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Expert systems for accountants

The age of thinking machines will soon be upon us. But what effects will “artificial intelligence” have on accounting? Robert K. Elliott, CPA, partner, and John A. Kielich, CPA, senior manager, both of Peat Marwick, New York City, summarize recent developments in this area and also explain how “expert systems” may both revolutionize and threaten the practice of public accounting. Elliott is a member of the American Institute of CPAs future issues committee.

Unless you have spent the last year on a remote island in the Pacific, there is a good chance that you have read at least one article on artificial intelligence (AI)—the simulation of human reasoning. Most likely, you concluded that the intrusion of AI into the practice of public accounting would occur far in the future, if it happened at all. However, AI’s effects on our profession are more imminent than you might expect. In fact, expert systems, which use computerized models of human reasoning to solve complex problems the same way a human expert would, are already being developed for public accounting applications. They will ultimately have a significant impact on all aspects of our practice.

Expert systems are one of the four current areas of AI research, the others being robotics, natural language and vision systems. Although research in these areas has been going on for the last three decades, it has only been in the last five years that practical applications of AI and, more specifically, expert systems, have been developed. Some of the early successes in expert systems are noted in exhibit 1, page 128. Several of the systems listed in this table, as well as many others that have been developed or are currently being developed, pertain to specific companies and require both sophisticated programming and powerful computer hardware. However, many emerging companies, as well as established companies such as Xerox, IBM and Texas Instruments, are developing hardware and, more importantly, software that will soon make the development and delivery of sophisticated expert systems a reality for the micro. It is also probable that standardized or “canned” expert system packages will become available as technological advancements are made.

Why expert systems in accounting?

Many of the early expert systems were developed for situations in which human experts were in short supply and high demand. You might then ask why the accounting profession, which is rich in talent and seems to have an ample supply of highly trained people, possibly exceeding demand, would need expert systems. There are several reasons.

First, the complexity of modern accounting practice leads to specialization which, in turn, leads to the concentration of expertise in specialized areas. No one can be expert in everything. Experts in each area know which factors to consider and combine in order to formulate proper conclusions. Because this is so, the demands on an expert’s time can become enormous, resulting in unfulfilled client commitments or, worse, in errors. By capturing such a person’s knowledge in an expert system, that knowledge can be made available to everyone in the firm. The firm also protects itself in the event that the expert leaves unexpectedly. And, finally, the firm can deliver more consistent quality if its experts’ “reasoning” can be
brought to bear in a greater number of decisions.

Emerging accounting expert systems
We accountants now incorporate expertise in our tools in many ways. Typical examples include audit programs, internal control questionnaires and various checklists. These tools represent the accumulated wisdom of generations of accountants who have coped with real-world problems.

The professional literature of public accounting—accounting and auditing standards—may also be seen as incorporating accumulated accounting expertise. Consider the disclosure flowcharts contained in the Financial Accounting Standards Board's Accounting Standards—Current Text. They encapsulate much of the expertise embodied in the FASB's statements. They provide the user with both the factors to consider and appropriate conclusions based on the combination of the relevant factors.

Unlike the disclosure flowcharts, which are based on authoritatively prescribed rules, many expert systems deal with problems that are solved by applying rules of thumb. A good example of a rule of thumb that is used in auditing might be, "If the customer's balance is greater than 90 days past due and there has been no communication with the customer since the date of sale, then a reserve equal to 50 percent of the balance is required." The difference between these more traditional embodiments of public accounting expertise and a computer-based expert system is that the latter can incorporate many thousands of additional factors, relationships and rules of thumb, and thereby permit a much more tailored application of expertise to specific circumstances.

An expert system typically elicits specific case information by displaying questions on a computer screen. Exhibit 2, page 128, shows typical questions from a prototype expert system for the evaluation of the loan loss reserve for commercial bank loans (with user responses underscored). This exhibit also illustrates the ability of an expert system to tell the user why the information is being requested (in response to the user input "why?"). "Rule 121," seen in the exhibit, is a representative element of an expert system. It incorporates criteria, provided by a human expert, regarding certain conditions that must be evaluated when formulating a conclusion about the adequacy of a loan loss reserve.

