CHAPTER 6

Developing CAATT Capabilities

Audit expertise is one of the least defined concepts, and yet companies, shareholders, stakeholders, and whole societies depend on professionals who audit and report on responsible entities for the benefit of the recipients of accountability information. In addition to professional proficiency, modern auditors need to possess what has become known as computer literacy; however, with so many computer-literate auditees around, the notion of computer audit literacy has become such an issue that this book had to be written.

Professional Proficiency: Knowledge, Skills, and Disciplines

The use of and dependence on computers in today's business environment is no longer an area that can be avoided by the audit profession. Auditing around the computer is not a viable option for effective audit organizations. In fact, the importance of computerized information and the review thereof is recognized by the inclusion of Practice Advisory 1220-2 "Computer Assisted Audit Techniques (CAATTS)" published by the Institute of Internal Auditors (Institute of Internal Auditors [April 2005]). In particular, the section of the IIA standards that deals with professional proficiency starts by stating that internal audit staff or consultants engaged by internal audit should have the knowledge and skills needed to perform the audit function. The standards continue and outline the specific proficiencies needed to meet audit responsibilities and include the discipline of electronic data processing.

It is important to think about and to identify the requisite technological knowledge, skills, and disciplines of modern auditors before we discuss information technology training in the next chapter. According to the Oxford

Dictionary, the following definitions apply:

knowledge	familiarity gained by experience
skill	practiced ability, facility in doing something
discipline	trained condition, mental and moral training

This means that audit technological knowledge, skills, and disciplines are needed to support modern auditors in their various tasks. In previous chapters, we stressed the need to access any electronic data and to be able to analyze and test them in any possible manner in the pursuit of audit objectives. We also subscribed to the notion that modern audit software and technology can, will, and should support critical thinking (discovery mode) and reasoning (judgment mode), the auditors' two main intellectual efforts that can guide them also in their critical observations.

The interesting issue now is trying to identify the minimal technological skills of auditors—clearly a moving target in our rapidly evolving technological environment.

Computer Literacy: Minimal Auditor Skills

In considering the scope and performance of the auditor's work, we can find a few important clues again in the IIA Practice Advisories. When discussing the scope of work, the standards include statements to the effect that internal audit should review the reliability and integrity of information. The IIA standards note the critical nature of data, the use of data to support decision making, and the requirement for external reporting. The Statement on Auditing Standards, Analytical Procedures, SAS 56, states that analytical procedures can be used to assist in planning the audit steps and the timing and nature of the work to be done; in performing substantive testing; and in the conduct of overall reviews.

The standards continue by stating that internal audit should be capable of reviewing and assessing information systems and that the examination by internal audit should include an assessment of the timeliness, accuracy, and completeness of the information, as well as the controls over the data. The section of the IIA standards describing performance of audit work also provides direction to auditors, stating that auditors should be able to access, analyze, and understand the data they need in order to formulate an audit opinion. SAS 56 encourages auditors to use analytical techniques to develop an understanding of relationships between various data elements, both financial and nonfinancial, and to examine the data for trends.

The IIA has also published Implementation Standard 1210.A3, which states that auditors should have knowledge of information technology risks and controls and available technology-based audit techniques. In addition,

IIA Implementation Standard 1220.A2, states that auditors should consider the use of CAATTs and other data analysis techniques.

SAS 94, The Effect of Information Technology on the Auditor's Consideration of Internal Controls in a Financial Statement Audit, and SAS 80, Amendment to SAS 31, Evidential Matter, describe both the benefits and risks of information technology to internal control. SAS 94 provides guidance to auditors in determining the skills necessary to consider the effect of computer processing on audit. It also states that auditors may not be able to access certain information for inspection, inquiry, or confirmation without using information technology. However, the matching of risks with audit steps will help ensure that exposures are properly considered, and addressed, by audit.

How then does an audit organization begin to take advantage of the new technologies and techniques? There is no set answer to this particular question. While a procedural-type manual cannot be used in every organization, there are often similar steps that must be covered by all organizations. In particular, any effort to implement CAATTs should include the following steps:

1. Development of CAATTs should be planned and supported by senior management.
2. CAATTs should be linked to the goals and objectives of the audit organization.

Many organizations have made half-hearted or ill-conceived attempts at employing automated tools and techniques—and have often failed. When this happens, any subsequent attempt at implementing CAATTs will likely face stiff opposition. Many other organizations have audit departments with long, successful histories, and they may not be inclined to embrace new technologies or approaches. However, organizations that are continuously performing self-assessments will see that automated tools and techniques are essential for audit in the 2000s and beyond. Electronic forms of information are strategic inputs to the management decision-making process. Audit must be able to capitalize on the utility and importance and to comment on the reliability of the information.

Hylas and Ashton (*Accounting Review* [1982]) reviewed hundreds of working papers to identify the techniques that had been used to identify reported financial errors. They determined that analytical review techniques identified almost 30 percent of all errors reported, making these techniques the most effective audit technique. The use of analytical techniques, therefore, is a very powerful tool, and in recent years has become more and more widely used by all auditors.

Before we discuss the steps that can be taken to develop CAATTs capabilities in an audit organization, it is useful to look closer at the requirements for performing data extraction and analysis.

Ability to Use CAATTs

The ability to use CAATTs effectively requires an easy interface to the data, a desire to use the technology, and the commitment of senior management. This may include the provision of training (introductory and advanced), the development of sophisticated tools, and the development of standard CAATTs for the main application systems of the organization.

The audit department should work to make it easier for all auditors to access required information directly, without the involvement of programmers. Several factors that should be considered are the development of a user-friendly interface for the CAATTs and a menu-driven user-friendly capability for downloading files from mainframe applications to the microcomputer.

