records in the Library of Congress card catalogues (LCMARC, and REMARC), *Historical Abstracts*, *Books in Print*, and the *Social Science Citations Index*.

The total cost of my research on the DIALOG system was about $130, a sum that was covered by a budget item in a grant under which I was working. To most scholars, used to "free" library reference rooms, $130 seems a great deal of money for only two hours of computer time. However, anyone who has made extensive use of one of these systems will recognize that two hours is an enormously long time for computerized searching. In my case, moreover, the alternative was to spend two to four days searching the thousands of citations in the relevant printed sources myself– time for which I would not be compensated and which was not covered by my grant.

In any event the process of search is summarized by the term "search strategy" which combines the application of a command language, the choice of one or more databses, and a decision about what to do with the resulting information – i.e. whether simply to look at it on the screen, to store it on a disk, to print it, etc., and, finally, some determination whether the search is complete or whether important material has been omitted through faulty searching or for some other reason.

### Using a System such as DIALOG

The reasons for the institutional orientation of systems such as DIALOG are multiple. For one thing there is the fact that the apparent cost is prohibitive. Databases are priced individually by the hour and sometimes by the accessed record. Prices range from as little as $35/hour for a file such as the United States Government Printing monthly catalogue (DIALOG file no. 66) to $300/hour for a file that gives access to chemical and chemically related patents (CLAIMS/UNITERMS DIALOG file 223-225). Individual printed records can be free in certain cases or they can cost as much as $50 each. Thus, to the inexperienced and timid, the threat of a really big access bill is genuine enough to be disuasive.

Second there is the problem of equipment. Although DIALOG can handle most of the modified microcomputers that a more consumer oriented system such as COMPUSERVE can handle, that fact is not apparent to the user through most of DIALOG's promotional literature. Basically,

DIALOG and similar systems have not seemed to be particularly interested in attracting individuals who are equipped with microcomputers instead of video or printing terminals specifically designed for communication with big computers.

Finally there are problems of access narrowly defined. I mean the problem, for example, of deciding which database to use and then of making efficient use of it so that the twenty or thirty records that one is looking for can be economically extracted out of the 80 million records that are stored. In this case one of the most formidable problems consists in learning a command language. This is a simple language that has been developed to give the host computer instructions about choosing a database and instructions on what to look for once it has selected a database. DIALOG's command language consists in something on the order of 100 individual commands. A related problem comes from applying the command terms to a search so as not to waste time (time is literally money here) and to produce to required information – nothing extraneous, but everything that is available in the databases.

Basically, the search procedure requires the same kind of patience that those who use a micro-computer for word processing need to have in order to make use of the word processing program. The similarities extend to the fact that word processors often combine a menu system with a fairly simple command language. The one I am using as I write this essay, for example, has about sixty individual commands and a very small number of menu items that appear at the bottom of my monitor screen.

Importantly, the orientation process requires not only a knowledge of the command language and of the available databases but also of the research context (e.g. the historical context) of the items being searched. Professional knowledge of the subject being researched substantially improves one's chances of choosing databases correctly and of creating appropriate search strategies within those databases. I have personally witnessed many dollars worth of database time being wasted by individuals who know the appropriate command language and other technical features quite well but who are insufficiently familiar with the context of their problem.

To cite a simplistic example, a searcher who has been asked to assemble a bibliography on the origins of the Russian Revolution of 1905 may not realize that searching *Historical Abstracts* under "REVOLUTION (W) RUSSIA?" will not yield satisfactory results. This is because the vast majority of the "hits" or items that have been selected will deal with the Revolution of 1917. Anyone could make this mistake initially, but a trained scholar would immediately recognize the inadequacy of the search profile and would re-

define it. My experience has been that those who are not trained as scholars in the field of research are considerably less capable of making such a judgement in a timely manner.

It is for this reason – ultimately an economic reason since time and money are wasted – that I argue that in the long run the services that are now being installed by university libraries whereby searches are performed by librarians at the instructions of researchers will be replaced by direct access systems in which the scholars themselves do the searching.

My comments about the forbidding dimensions of a system such as DIALOG for individual or small-scale users are not meant to imply that such systems are inaccessible to individual users who have microcomputers. Quite the contrary. In fact, I have been using DIALOG as an individual (i.e. independently of my university or any other organization) since I first realized that by instructing others to do my searching for me I was only scratching the surface of a huge, important body of information. Apart from the several advantages listed above that have to do with speed, comprehensiveness, and convenience, there are specific advantages for an individual who uses the DIALOG system in the form of (almost) 24-hour accessibility, the fact that there is no minimum monthly charge, the fact that the system is self-documenting for those who are just slightly adventurous (i.e. no training is required – I haven't had any, for example) and that with proper modification, a home or personal computer works fine with the system.