After obtaining responses to the questions, the expert system applies the rules of thumb that have been programmed and, in a properly designed system, reaches the same conclusion that the expert would have reached, given the same conditions. The results are displayed along with the rationale or intermediate results that support the conclusion. Exhibit 3, page 129, shows a typical display that the user would see for the prototype loan loss system (with system conclusions underscored).

An expert system for the evaluation of commercial bank loan losses is an example of a system that might prove useful to accountants. Other systems are also being developed, primarily by accounting academics. Some of the systems that already have been developed are listed in exhibit 4, page 129. They represent only a small fraction of potential applications in the accounting profession. Other possible, and likely, applications include the following:

- Auditing
  - 1 Audit planning.
  - 2 Risk analysis.
  - 3 Evidence evaluation.
  - 4 Opinion formation.
  - 5 Engagement management.
  - 6 Engagement scheduling.
  - 7 Personnel decisions.
- Tax
  - 1 Tax return preparation.
  - 2 Estate planning.
  - 3 Personal financial planning.
  - 4 Other tax planning.
- Management advisory services
  - 1 Accounting systems design.
  - 2 Electronic data processing systems design.

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This list is not complete by any means, but it does hint at the broad array of problems that may be subject to the application of expert systems.

Benefits

In view of the potential accounting applications for expert systems, let us consider some of the benefits that might be gained by implementing these systems.

1 Staff training. An expert system contains both the factors considered by an expert and the rules of thumb that the expert uses in problem solving. The expert system can be used to simulate real situations, thereby teaching inexperienced professionals what information is important and how that information is combined in reaching a decision.

2 Knowledge sharing. The expertise of a firm's top technical partners can be made available to each staff accountant, along with the associated reasoning. The firm's expertise is, thus, more widely available.

3 Augmented professional judgments. Because of the many unique situations faced by accountants and the complex judgments often required of them, an expert system may be used to provide a "second opinion." It can also be used to determine what a decision might be if one or more of the facts were changed. Such "what if" analyses could be particularly beneficial in the tax planning area.

4 Shorter decision time. An expert system should speed the user's arrival at an appropriate decision and prevent wasting attention on factors irrelevant to the decision. Because expert systems are computer-based, once the facts are input, the result can be known almost instantly. And because expert systems provide a structured approach to problem solving, a user will be prompted to gather only the facts that are relevant to the required decision.

The above list could also include optimizing a firm's ability to expand into new areas of service, but this would require tools embodying...
a level of sophistication beyond what is likely to be available in the near future.

Costs
Expert systems involve a number of costs, which can only be estimated at this early stage of development.

- Hardware and software. Early expert systems required sophisticated hardware and, because expert-system development software was not available, special programming using arcane computer languages. Even today, in order to build a complex expert system, the price tag for the equipment and development software could easily approach $100,000. However, the pace of commercialization and developments in this area is staggering and it should not be too long before development software costing $5,000 or less will be available for use in developing complex expert systems on standard microcomputers. In fact, some development software is already available for standard micros at a price of $2,000 or less, although there are still limitations associated with these products, such as the number of rules that can be included in a system.

- System development costs could be absorbed by many users if standardized application packages were developed and marketed by commercial vendors. Although we are unaware of any canned, accounting-oriented packages being available at this time, it seems likely that they will become available at some point. We can only guess that the cost of such products will be on a par with that of other software products and decrease over time.