Also, the importance of having all audit teams buy into the concept of CAATTs cannot be understated. For some, use of the new techniques and tools will be easy, but for others it will not. Management must show a commitment to the development and use of CAATTs and promote and encourage their use.

Access to regularly used data can be made more beneficial and useful by the creation of summary files. The audit department can develop regular, monthly, or yearly summaries for the key applications and download these summaries. The summaries can be used to support audit requirements and even made available to senior management. If the auditors and management are on a local area network (LAN), all the summaries will be available to all workstations on the LAN. Alternatively, one workstation can be designated as an audit research workstation with all common information loaded onto it. The summarized file can then be used to identify trends, quantify audit materiality and population sizes, and support continuous auditing.

Case Study 39: Executive Information System

Audit summarized ten years worth of financial information (each year containing more than seven million transactions and covering more than $10 billion in expenditures) by responsibility center and by line object. The summary file, downloaded to the LAN, was only 20 megabytes in size. The current year's data was updated monthly and a menu-driven query facility was developed. As a result, all auditors had access to ten years of data, making trend analysis and the sizing of the audit population quick and easy. For example, audit could quickly determine the total expenditures for telecommunication, for overtime, or for specific responsibility centers for the last ten years.

Telecommunication Expenditures (2005 to 2008)

Type	2005	2006	2007	2008
Long Distance	41,256.25	43,845.23	52,397.34	53,723.56
Local	121,342.77	122,396.43	134,452.78	133,298.72
Other	5,387.12	5,778.33	11,254.11	11,744.42

The auditors did not require access to the mainframe system and the mainframe CPU costs, or obtaining this information dropped considerably since the extract was done once a month rather than once for each individual audit request.

When senior management heard about the system, they immediately demanded access to the data. In effect, audit had developed an Executive Information System (EIS), which supported audit and management's requirements for information.

The continued ability to use CAATTs effectively requires audit to search for new and better ways to conduct audit work. Audit management should evaluate new software, continue to research and develop ways and means of obtaining large data files from mainframe systems for subsequent analysis on microcomputers, explore alternative means of improving electronic communications with audit teams in the field, and provide all auditors with computer training where appropriate.

Understanding of the Data

Usually the failure to access and use data is more often a result of audit's lack of familiarity and understanding of the application systems or a failure to appreciate the importance of CAATTs than an issue of access. The issues of familiarity, understanding, and appreciation can be addressed by establishing CAATT working groups. These groups determine which applications the audit department requires access to and develop a good working knowledge of the applications and their possible importance to audit. The CAATT working groups are responsible for the identification of the critical applications and for the determination of which information, fields, and databases are relevant to audit. (Development and use of CAATT working groups is discussed later in this chapter.)

The working groups should not be the only source of information concerning useful application systems for audit. All audit staff should be aware of the importance of identifying electronic sources of information within and outside the company. For example, auditors doing field work

in branch offices may discover end user–developed applications that could be of use for subsequent audits of that office. Involving all auditors in the process of identifying possible sources of information can only help change the audit paradigm from the old approaches to one that considers CAATTs.

Analytical Support and Advice

Auditors who are using audit software need to be able to ask questions and receive technical support. Not every auditor will embrace the new technology with open arms. While some of the early adopters will be up and running, others will require ongoing support and advice. In order to support audit's use of CAATTs, many organizations have established an information support, analysis, and monitoring section (ISAM) within the audit organization. The support activities, such as analysis of complex files, extraction of data files, and ongoing advice, will be critical to the successful use of CAATTs by many teams. The ISAM staff should be selected so that they have a combination of audit and computer expertise. This will give them a unique perspective on audit automation and CAATTs and make them better able to support audit's requirements. (The concept of an ISAM is discussed later in this chapter.)

Initially, all audit teams will probably need help with the development of the analysis plan for the audit. This plan will identify the required data, its source, and the proposed types of analyses that will be performed. Audit teams will also need help in identifying CAATT opportunities. This is particularly true of areas where automation may not have been considered before. Consider, for example, an audit of the management of overtime (e.g., an audit in the personnel area). Most people would envision this audit requiring the review of hard-copy overtime forms and not see it as a likely candidate for the use of automation. However, someone with audit and IS experience might see opportunities for the application of automated techniques. For example, computer-supported analyses for an overtime audit can not only make a routine audit more effective and efficient but make it more valuable as well.

Case Study 40: Overtime Audit

The vice president of personnel had noticed that overtime expenditures were increasing at an alarming rate and asked the audit department to review the management controls over the use of overtime and assess the appropriateness of the overtime charges. Pay information related to

overtime expenditures for the previous and current year were downloaded to a microcomputer. The auditor summarized the information by manager and by individual employee. The auditor produced computer reports to:

- Identify managers with overtime expenditures more than 15 percent greater than last year's overtime totals
- Highlight all managers with overtime expenditures greater than or equal to 10 percent of their regular pay budget
- Identify all employees with total overtime payments equal to more than 25 percent of their salary

Overtime by Manager O/T ≥ 10% of Regular Pay

Manager	Emp	Overtime	Regular	Pay %
Production	112	523,059.23	3,932,776.25	13.3%
Personnel	181	841,824.03	6,377,454.82	13.2%
Marketing	21	121,515.03	1,012,625.36	12.0%
Totals	314	$1,486,398.29	$11,322,856.43	

The auditors then examined the appropriateness of use and type of overtime granted (regular overtime, first day of rest, or second day of rest). First, the auditors performed an analysis that matched overtime records to the leave system, to determine if individuals were consistently working overtime on the first and second day of rest, then taking the next two days off with or without pay. These cases were examined in detail to see if overtime was being used in an effective and cost-efficient manner or being abused. Next, for each employee, the total overtime paid by type of overtime was calculated to identify instances where individuals were working more overtime on the second day of rest, at double-time rates, than regular overtime, at time-and-a-half rates. This served to highlight potential areas where the management controls over the use of overtime might not be working as intended or were ineffective.