All that is necessary to begin is an application to DIALOG Information Systems, an ability to establish credit, the patience to read through the generally easy to understand documentation that is provided by DIALOG and sufficiently strong nerves to overcome the fear that, in the first two or three sessions, you will run up a bill of, say, $2.000. Alternatively, if one cannot overcome the fear, or if one is not a good self-instructor, DIALOG provides training sessions (for a fee) all around the United States, in Europe, Canada, Latin America, and Australia several times each year. In addition it provides users with extensive printed documentation about the system as a whole and about each individual data base. Eventually, it seems to me, it should be the role of university libraries to instruct individuals in the use of these systems in much the way that the Library of Congress reference librarians now instruct individuals who use the LC on-line card catalogues.

### Using the Microcomputer as an On-Line Terminal

It is clear that a system such as DIALOG was not developed (as was COMPUSERVE) with the microcomputer in mind. On the contrary, the idea was evidently that access would be achieved through one of many dif-

ferent kinds of video or print computer terminals such as those produced by Digital Equipment Corporation, IBM, or Honeywell. Nevertheless, the microcomputer can be used with great effect as a conversational terminal and, by comparison with many terminals, the micro possesses certain distinct advantages since it possesses a memory and, often, a printer that will reorganize and store files in different ways.

First, let me explain the process of transformation. As one will have gathered, the essentials in conversing with a big computerized database are a communications line (e.g. telephone line), and a combination of software and hardware at each end that will translate signals from the terminal/computer into signals transferrable across telephone lines. This latter implies, of course, that translation (or encoding) will work in both directions and both for transmission of data and their reception. In other words, it has to be possible for signals generated by the terminal to be translated into transmissible signals, and for the transmitted signals to be re-translated into signals acceptable to the receiving computer. Similarly, the whole process must also work in reverse.

An important point here is that, because of the transformation of signals that occurs at each end, it is not essential that the devices at both ends (i.e. terminal or computer) speak identical languages or generate identical signals. What is vital is that each must be equipped with a device that will translate its signals into the common signals transmissible across telephone lines and also with a device that will translate telephone signals into signals understandable by it. The devices most commonly employed for this purpose (in the cases of both terminals and microcomputers) are a circuit that works in the terminal itself called an RS-232 serial port. This bit of electronics actually transmits signals out of the terminal, microcomputer, or large computer. However, since telephone lines are designed to transmit only certain categories of signals, a second device is necessary. It most commonly consists of a combination of circuitry and accoustic equipment that transforms the signals generated by the terminal or computer into a form that is transmissible across the telephone lines. This device is called a MOdulator-DEModulator or a MODEM.

A final and highly important ingredient is one or more bodies of instructions that control the incoming and outgoing signals and that may do a number of other things in addition. In the case of microcomputers, these instructions usually take the form of software (disks or cartridges) that must be entered into the microcomputer before initiating communication with the host computer.

To summarize, then, thinking now of the microcomputer as a commu-

nications device, it is clear that several elements must be combined in order to gain an adequate level of terminal-like operation. Obviously, the user will have to be able to use the keyboard and interpret the screen in a fashion appropriate to applying the software and hardware. Also, the software must be adequate to the task of instructing the computer to handle itself in a fashion that will be familiar both to the user and to the host computer. Next, the transmission equipment must be in place (RS-232 and MODEM) and a telephone line (sometimes long-distance) must be available. At the same time a roughly parallel concatenation of devices and instructions must be in place at the opposite end of the communication process.

Assembling the necessary software and hardware is much more difficult to describe in writing than it is to do. I believe that every microcomputer that has been manufactured in substantial amounts has such equipment and software available. I am including here not only the relatively "professional" devices such as Compaq, DEC, IBM-PC, and Apple, but also the distinctly home computers such as Commodore, TI-99, and others. Properly equipped these machines will certainly access menu-driven databases such as COMPUSERVE and they will probably all access the large broadgauged research databases such as DIALOG.