- Knowledge acquisition. This is the most costly and difficult part of developing an expert system. The factors human experts consider when solving a problem must be determined and their reasoning processes must be formalized. The human experts' knowledge must then be converted into a computer program. The extraction of expert knowledge and the computer programming require a specially trained individual who, in AI jargon, is called a "knowledge engineer." Other persons familiar with expert systems and AI are usually also needed as part of the project team. Persons in an organization can be trained to become knowledge engineers or else knowledge engineers can be hired as consultants. Regardless of the route taken, the cost for this part of a complex expert system could reach $1 million, depending on the complexity of the system. These costs also should decrease as the AI field continues to grow and more efficient system development techniques are generated.

- Maintenance. Once a system has been implemented, it will have to be updated on a regular basis to accommodate changes in circumstances and advances in expert systems.
knowledge. For example, updating would be necessary for changes in tax regulations, in accounting and auditing standards or in economic circumstances.

Other costs. Costs such as the development of user guides and training manuals, which are not unique to the development and implementation of expert systems, would also have to be considered.

Some implications for the accounting profession

Although we can't be certain what the ultimate effects of expert systems will be at this early stage in their development, their use in the accounting profession makes the following consequences seem quite likely to occur:

1. Reduced need for staff time. Automated tools have already replaced mechanical tasks that were previously reserved for junior accountants. As a result, the demand for junior staff time has already declined. Assuming that early expert systems will replace lower-level judgments, the demand for lower-level staff time will decline even further. This, in turn, will lead to fewer new hires and lower turnover, with a higher probability of gaining admission to the partnership for those who are hired. However, reduced opportunities will also dry up the wealth of training and screening that the profession has traditionally relied on to find the best qualified partners.

2. Greater capital investment. The accounting profession traditionally has been a labor business. Computerization of the profession will result in a shift from labor to capital. Capital will increasingly include computer hardware, software and expert systems costs. This shift will necessitate new pricing and management strategies for practice units in the profession.

3. Nonaccounting competition. Historically, the accounting profession has had a virtual monopoly on accounting services because of the expertise needed to provide the various services. However, as expert services capture more and more of that expertise, anyone with the capital to develop or purchase such systems will become a potential competitor. This may be especially true in the tax and consulting areas, which are not reserved to CPAs by the state accountancy statutes. If the profession fails to take advantage of the efficiencies possible through use of expert systems, others may begin capturing major segments of our business.

A problem or an opportunity?
The picture painted above of public accounting in the future may not appeal to those who cherish the old ways of public accounting, but these emerging technological and economic conditions are inevitable. The profession's future belongs to individuals who can adapt to and exploit the emerging technologies—and expert systems are bound to be an important part of those technologies.

Downloading to expand micro productivity: a user perspective

Mark E. Rabinovitz is a senior manager in the Cleveland, Ohio, office of Price Waterhouse and a full-time member of the firm's public utility industry services group. In the following article, Rabinovitz presents a hypothetical case study of microcomputer downloading and provides a basic framework for download implementation. Although the concepts described in this article reflect the author's specific experience in the public utility industry, the ideas presented are generic in nature and, thus, applicable to organizations in any industry.

Eric Johnson, a manager of the hypothetical Midwest Power & Light rate department, was the first in his company to introduce micros. Within weeks of their installation, it was clear that micros were having a profound effect on productivity. Monthly schedules, which in the past had been prepared manually and then typed, were now generated from the micros, and portions of the company's regulatory filings had been transferred to the micros.

Eric soon became convinced that employee morale had improved because of the new computers. His people were obviously intrigued by micro technology and, consequently, began reading micro magazines and were willing to stay at the office past regular business hours to learn more about their machines.

Eric's managerial colleagues followed his micro 'experiment' with keen interest. In time, micros began popping up throughout the organization.

Eric's reputation as an innovator had been firmly established.

One step further

Eric's early decision to "go micro" was a good one, yet something about the machines still nagged him.

Too often, he would see his highly skilled and well-paid rate technicians sitting in front of their terminals entering endless rows of numbers so that a certain schedule could be produced. Source data still had to come through the data processing department. This sometimes necessitated an extra day's wait while other, more critical jobs were processed. As a result, his staff occasionally had to spend overtime hours producing reports from the micros. Although he had a great staff, Eric found it difficult to keep them motivated while they were performing basic data entry functions.