The results of their analyses were used to select a judgmental sample of managers and individual employees for their on-site review of overtime usage. In addition, a random sample of all employees who had received overtime payments this year was selected for review.

In a short time, the auditors were able to review the overtime expenditures at headquarters and several branch offices. The computer analysis helped identify additional lines of inquiry and isolated the higher-risk areas for further follow-up review and reduced the overall audit time.

Case Study 40 shows the application of CAATTs in an area where it might not have been obvious. In fact, CAATTs can be a significant support to audit in many nontraditional areas as long as a true audit attitude exists. However, initially auditors will need support and encouragement when applying CAATTs.

Communication of Results

Audit management must be committed to the use of CAATTs and should be actively promoting their development and use. All audit staff should be kept informed of new ideas, potential errors, and success stories. Several different communication tools can be used:

- Continuous auditing can be used to test controls and identify changing levels of risk.
- The CAATT working groups should develop catalogs of CAATTs that explain the applications and provide examples of the types of information available from each specific application.
- Audit management can publicize lessons learned, including successes and failures, which can be used to help the audit organization continue to learn and grow.
- Monthly summaries, briefly outlining the use of CAATTs by each current audit, can help all auditors see additional opportunities for the use of CAATTs.
- Lunch-and-learn sessions can highlight new audit software and demonstrate their use.
- New staff should receive a proper orientation to the CAATT being employed.

Steps in Developing CAATT Capabilities

The development of CAATTs in an audit organization can be supported from the outset or actively resisted by the current staff. CAATTs should be introduced to the organization in a way that does not evoke a negative reaction. It is important for all steps in the introduction of CAATTs to be planned and managed. The first step is to assess the organization's willingness to accept CAATTs.

Understand the Organizational Environment/Assess the Organizational Culture

One of the keys to the successful initiation of such a change is managing the internal inertia and resistance to change while mobilizing people's desire to

improve the environment and to be innovative and forward thinking. Individuals who try to bring about change in an organization may be perceived as innovative by some, but, unfortunately, they may be seen as saboteurs of the status quo by others. Therefore, as a first step in the process, it is important to try to understand how the initiative to automate the audit function will be viewed, both by audit management and by the organization's senior management.

Some people may see any attempt to change the way things are done as an act of sabotage. If the use of automated tools is seen as an attack against the status quo, it will be actively resisted, as would any attack on the well-being of the company. Combating this type of reaction will require you to form allies who can work on your behalf to bring about changes in attitudes and to help create opportunities where the benefits of automation can be demonstrated. Within the audit organization, support from audit management should be actively sought. In addition, it would be useful for audit management to cultivate support from among the company's senior executives (see Case Study 39). The idea is to have someone from the outside pushing for the cause on your behalf. Also, seek a single success first and then push for more.

Thomas J. Peters and Robert H. Waterman Jr., in the book *In Search of Excellence*, cite numerous examples of how innovative ideas were made possible because of the existence of "champions" (Peters and Waterman [1984]): people who believed that the idea was a good one and fought to give it a chance. The authors also stress the importance of creating an environment that supports innovation and tolerates and accepts failure.

Obtain Management Commitment

As with all initiatives, an important step is obtaining management commitment for the project. Often said and not as easily done, management must be willing to commit scarce time and resources that are necessary to the development and implementation of CAATTs.

The implementation of automated tools and techniques in the audit environment will likely involve a change in the basic audit processes and procedures. Usually audit resources will already be stretched to the limits, and there will be little or none left over to take on new initiatives. If audit is on a chargeback schedule, or must pay its own way or is working for external clients, the question of who will bear the development costs may be a big one. However, given a bit of freedom, a champion of CAATTs will find the time and resources required to implement automated tools and techniques. At some large companies, managers are allowed to spend up to 25 percent of their resources on their own projects, but are expected to meet deadlines and resource constraints for formal projects. While this may not seem to create a good working environment, it allows people the

flexibility to pursue pet projects without having to hide the activity from senior management. By adopting a similar attitude of tolerance, you may find that you have auditors who believe in CAATTs and are willing to invest some of their time and energy in the project. Given an opportunity, good people always find a way.

Establish Deliverables

It is important to keep a tight rein on management's expectations, even when the effort to automate audit is seen as innovative and a good thing. Many an otherwise successful project has failed because it did not meet expectations that were overly optimistic and perhaps even unattainable. At the outset of the project, well-defined deliverables and time frames should be established and agreed upon. Ascertain what resources (people, hardware, software, etc.) will be given to the project. Since the automation of the audit function will not likely be the primary task of such resources, you should determine what priority the effort will be given in comparison to other projects by the people assigned to the task. In short, answer management's expectations by having everything clearly stated, in writing and up front. In particular, the cost/benefit aspects of the effort will be a crucial factor in management's decision of whether or not to let you try it.

Set Up a Trial

Obtaining management commitment can be approached from a number of perspectives. Perhaps the easiest route is to obtain permission to perform a limited trial of the application of automated tools and techniques to a specific audit. The trial should use an audit as a test case to evaluate both the savings in time and resources. Since CAATTs can be developed incrementally, start off with simple tools and techniques in order to keep the initial outlay of resources to a minimum. Many hardware and software vendors are willing to supply their products and support for an evaluation at little or no cost. However, some groundwork must be done to prepare the way, and you should try to create an environment where the trial will have a high probability of success.