On the other hand a microcomputer equipped for communication may – or may not – be able to function as terminal to a computer system that has its own locally designed terminal system. Such systems would include university systems and systems designed for individual companies, for example. Whether a given configuration of microcomputer, communications hardware and software will work or not will depend on the characteristics of the local system and, especially, on the characteristics of the microcomputer and the software that governs its terminal emulation. For example, I use an Apple II+ as a terminal for all of my database communications functions including access to my university's large computers thirty miles away from my study. However, the simple and very easy to use software that arrived with my "AppleCat II" communications system works splendidly with DIALOG and COMPUSERVE but not with my university's DEC and IBM systems although these are terminal-oriented systems. In order to create a link with those systems I use a much more sophisticated package of communications software (not hardware) that turns the Apple into a far more complex terminal than is demanded by the big commercial databases. Unfortunately this software is considerably more complex to use than the package that arrived with the AppleCat.

## What are the Important Differences among Representative Databases

Although my original objective was to discuss "accessing" – not "assessing" – commercial databases, I do want to discuss briefly the differences of some of the big, individual databases as research tools.

Let me begin by observing that my very first experience with on-line research in a large databases was in Washington, several years ago. In the card catalogue room of the Library of Congress I made my first acquaintance with such a system via MUMS. This system is relatively easy to use and highly rewarding for those who do so. It has the important advantage of being free to the user and the terminal area is staffed by a small group of knowledgeable and usually helpful reference librarians. These two characteristics establish a standard for reference assistance by which every library should be judged. As a tool for research in recent bibliography, I believe the LC file is unexcelled, and I speak on the basis of experience with many major libraries here and abroad. In fact the advantages of the LC system are similar to those of other good, research-oriented on-line databases.

While the Library of Congress system is the electronic equivalent of a library card catalogue, the electronic files listed below tend to be more subject specific. All of the following files are accessible via DIALOG. I will comment briefly on each. The reader should keep in mind that the charges listed here are hourly rates but that, for a trained and prudent scholar, it is a rare search that lasts more than a few minutes.

- **Social SCISEARCH (Social Sciences Citation Index DIALOG # 7; $110/hour).**
  Based on the notion that the bibliography that is relevant to a given topic will be found in the titles of the published research and the research citations on the topic. Thus one can begin with a piece of research and trace its intellectual provenance by identifying the works that are cited in its notes, the works that are cited in the notes of those pieces, and so forth. Alternatively, one can search time periods and subjects through titles and subtitles. One can also build up a bibliography for a given author by searching under his/her name. Using this file can be tricky and expensive but also uniquely rewarding. I recommend experience with the print version before using the automated version.
- **Historical Abstracts (DIALOG # 39, $65/hour).**
  Since it is based on searches of author, title, an index and abstracts HA is relatively easy to use and very close to one's previous experiences with author/title and subject headings in card catalogues. Abstracts can be

extremely useful. Considering the straightforward use techniques, it can be relatively cheap and it is certainly a good file to experiment with. One can also use HA on-line in combination with the printed version, since the automated file can identify the sought after items quickly and one can then examine the tagged items at leisure in print. A final, enormous advantage of both the printed and on-line versions of HA is that it is international and multilingual in scope. A major disadvantage of the on-line version of Historical Abstracts is that only comparatively recent files are maintained.

- **Dissertation Abstracts Online (DIALOG # 35; $72/hour).**
  Rather straightforward to search and relatively inexpensive. This file includes dissertation citations going back to 1861 but abstracts are available only for dissertations entered after January, 1980.
- **Book Review Index (DIALOG # 137; $55/hour) and Books in Print (DIALOG # 470, $65/hour)**
  are familiar to most scholars in their printed versions. Automated searches are often very fast and, thus, comparatively cheap.
- **Philosopher's Index (DIALOG #57, $55/hour)**
  is similar to its printed version. International and comprehensive in the philosophical literature and the history of ideas.
- **LCMARC (DIALOG # 426; $45/hour).**
  An excellent computerized card catalogue. Unfortunately, it holds only relatively recent LC acquisitions and so is limited in its utility for this generation of historians. To make matters worse, foreign languages entries are even more shallow. An excellent means of updating older bibliographies. Cheap. All in all an enormously important research tool.
- **REMARC (DIALOG # 421-425; $85/hour).**
  These files represent a commercial effort to supply the pre-1980 data that LCMARC has left out. Although they are considerably more expensive than LCMARC, their utility as bibliographic sources is obvious.

### Databasing: A Selected Bibliography

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