During rate hearings at the state capital, Eric had to request his staff to develop graphics and reports for the company's operations and maintenance expenses over the last five years. Although his department had recently purchased a terrific graphics package, only basic graphs could be produced since the staff had to spend their time inputting data. Further, the graphs and reports reflected a data transcription error, which distorted maintenance expense for one of the years presented. Given the volume of data
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How downloading can help

Downloading refers to the extraction of data from a mainframe computer with the aid of a micro. The data can then be analyzed and manipulated on the micro without using valuable and expensive mainframe processing time.

Downloading expands the micro's usefulness by providing users with direct access to company data stored on mainframes. Report requests no longer need to be channeled through a central data processing department. Users are, thus, given control over what data they receive and when they receive it.

Another benefit of downloading is that it reduces data entry time. For instance, if Eric Johnson had had a download capability for his operating and maintenance expense data, he might have spared his rate analysts many hours of data entry for spreadsheet programs. The time saved by this method could have been used to consider how best to present the company's position graphically.

The ability to analyze mainframe data on the micro without the burden of inputting each data element represents an opportunity to significantly enhance micro productivity. Staff members are able to use their creative talents in analyzing and developing information. Micros can perform their intended function of sophisticated computing instead of being used as data entry terminals.

Downloading can also be a useful interim measure during application implementation periods. For example, suppose that our hypothetical utility has developed a need for more sophisticated payables reporting than the current system allows. The long-term solution is clearly to purchase or develop a new payables
system to meet the need but, since software implementations can easily take more than a year to complete, downloading can serve as a temporary solution.

In addition, downloading can be used as a tool to increase the flexibility of newly implemented packaged software. An application that meets 80 percent of user requirements can be enhanced through the downloading process to avoid costly, time-consuming modification. Stated another way, top priority enhancements often can be implemented even when data processing resources are limited.

A few caveats

The prospective downloader should be reminded that “there ain’t no such thing as a free lunch.” A successful mainframe-to-micro link must be thoroughly planned and closely controlled and monitored. The overriding concern throughout a download installation must be to preserve the integrity of mainframe data.

Ordinarily, technical aspects of a download project should be the responsibility of the data processing area. Individual user departments should provide data processing with specific directions as to what data is to be accessed. Thus, the first step in a download installation is to have users and data processing review the data that is available through mainframe applications. The users then must identify those data elements that will be of use to them through the mainframe link.

Occasionally, users will find that the volume of data requested from a given application is simply too large to be handled on a straight mainframe-to-micro download. In these cases, summarization schemes must be developed to arrive at an acceptable solution.

A management group should function as a sounding board to help determine the objectives of the download project. This can be achieved through periodic meetings with the download project team to:

- Discuss the team’s progress.
- Resolve issues that may affect corporate policies or procedures.
- Provide final approval for data to be downloaded.

It is important for management to have final approval for downloaded data to ensure that the integrity of certain types of information, such as payroll, is maintained.

Technical requirements

Once the user has specified which data are to be downloaded and management has provided final approval, the data processing department can begin to consider technical aspects of downloading, such as:

1. Establishing a telecommunications link to transfer data to the micro.
2. Providing security clearance to access data in the mainframe application master files. Establishing se-
curity clearance should be the most difficult aspect of downloading and, consequently, provides an excellent opportunity to test important systems controls.

3 Using a generalized report writer to create a downloading transfer file.

4 Downloading the transfer file through specialized software.

The creation of the transfer file is of the utmost importance to the download process. The data to be downloaded must be extracted from the mainframe application’s production master files, summarized as required and loaded into the transfer file. The transfer file is then made available for download to the micro. To maintain the integrity of the mainframe application’s production files, the data should always be placed in an intermediate transfer file to minimize the risk of unauthorized access to and modification of master file information.