Plan for Success

No one plans for failure, but we often fail to plan for success. Proper planning will seek to create an environment in which the trial is likely to succeed. This involves selecting the right people, the right audit, the right time, and the right tools and techniques.

Ensure that the people on the audit team have a good level of computer literacy, experience with the audit software, and are committed to

making technology work. You may even consider hiring a consultant with proven expertise. Next, select an audit that has been performed before and has known costs. Preferably, choose an audit that requires the auditors to perform tasks that are better suited to automation. Tasks such as sorting, totaling, or comparing two or more sources of information are labor-intensive when performed manually, but are ideally suited to the computer. Also, the implementation of CAATTs assists auditors in analyzing data, turning it into information, and making relevant decisions based upon their analyses.

Finally, be sure the data is readily available and in a format that can be used by the audit software. While this may seem like you are stacking the deck in your favor, a trial case is no time to prove that CAATTs can be used under any and all circumstances. If the pilot is successful, you can take on more complex or technically difficult projects at a later date. During the trial, you should strive to create ideal conditions, since the organization and the team members will still be on the steep part of the learning curve and can use all the help you can provide.

Track Costs and Benefits

Track all costs, but try to differentiate between costs that were directly attributable to the specific audit being performed and those that produced results that can be used by other audits. Stress areas where 100 percent testing was possible because of CAATTs. Highlight areas where substantial savings over manual methods are achieved. For example, the preparation of the trial balance may take three days to calculate manually but only one hour using the computer. In addition, note areas where the effort can be improved the next time. For example, if you developed specialized routines that can be reused by next year's audit, note the potential future savings.

If the techniques are readily applicable to other audits, this should also be factored into the cost/benefit analysis. Be sure to highlight areas where other audits will be able to benefit from the work completed in this audit. Some outputs from the trial may only be valid or useful for that audit; others may produce savings in other audits. If you had to access and analyze the corporate financial system, part of the cost should be charged against the trial audit, but it should be formally recognized that any future audits requiring access to similar information will benefit from the work already performed.

Lessons Learned

At the end of the trial period, prepare a simple statement of what worked and what did not work. Outline the lessons learned, stating where automated tools and techniques can be used and what could be improved upon and how. Do not downplay problems that occurred, but focus on their

resolution and ways to ensure that future CAATT activities can avoid the same problems. Also, highlight the things that worked well and were of particular value. The lessons learned also provide an opportunity to discuss the soft benefits or intangibles, which may not have been reflected in a hard cost/benefit analysis. Note how the use of CAATTs allowed the auditor to perform the audit more efficiently and effectively. Also note areas where the audit team was able to adjust the initial audit program and make a better assessment than by simply following a manual audit program. Finally, outline how the concept of CAATTs fits with the goals and objectives of the audit department and the entire organization. If the initial trial of CAATTs was successful, audit management should be interested in expanding the use of computers to other audits. Senior management may also be interested in the capabilities (see Case Study 39).

The next problem to overcome is the fact that not all auditors have the same degree of familiarity or competence with computer hardware and software. Nor will all auditors openly welcome the introduction of information technology. You will be faced with a different type of inertia and, to some degree, fear. As pointed out in Chapter 1, there is an information technology continuum, and some auditors will be at the introductory stage as frightened, new users, whereas others will be at the advanced stage as experienced users who are driving the audit organization into new areas of automation. The expectations and requirements of both these types of auditors will have to be managed.

Organize Working Groups

The underlying philosophy behind the suggested approach to the development of automated tools and techniques is the provision of data, tools, and support to enable the auditors to conduct their own analyses. Auditors must be able to pose questions and obtain answers and must be able to interact with the data. This approach requires a conscious and deliberate move away from a strictly centralized support operation where an IS specialist receives auditors' requests for information, writes the required code, and hands them printed reports. One can see the transition to a more hands-on approach, starting with computer literacy; moving to the development of standard CAATTs, with extraction and download capabilities; and finally, to data analysis and automated tools and support for the auditors. The idea is to have CAATTs support and enhance the thought processes of the auditors. Thus, auditors can develop new lines of inquiry on-the-fly and use the computer to evaluate results. They can interact with the data and develop a better understanding of the information.

In order to manage this process in the most natural way for a constantly learning organization and its members, the formation of working groups has proven helpful.

Computer Literacy Working Group

One of the first steps in the development of automated tools and techniques for audit should be the establishment of a computer literacy working group. The aim of the working group is to increase the knowledge and comfort level of all auditors and audit management with respect to computers. The working group will be responsible for the identification, development, and delivery of computer literacy seminars. These computer literacy courses should not be long or intensive (approximately one to two hours each). The major goals of these seminars are to increase the awareness of the potential of using the computer as an audit tool and to make the auditors more familiar with the computer. The courses can be developed in-house or instructors may be brought in. Ideally, hands-on training will be included.

A basic computer terminology course may be needed to provide the foundation for further learning. In particular, everyone should have a good understanding of the concepts of field, record, and file and what they represent in terms of knowledge elements. In today's information technology age, this may seem obvious, but it is often not the case. Some people are isolated from technology or have had little or no exposure to the basic concepts. (Almost half of the DVD players in people's homes are flashing 12:00 because the owners do not know how to set the time.) Even regular users of some software packages do not always have a good grasp of the underlying concepts. Any attempt to use client data files will quickly make these gaps in understanding painfully evident. It is better to address them in the early stages of automation than to incur the negative feedback and the accompanying setbacks months down the road.

Additional things that should be covered by an introductory course include concepts such as sort, select, logic statements ("AND," "OR"), if clauses, import, export, download, extraction, record layout, file structures, naming conventions, and standard extensions. With each concept, examples relevant to audit should be used to bring home the salient points. Literacy training that uses company data files and audit-specific examples will not only improve the computer literacy of the auditors, but also introduce them to the corporate data sources and corporate files that they will be using during the actual audits.

Other literacy seminar topics could include spreadsheet, presentation, flowcharting, database, and project management software packages. Each literacy seminar needs to be only a few hours in length and should contain

examples to emphasize how the software can be used in support of audit requirements. Ideally, an example of how the software was used to support a recent audit would be presented as well. In some organizations, the seminars were offered during lunch-and-learn sessions.

Case Study 41: Computer Literacy

In one audit organization, ten in-house presentations covering different software packages were given to a total of 230 persons. Some people attended all ten sessions; others only attended two or three. Despite the number of people involved, the person-cost of this activity was only 80 days, including employee attendance and course development time. At the end of the year, every auditor had a good basic knowledge of computers and various audit-related software packages.

Once the basics have been covered, emphasis can be placed on building a good working knowledge of these tools. Many companies offer two- to three-day courses on most software packages. Computer-based training, videos, and in-house courses should also be considered. Chapter 7 covers information technology training for auditors.

CAATT Working Groups

Once management has committed to the idea of CAATTs, the audit organization must begin to develop or expand its knowledge and expertise with the company's information systems. One approach is to establish a working group that will take on the task of acquiring the necessary familiarity with the corporation's applications and developing the tools to be used by the auditors.

The initial task of this working group is to determine which application system will be investigated first. Often, the financial system is chosen because the use of automated tools and techniques in the finance area is more readily obvious and because of the large number of audits of, or using, financial information. The development of automated tools and techniques for the payroll, inventory, personnel, and other applications often follow at a later date. After selecting the information system to be investigated, the working group should decide who will be on the CAATT development team for the selected application. In the case of the financial system, the

development team will likely contain a mix of financial auditors, general auditors, and IS specialists.

The goal of the CAATT development team is to gain sufficient knowledge about the application to enable them to find ways for the information system to be used more effectively by audits. In order to do this, they must develop a detailed understanding of the application system, its data fields and sources, and the potential uses for audit. Typically, the development team will:

- Obtain copies of record layouts, database definitions, data dictionaries, and other system documentation
- Develop various reports (standard and ad hoc) and compare these with independently produced reports
- Develop extraction capabilities so that specific transactions can be identified and selected
- Develop download capabilities so the data can be further analyzed using audit software on the microcomputer

The results of the working group's efforts must be communicated to the rest of the audit organization. One method is to produce a CAATT manual for the specific application, outlining the results of the team's efforts. This manual should contain a description of the application, an explanation of the key fields and other audit-related information, samples of the standard reports, and details on how to obtain a standard or ad hoc report.

After completing the development of the CAATTs for the selected application, the first development team should be dissolved and a new team constituted so that auditors with different skill sets and expertise will be involved in the development of CAATTs for the next application. For example, in the case of the personnel system, auditors with experience in personnel should be on the development team, in addition to general and IS auditors.

Information Systems Support to Audit

Audit organizations seeking to derive the maximum benefit from automation, must have, or obtain, a working level of expertise with information technology (IT) including hardware and software. The audit organization cannot rely on outside consultants or programmers from the data processing area. Long backlogs within the data processing shops are too often still the norm.

Audit management must also be very concerned with the issue of audit independence. Reliance on programmers from outside the audit

organization can jeopardize the independence of the audit results. Investigations into potential wrongdoing or other sensitive audits may raise confidentiality concerns. Since audit may have unique requirements, or the need to combine information from various systems (combining mainframe and microcomputer data), the required skills may be outside of the traditional programming areas, making reliance on system programmers an even less viable option.

Given the nature of today's decentralized processing, the programmers responsible for the payroll system may have little or no experience with the software used for personnel systems. The company may have an Enterprise Resource Planning (ERP) system as well as several legacy systems. Therefore, if an audit team wanted to extract all personnel records to compare the information with the payroll system, it may be difficult to find someone in the organization with the required combination of skills. As a result, that expertise should rest with individuals within the audit organization. This would also allow audit to search for new opportunities for audit use of the technology, not simply to automate what was previously done manually.

The successful introduction, implementation, and support of CAATTs in audit will require a combination of audit and IT expertise. There are two basic approaches to achieving this: (1) bring in programming experts and develop their auditing skills or (2) develop the information systems (IS) skills in an auditor.

Using an IS specialist will make some advances in automating the audit function, but there is a risk of many missed opportunities. The programming expert often does not have a sufficient appreciation of the role of audit and, therefore, may miss opportunities to apply CAATTs to audits. In most organizations that have implemented CAATTs, the biggest challenge is the identification of areas where automated tools and techniques could have, or should have, been applied, but were not. Traditional areas, such as finance, may be well served, but nontraditional areas are neglected because the application of technology to audit may not seem likely at first.

Alternatively, the skill levels of IS auditors and the option of developing IS skills can be viable and successful. The IS auditor may already have significant experience with several of the client applications and already understand the goals and objectives of the audit department.

Whichever approach is chosen, the outcome must result in IS and audit skills existing in one or two individuals within the audit organization. This skill combination will allow them to examine electronic information with both an auditor's perspective of the potential uses and an analyst's view of how to extract, analyze, and use the information.