The fully downloaded organization

Given the attention and support that mainframe—micro links are receiving from the computer industry, the fully downloaded organization is likely to soon become commonplace. Downloaded data are at the complete disposal of the user once the mainframe—micro link has been established. Analysis of this data is a relatively simple task because of the spreadsheet, financial management, data base and other specialized software available for use with micros. The user can produce schedules, reports and graphics as they are needed.

Using our hypothetical utility, the following examples illustrate numerous uses for downloading data.

1 The rate department. As soon as it became available, Eric Johnson used the download to meet the department’s rate filing needs. Monthly test year data were taken from the mainframe and downloaded to a micro general ledger package. Staff rate analysts then formatted the data in accordance with the state commission’s filing requirements and final reports were incorporated directly into the company’s filing. Test year data were also formatted for use in the company’s micro-based cost of service program. Hours that had once been spent inputting data and proofreading reports were now spent developing alternative rate designs or gathering additional support for the company’s key regulatory positions.

Automatically generated detailed rate filing schedules included 1 Plant-in-service schedules for date-certain analysis by account and subaccount; gross additions, retirements and transfers during the test year; depreciation rates and reserved balances by account; calculation of test year depreciation; analysis of plant by accounting for funds used during construction and historical plant balances. 2 Construction work in progress schedules for analysis by both work order and percentage completed; accounting for funds used for construction and estimated in-service data. 3 Statistical schedules for revenues by month and customer class during the test year and monthly billing statistics by customer class. 4 Capitalization schedules for reconciliation of beginning and ending test year balances of common stockholders’ equity; a detailed breakdown of long-term debt and calculation of interest expense. 5 Working capital schedules for monthly account balances for materials and supplies; cash receipt information and average days in shipment for fuel. 6 Financial statements including test year statements at current and proposed rates as well as historical financial statements.

2 General accounting. Through its direct link to the mainframe general ledger system, general accounting found it much easier to do its monthly account analysis work. The source and nature of each transaction affecting any given account could be identified directly through the micro. The download feature also saved the department valuable hours by substantially reducing the need to manually prepare schedules for the company’s internal and independent auditors. Schedules were now being generated through the micro—sometimes by the auditors themselves.

Auditing. In addition to generating many of their own year-end account analysis work papers, the company’s auditors found many creative uses for downloaded data. Some of the areas in which computer-assisted audit testing was used included 1 Preparation of lead schedules, preliminary trial balances, accounts receivable confirmations and, eventually, the financial statements and related footnote disclosure data. 2 Selection of individual transactions for exception and statistical testing. 3 Comparison of selected company financial and statistical data to internal budget data and external items such as key utility industry statistics. 4 Calculation of trends and ratios for specified periods, accounts and percent changes. 5 Performance of specialized accounting and auditing procedures including a lead lag analysis, foreign currency translation and consolidated financial statements. 6 Communication of financial information to and from remote company locations.

Administrative services. As part of an ongoing productivity review, the vice-president of operations at Midwest Power & Light requested an analysis of the number of employees as well as information regarding departmental salary expenses. Using the download, his staff produced the required reports so quickly that they also had time to develop other statistical reports which highlighted key productivity ratios by operational departments, maintenance departments and generating plants.

Specific reports developed through the mainframe—micro link included 1 Comparison of current month and year-to-date actuals to those of the prior year. 2 Monthly employee statistics by department. 3 Monthly plant maintenance work
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Budgeting. The budget department set up its annual budget process on the micro using the mainframe link. Prior year departmental budgeted and actual data were downloaded to produce the current year’s budget worksheets. Each department was able to use its electronic spreadsheet to perform various types of “what if” analyses before providing the budget department with its budget as well as a three-year projection.

Other uses
Downloaded data also could be put to use in virtually every department of Midwest Power & Light for applications such as
1 Tax calculations.
2 Trend analysis.
3 Pricing worksheets.
4 Revenue and usage analysis.

These are examples of items that can be performed on a micro using the download, thereby replacing manually prepared schedules or those requiring valuable programming resources before they could be prepared.

Final words of advice
As has been demonstrated for the hypothetical utility described above, there are many advantages to downloading. Chief among these are
1 Ensuring the integrity of mainframe data.
2 Reducing the risk of data transcription errors.
3 Relieving professional staff from the burden of clerical data entry responsibilities.
4 Increasing productivity by making the data available for analysis even before mainframe reports can be produced.
5 Serving as a multipurpose standalone tool for activities such as spreadsheet analysis and word processing.
6 Serving as a dual function as an online mainframe computer terminal.
The downloading process can also extend the life of obsolete mainframe systems. Old mainframe systems that require a major investment of resources to provide enhancements, or time and money to replace, can be enhanced through the download process. If the information exists in the mainframe system's files, it can be downloaded to provide the user with the desired enhancements. The result will be better and more timely management reports without costly reprogramming of existing systems. This is often a good interim solution while the requirements for replacement systems are defined and an implementation solution is sought.

Techniques for managing micros

Most CPA firms are now learning how to best harness the power of micros. Relatively inexpensive, these machines enable smaller firms to operate at a far more sophisticated level than was previously possible. Sherry D. Knight, CPA, managing partner, and Steven E. Yoder, principal, both of Knight & Company, CPAs, San Mateo, California, spoke with a number of accounting firms about their experiences with micros and report here on their findings. Knight and Yoder are coauthors of Micro Accounting: Setting Up Your Books on the Computer, an introduction and guidebook for business and professional users of micro accounting systems.

There seems to be no limit to the uses of micros in accounting firms, especially as more firm staffs become familiar with them. In addition, the price of powerful micros continues to decrease. The result is an extremely rapid proliferation of these machines in public accounting practice. This influx of new technology does, however, carry a high "price tag"; namely, the large number of organizational problems that massed micros present.

This article discusses some of the ways that accounting firms we questioned are coping with their proliferating micros. It is largely based on discussions with firms of various sizes that are members of a San Francisco users group.

The trial period

Firms usually purchased their first few micros on a trial basis. Often, these machines were purchased by individual partners or staff members, rather than by the firm, and generally were not shared. Invariably, these micros' performance was sufficiently impressive to inspire additional purchases.

The development period

Trial periods were, for the most part, rapidly supplanted by a policy of shared micros, with one micro being assigned to four or five staff members. We found that few, if any, formal policies or controls were instituted by firms at this point. The users, thus, were left to their own discretion in deciding what and when to learn, what applications to develop, what backup copies to keep and so on.

The firms were enthusiastic about using micros during this developmental stage, but they also expressed a vague uneasiness about them. When questioned about policies and controls, their usual response was that there were none and that the current situation "had just evolved." They generally felt that "things were under control" at the present time, but that the situation might change as more users became experts or as more micros were acquired.

As more users reach proficiency, it becomes easier to identify areas in need of management policies and control. Premature controls can inhibit the learning process by excluding micro usage from areas that would benefit the firm. On the other hand, absence of controls can result in a serious lack of direction, with the firm's resources being diluted by pursuing too many potential opportunities.

The first "power users" in a firm, those who are quickest to master micros, often are imbued with authority over and responsibility for staff members who are just beginning to learn the machines. The newer users look to their superiors for advice, support, training and troubleshooting. Because these trainers' status is unofficial, their duties are frequently described as being a necessary, enjoyable, increasingly burdensome function, with some of them feeling overburdened because their normal job responsibilities also are maintained. Moreover, when those whom we consulted were not in a position to implement formal controls, they felt no motivation to champion such controls, even though they recognized the need for them. They clearly feel that their efforts would not be rewarded with job advancement and, indeed, would only serve to alienate their coworkers.