Many audit organizations have formalized the information support function by creating an ISAM section within the audit organization. This group is distinct from the IS audit group in that it operates as a support service to

the entire audit organization. The ISAM section should consist of staff with excellent IS skills and audit experience. The main goals of the ISAM are to:

- Provide internal auditors within the audit organization with guidance and assistance in obtaining and analyzing automated information required to plan, conduct, and report on audits effectively and efficiently
- Provide senior management in the audit organization with feedback on the integrity of the data analyses performed by audit staff

The ISAM would also perform more complex analyses upon request and promote more effective and efficient planning, conducting, and reporting of audits.

The resource cost of IT support is not overwhelming. In one audit organization, two people supported the information requirements of 70 auditors. This group more than paid for itself, introducing productivity increases in all phases of the audit process.

Case Study 42: The Changing Role of the IS Auditor

An IS auditor was hired primarily to conduct audits of the company's computer systems. As a secondary duty, the IS auditor supported the seven field auditors with their information requirements. This support, which included developing ad hoc and standard audit software applications, vastly increased the productivity of the field auditors in a very short time. Moreover, after the IS auditor supplied the field auditors with crucial information that was not available before as it was buried in the data files, the controller noticed the change and asked a few questions. Audit management also expressed an interest in transferring the IS auditor's knowledge to the field auditors. After she had trained the field auditors in the use of the audit software, she developed standard applications for the controller with the same intuitive audit software. This provided the controller with critical, previously unknown information. In fact, the controller became so informed that both the CEO and the chairman of the board noticed and asked for the reasons behind this surprising new state of enlightenment.

The final result: The IS auditor is now working on an Executive Information System (EIS) that is based on the audit software applications. The EIS will provide access to all electronic data in the corporation and will be accessible by senior management and audit management. Audit management has also formalized the information support function provided by the IS auditor, making this task a full-time position.

As indicated in Case Study 42, while the number of people required to support the ISAM function is not large, the level of the individuals within the group must be sufficiently high to allow them to perform the tasks required. These positions cannot be staffed at junior auditor levels. The ISAM staff will be required to question the analysis plans developed by team leaders, to perform quality assurance reviews of analyses performed by audit teams, to drive the use of CAATTs by the audit department, to be proactive and forward thinking, and to have a good view of where the audit organization is trying to go in terms of automation and how to get there from here.

In order to be able to develop an environment that supports the creation and implementation of CAATTs, it will be necessary for the ISAM to satisfy several objectives. Initially, staff time in an ISAM function will be divided as follows:

- 30% providing ongoing support and advice on defining criteria for the audit population and identifying possible sources of information to satisfy audit requirements
- 25% building standard reports, performing downloads and developing new techniques, obtaining access to new sources of information, and evaluating new audit software tools and techniques
- 20% performing complex analysis of client data files and developing a good understanding of the data in support of specific audit objectives
- 25% performing quality assurance reviews of analyses performed by various audit teams

As the use of CAATTs becomes more accepted and integrated into the audit processes, the percentage of staff time will change. Less time will be spent on providing support and advice and more time will be spent on performing complex analyses. Ideally, there will be a switch from ISAM staff-driven analyses to auditor-driven analyses.

The audit organization should develop a strategy that centers on a four-pronged approach to information support with the:

1. Provision of standard CAATTs for use by auditors with little or no IS experience
2. Development of a user-friendly interface to provide auditors with easy access to the mainframe and the development of a menu-driven system to allow auditors to perform their own analysis and print their own reports
3. Provision of data and tools to auditors that will give them control over the data and the ability to perform their own analyses. This includes a facility to download data from the mainframe to the microcomputer.

4. Provision of the services of specialized audit staff to perform complicated analyses and to conduct Quality Assurance reviews on behalf of the audit organization

The ISAM is established as the focal point for information systems support and expertise. This group is expected to play a key role in negotiating access to information systems. As a result of the mixture of IS and audit skills, the ISAM can bring about significant improvements in the automated analyses of data for audit purposes and reductions in turnaround times. Audit staff would no longer deal directly with programmers, who might have a tendency to code requests exactly as presented by the auditor, rather than offer suggestions related to audit objectives. Typically, auditors tend to have insufficient knowledge of the application and technology, and the programmer has little or no knowledge of audit methodology or the functional area under review. As a result, the programmer may add limited additional value to the process. The ISAM staff, however, will be able to offer audit-related improvements, asking the appropriate questions of the auditor requesting the report or data to ensure that the request is not only fulfilled, but is relevant to the audit in question. Further, since the ISAM is part of the audit department, independence is maintained and the knowledge acquired remains with the audit department.

Assure Quality

CAATTs can significantly improve the operation of the audit organization and the results of the audit work. The use of audit software to perform analyses of client data can quantify errors, identify dollar savings, or provide the auditor with improved insight into the client's operations.

Initially, the analyses will have to be reviewed as the tools and techniques will be new to the organization and the auditors will still be on a learning curve. As the use of CAATTs increases, quality will remain an important issue because more reliance will be placed on the results of the analyses, and these analyses will likely become more and more complex. A good Quality Assurance (QA) methodology and adequate training and support to the auditors will provide management with the required level of comfort, and CAATTs will enhance the reliability and usefulness of audit findings.

Simply providing auditors with the data, the tools, and the necessary training does not guarantee success. As discussed in Chapter 5, errors of interpretation, logic, performing downloads, extracts, selecting samples, and so forth can, and do, occur. The potential for error is high unless the use of CAATTs is properly managed. The credibility of CAATTs and that of the

audit function itself may be at stake. It would be a shame to go to all the effort of obtaining access to client data, purchasing audit software, and performing detailed analyses of the data only to find out that you had used "AND" instead of "OR" when performing the initial extract of the data from the mainframe application. The use of CAATTs will always require senior management to ensure the quality of the analyses performed.

Waiting until the manager performs the working paper review is not effective in reducing the negative impact of these types of errors. A more proactive approach involves the development and implementation of a methodology for conducting ongoing QA reviews of the data analyses performed by audit staff. This QA methodology will help ensure that the results produced by the CAATTs are valid. The more reliance is placed on automated tools and techniques, the more the reliability of the analysis performed must be ensured. The main purpose of the QA program is to provide a mechanism for assuring the accuracy of the analyses performed for audit purposes. This will permit audit management to place more reliance on the analyses and capitalize on opportunities for gains in effectiveness and efficiency.

Quality Assurance Methodology

The first line of defense against improper results being released to clients is the auditor performing the analyses. Every auditor has a responsibility to ensure the integrity of the proposed analyses and the validity of the logic employed. The audit team leader is the next line of defense. The team leader should be aware of and review the planned analyses, as well as carefully examine the results obtained. The audit manager, as part of the planning process and during the file review toward the end of the audit, should be concerned with the nature of the analyses and the reasonableness of the results. Senior management is responsible for ensuring that the proper controls over data and analysis integrity exist and are working as intended.

The roles and responsibilities can be further defined as follows:

- Auditors are responsible for establishing an analysis plan outlining the audit objective to be addressed and the specific analyses to be performed, and for maintaining proper documentation to support the analyses performed. Auditors are also responsible for performing the analyses and reviewing and assessing the results.
- Team leaders are responsible for approving the analysis plan and for reviewing documentation, analyses, and results.
- Audit managers are responsible for ensuring that the analyses have been adequately planned and reviewed for completeness and accuracy.

- Senior management shall, at its discretion, request a QA review of the analyses performed by an audit. This review will include a review of the criteria to the selected audit population, the analysis plan, the documentation detailing the analyses performed, the analyses performed, and results obtained.
- Information Support Analysis and Monitoring (ISAM) will conduct and report on reviews as requested by senior management. In addition, the ISAM will conduct QA reviews that they feel are appropriate, based on the complexity of the analysis or the significance of the potential error.

There are three basic types of controls for data analysis: preventive, detective, and corrective. The QA methodology should contain a mix of all three types of controls:

- Preventive controls reduce the frequency of errors in the analyses performed by the auditors.
- Detective controls do not keep errors from happening, but, rather, highlight them after the fact and help prevent them from occurring in the future.
- Corrective controls assist in identifying and determining the causes of and correcting errors or omissions in the analyses.

Preventive Controls for CAATTs

The most basic type of preventive control is knowledge. The auditors involved in the analysis of data files must have a good understanding of the data files and the audit software, which is gained through training and experience. Many audit organizations offer new staff training in audit, but few offer the new auditor any training aimed at understanding the main information systems used by the organization. How many audit organizations have a good understanding of the financial system of the company? How many audit organizations are using standard reports that were developed by outside consultants, without understanding how they work or knowing what types of transactions are being selected or, worse yet, without maintaining the automated routines when modifications are made to the application? In these cases, outsourcing of audit may happen by default.

All general auditors should receive IS training, including computer literacy and specialized training on the audit software package. Required IS training should be identified as part of the performance review process and should be properly planned. Ideally, the training on the audit software will be conducted using data from the company's applications and will address audit-type issues.

Earlier in this chapter, the utility of establishing CAATT working groups to determine which applications will be supported by CAATTs was discussed. The working groups are also responsible for developing and communicating an understanding of the applications. This includes identifying the main fields and providing definitions thereof, ascertaining the update schedule (to ensure you have the most recent data), and determining the source and use of the data contained in the application.

Experience with the company's applications can be gained through exposure to these systems. Further, the production of CAATT catalogs, which describe the main systems (finance, pay, inventory, personnel, and other applications), by the CAATT working groups will be invaluable. The ISAM, if it exists, should also discuss all aspects of the data extraction and download with the audit team at the time the request is placed and when the file is made available to the audit team, to ensure that tests for syntactic errors are performed.

Another preventive control is the ongoing involvement of individuals with expertise in audit and informatics. As mentioned, this can be accomplished by the establishment of an ISAM with a mandate to provide ongoing support and advice. This group should be involved in discussions concerning the approach the audit team will be taking in analyzing the data files. They should also be involved in the initial extraction and download, ensuring that all the required records are extracted and that the audit team has a good understanding of the data files. The involvement of the ISAM can correct potential problems before a great deal of time has been spent on the analysis and before invalid audit results are released to the client.

In audit organizations that have a formalized support unit, the unit is usually involved at the beginning of the audit. The ISAM will review the audit objectives and the audit plan to ensure that not only has optimum use been made of the technology, but that the proposed analyses are complete and accurate. If the analysis is standard and can be used over again, either for other audits or for a different time frame (next year or next month), the required commands can be captured in a script or macro. Audit software packages allow you to capture a series of commands and run them as a batch file. This ensures the consistency of the analysis across auditors and across time.

Detective Controls for CAATTs

The main feature of a detective control is the comparison of what happened with what was supposed to happen. In most cases, this implies comparing the results of the analyses with the expected results or with another source of information. Detective controls are particularly useful in two areas: extraction and download of files and data analyses.

One potential source of syntactic errors is the extraction and download of files from the mainframe to the microcomputer. From time to time, errors in the communication software or hardware will cause records to be dropped or data to be corrupted. In addition, the interpretation of the data types by the audit software may not agree with the mainframe application. One of the basic detective controls—an obvious one to auditors—is control totals. Verifying the number of records, total dollars, file size, and so on of the microcomputer file with the mainframe file will provide an indication of the integrity of the downloaded file. Where possible, you should check all downloads against a system report. This can be a standard report produced by the application or an ad hoc report run for audit.