Informal control seems to be effective on a short-term basis, with standards in hardware, software and procedures evolving as the newer users learn from their more advanced colleagues. There comes a time, however, when new users break away from their mentors and start moving in their own directions. Too many experienced users are, then, engaged in individual exploration of the subject matter at the expense of everyday revenue-producing tasks.

Firms in the development phase chiefly concern themselves with micro placement and access, data and diskette care, spreadsheet development and quality assurance.

Placement and access. Theories of automated offices always envision a micro on each individual's desk. Some of the firms tried this arrangement after the trial phase but found that it made the machines too inaccessible. The new users' micros often were left unused and the more advanced users were less able to help others.

Shared micros, on the other hand, seem to enhance the learning process as well as to allow efficient micro utilization. New users can observe others and, thus, be able to learn by asking pertinent questions. Group trial-and-error learning is far more efficient than individual trial and error.
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There is no consensus regarding micro placement. Putting several micros into one "computer room" allows peripherals such as printers, plotters and modems to be shared effectively and simplifies supply control, maintenance and scheduling. Scattering micro workstations around an office is sometimes more convenient to set up because any extra desk can serve as a workstation. Several firms have both a computer room and scattered workstations.

□ Data and diskette care. As micro use increases, problems arise from the growing number of diskettes, the amount of information any one diskette can hold and the ease with which diskettes can be copied, erased or inadvertently destroyed. How many backup copies will be made is usually determined by the perceived value of data contained on diskettes. Most firms agree that individuals should be assigned specific responsibility for important diskettes. A few firms declared that users who lose vital diskettes are expected to "make it good again or else," but most went no further than stating that individuals are responsible for their own projects. In addition, most firms do not have any standard three-diskette rotational policies, backup logs or any standardized diskette labeling.

□ Spreadsheet development. Duplication of effort occurs routinely during the development of spreadsheets. Individuals are generally left free to "work up" any and all desired spreadsheets, although most firms have added a special code for such development work. Firms do not presently implement controls to eliminate potential problems such as a lack of documentation in complex spreadsheets or incorrect algorithm use.

Two firms experienced problems when a staff member left the firm. In both cases, the complex spreadsheets for which the past employee was responsible were redeveloped from scratch. This was apparently easier than trying to determine the logic and procedures of the orphaned spreadsheets.

The accounting firms surveyed have not yet addressed the issue of ownership of such spreadsheets.
Most software houses claim complete ownership if a program has been developed on company time, but such ownership is very difficult to enforce, especially if it is easy for the staff to take backups off the premises. Ironically, packaged software, such as Lotus 1-2-3, is similarly vulnerable, yet its abuse often leads to lawsuits and negative publicity.

- Quality assurance. Quality assurance often becomes a problem as more and more micros are used. When a new spreadsheet is developed, is its design reviewed by a second person? When a spreadsheet is used, is there any policy for footing the input or output or for checking the spreadsheet formulas? Input errors still occur and some spreadsheet designs are susceptible to inadvertent changing of formulas. Some firms are very wary of this problem and, consequently, claim that they put more review effort into this area than they do for traditionally prepared services. One firm has established a policy of never sending a client any direct output from a micro. Such output is always run through their standard report preparation and review process. Other firms delegate responsibility for quality assurance to individual project managers. Indeed, one firm has just created a new position, the sole purpose of which will be to administer micros. The nonaccountant who is hired for this job will be responsible for organizing and tracking diskettes, constructing and documenting spreadsheets and maintaining the hardware and software.

The advanced users
Some firms have reached an advanced stage of micro use. They have owned machines for at least three years, with one or more of the partners numbering among the firm's first users. Micro implementation at these firms takes the form of assigning one micro to each staff person and implementing formal controls and policies. Having grown comfortable with micros, these firms are developing uses for the machines that extend far beyond basic spreadsheets and word processing. All staff members are expected to use micros routinely.