For example, in performing a review of overtime payments, the auditor could:

- Extract all overtime payments from the pay system and run a report to summarize overtime payments by division using mainframe software
- Download the extracted file and produce a summary by division and compare the results with the report produced on the mainframe
- Compare the summary report with a standard report produced by the pay system for management

Notwithstanding the fact that CAATTs promote the use of the computer to help automate syntactic controls, they can be useful to check a sample of transactions against the manual records in order to test semantically for correspondence to reality.

As a general rule, whenever possible, seek independent verification of the results of the audit analyses. You can even share the results with other auditors or the application programmers to ensure that you have not overlooked any material. The ISAM can also be a valuable resource in ensuring the validity of the logic employed.

A second type of detective control is peer and management review of the analysis. Most audit software packages have a log feature, with all commands and the results of the commands captured in a log file. This log file can form a part of the working papers for the audit and the integrity of the analyses can be reviewed by examining the log file.

Corrective Controls for CAATTs

It is important to ensure that not only is optimum use made of the technology, but that the proposed analyses are complete and accurate. Generally speaking, it is better to prevent and detect errors close to their source. When errors are made, the underlying causes should be determined and corrective action taken to prevent the errors from occurring again and again.

The ISAM can be instrumental in identifying the underlying causes of recurring problems. These types of problems can be highlighted via regular communication with the auditors. Further, a training course can be tailored to address specific issues that have been identified as a source of errors. For example, if the financial system has been incorrectly used for a particular reason, this could be addressed when training on the system is delivered to new auditors.

The QA methodology and the associated reports will also serve as a corrective control. All results of QA reviews should be available to audit staff.

Quality Assurance Reviews and Reports

At the request of senior management, a review of the logic supporting the analysis conducted for a given audit should be undertaken. This will be limited to commenting on the syntactic accuracy, not the semantic or pragmatic sufficiency of the analysis performed. The results of all formal QA reviews requested by senior management should be presented to senior management, and the results of file reviews should be discussed with the audit teams and the appropriate audit manager. It is clearly important to realize the three dimensions of controls and tests, as the direction and intensity of the tests are different for each.

Summary and Conclusions

There is no single approach to the development of CAATTs that will work in every audit organization. The unique operating environment, level of knowledge of the staff, and the requirements of the organization will affect what, when, and how something is to be audited. However, the following steps should be considered when developing CAATT capabilities:

1. Define the current IT environment, including hardware, software, policies, knowledge levels, and expertise of audit staff. Also, consider the current attitudes in the IT area of the company, which may give an indication of the support (or lack thereof) for CAATTs
2. Define the future IT environment, with consideration given to the computer platform (mainframe, midrange, and microcomputer), operating system (MVS, DOS, Windows, and Macintosh), interfaces (IMS, DB2), organizational changes (structure, reporting relationships, etc.), and required levels and IS skills of audit staff
3. Identify the auditor's toolset (e.g., laptop, desktop, standalone, or LAN). Define the basic software tools (e.g., word processing, spreadsheet, database, data extraction and analysis, presentation, flowcharting, time

and project management, communications), specialized audit software, and other capabilities that are required

4. Identify audit management tools (e.g., risk analysis, budgeting, audit universe, time reporting, audit tracking, and follow-up and project management capabilities)
5. Identify other requirements (e.g., e-mail, reference libraries, access to external databases, Internet access, specialized equipment [color printers, fax, modem, etc.], storage medium, and capacity)
6. Identify training requirements, (e.g., who should receive training, how much and how quickly, and which type of training [in-house, external, instructor-led, video, computer-based])
7. Determine support requirements (e.g., hardware, software, and problem solving)
8. File management (e.g., establish policies for determining the official version, backup and restore, clean-up procedures at end of audit, file naming conventions, data security, virus protection, and external access via modem)
9. Quality assurance (e.g., establish a policy to help ensure that data analyses are planned and reviewed for accuracy, completeness, and relevance)

Any audit department interested in pursuing additional areas of CAATTs should also consider the:

- Establishment of an audit research workstation with specialized peripherals and audit software
- Development of audit methodology and findings databases and electronic working paper software
- Creation of a software library with specialized software programs
- Improved access to information from external sources, such as Internet access
- Communication and feedback mechanisms, such as CAATT manuals (with description of the tools and techniques and information about the application system), a newsletter outlining data analysis successes and failures, and flashes to highlight specific items of importance to the audit organization
- Development and delivery of in-house courses, beyond computer literacy, to improve the ability of all auditors to use automated tools more effectively

The productivity improvements that can be realized through the development and use of automated tools and techniques will only succeed if the implementation of CAATTs is properly planned and executed. Initially, it

may be necessary to develop and cultivate the required management and auditor commitment. In addition, the audit organization may be required to adopt a different mind-set and to break old paradigms and modes of thinking. As is the case whenever something new is being introduced, communication is a key to success. Communication between the auditors and the ISAM and between management and the support section are particularly important. Everyone should have a clear understanding of the goals and objectives of CAATTs. Both management and auditors should know what will be expected of them and what part they will play in the development and implementation of automated audit tools and techniques.

Auditors cannot be expected to obtain maximum benefits from CAATTs unless they have received sufficient training. They must be comfortable with the technology before they can apply it successfully. Further, a mixture of IS and audit expertise is highly desirable in establishing effective CAATTs and in creatively determining how the computer can be used to accomplish audit objectives.

The path to automation is littered with failed projects—projects that failed to plan to succeed. As the saying goes, "no one plans to fail, they just fail to plan." Given the benefits that can be obtained and the requirement to develop automated capabilities, audit organizations must take on the challenge of developing CAATTs.