There is a high degree of standardization in firms that are advanced users. All but the newest staff members have micros on their desks. The firm has chosen specific spreadsheet, database and word processing software, and everyone uses those packages. Newly hired persons, who have experience with other software, are expected to learn and use the "house brands." Hardware is also standardized, with most systems having the same amount of memory and the same type of printer.

One advanced user firm has 42 micros to be used by 44 staff members and will shortly add two more machines. Another has eight micros for three partners and five staff members. Both firms no longer have traditional clerical staff. Instead, clerks are now described as "para-accountants" and assist in many tasks formerly done by the CPAs. The CPAs, on the other hand, are expected to enter all correspondence and memos into their micros, thus eliminating handwritten work. Some large firms use electronic mail between their offices and ask their staff to enter such correspondence directly. Electronic letters are viewed at a computer screen with hard copy being generated only for archival records.

These advanced firms employ a number of microcomputer specialists who do not do any accounting work. Some of these individuals are CPAs who have decided to switch specialties while others are computer specialists with varying accounting backgrounds. The latter oversee training programs, develop advanced applications and manage the firm's hardware and software activities.

Some staff positions do not require continuous micro use. Conversely, some computing tasks require specialized equipment. Both situations are met by what are known as "special work stations," designed with a specific purpose in mind. For example, one station may be specially configured to handle advanced graphics and may include either a special plotter or color graphics printer. Other special configurations might include a high-speed modem, an extra-high-speed printer or one of the new laser printers with typeset-quality output. Generally, one person is assigned responsibility for these advanced stations and he or she will assist others in their usage.

In one national firm, the audit department uses micros differently from other departments. There is a specially configured pool of micros for that department's work. Using Lotus 1-2-3, the firm has developed an application program for use by auditors in all of the firm's offices. It is installed on portable, hard disk computers that have an additional hardware "key" installed. This allows each audit team to leave a computer at the audit site as needed, without anyone else having access to data that have been accumulated on the hard disk. The auditors do relatively little spreadsheet development. Most of what they need is built into the standard program they use.

Some advanced firms have developed sophisticated controls for their diskettes. One has even had its own special labels printed, and all disks are relabeled as soon as they are received. The new labels carry unique serial numbers and every diskette is assigned to a specific individual. A computer is used to track diskette usage. This firm has very few hard disks, none of which are shared. The firm does not intend to network its micros, feeling that its established controls function better without a network.

Other advanced firms organize their diskettes by type, standardize the labels and set up various diskette filing systems. Internal diskettes are generally kept in a central location while client and special project diskettes are stored within respective project files. Backup logs may be established for certain types of projects to ensure that backups are made in a timely manner.

Few spreadsheet development controls are currently operating.
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One firm has a users group that makes unofficial recommendations for purchases in different spreadsheet categories. No firm requires staff members to document the spreadsheets they develop or use.

**Conclusions**

Public accounting will never be the same once firms effectively harness the power of massed micros. Most advanced firms are excited about new service areas that have opened up, including the evaluation and installation of micro accounting systems and the development or sales of specialized software products. The full impact of this transition will be felt over the next few years, especially at the small business end of the accounting industry.

New billing issues have already emerged. If micro use enables a firm to cut compilation time in half, traditional hourly billing becomes a windfall for the client and forces the firm to take half its normal fee as well as bear the costs of making its staff proficient on micros. This situation can be remedied through value billing but, as more and more firms become competitive through micros, market laws of supply and demand will drive down the fees for that task. Thus, firms that keep billing at traditional value will be severely undercut by more aggressive firms.

**Software on center stage**

Today's typical computer user looks at the hardware with a steady pulse—it's the software that excites him. . . .

It's surprising, perhaps, that software is getting more attention than hardware now after years of taking a back seat. But maybe it's just a sign that the industry is growing up, paying less attention to flash and more attention to what you can actually do with a personal computer. If that means more and more people will find real, practical uses for microcomputers, then that's a very good sign indeed.

From "Rekindling the Fire" by Michael J. Miller

Popular Computing, September 1985