

AUDIT OF COMPUTER READABLE RECORDS:
A Study of Process*

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OUTLINE

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APPENDIX 1: RESUME

ABSTRACT

This proposal describes a program of research to probe into the key differences between manual and data processing audit approaches in the examination of computer generated records. The literature in the audit field, while plentiful in dealing with procedural and sampling processes, has been scarce when dealing with computer auditing. This research proposal deals with the processes surrounding the audit of data processable records, not the audit of the data processing facilities nor the system development process. In consequence this study will emphasize the tradeoffs between manual and computerized audit procedures during a substantive testing process.

Two key methodologies will be used in this research:

(1) the principal approach is that of laboratory experimentation within a surrogated environment with control and experimental groups role playing as part of the surrogated environment. An audit case will be used to set up a simulated audit setting. A common set of basic audit objectives will be given to two groups: one trained in computer auditing and the other trained in traditional audit procedures. A 'systems analyst' will be made available to the first group to provide them with required computer printouts. A cost will be attributed to additional reports requested. Careful monitoring will compare costs and approaches used. Some process tracing techniques will be used to analyze the features of the two processes.

(2) the secondary methodology, to be used in comparison with the experimental approach, involves a survey of practicing traditional and computer auditors from the same CPA firm.

This proposal introduces the problem, discusses key research questions, outlines research plans, states the current status of the research effort, outlines the consequent Study in Accounting Research, and sets the timetable and budget for the study. Conclusions discuss the advantages and disadvantages of the research being proposed.

I. PROBLEM AREA

Many recent articles from the practitioner literature have suggested the need for further developing auditor competence and auditing methods to complement the use of the computer as an audit tool. Considering that the number of computer systems being used to process accounting and related activities is continuously increasing, the auditor must:

- (1) understand the role of the computer in the accounting and financial systems, evaluate the internal controls, and form an opinion as to the results of processing, and (2) use the power of the computer as an audit tool. (Johnson, 1974; p. 24)

Improved understanding of the role of the computer in auditing requires considerable academic research into its main environmental, procedural and intrinsic factors. A review of the computer audit literature reveals only a few academic studies of these processes (i.e. Cash et. al, 1977 and Will, 1972) and none oriented towards its behavioral, procedural or economic factors. Audit is an empirically developed field in great need of supporting research. Evidence of such a need is the current emphasis on audit research sponsored by academic institutions and CPA firms. This research proposal deals with the usage of computers in the audit of data processable records. It emphasizes the

use of computers in the substantive and compliance testing phases of the audit process. This research, comparing computer with traditional audit methods by means of experimental and survey methodologies will examine the following factors:

(1) the differences in audit objectives between manual and computer audits, (2) the extent and scope of the two types of audits, (3) costs, (4) the extent of reliance on judgement, (4) the reliability of the results, and (5) the appropriateness of the approaches for both compliance and substantive testing questions.

Particular research hypotheses will be stated after the review of the literature presented in the following sections.

II. LITERATURE REVIEW

A careful examination of the literature revealed two comprehensive surveys of computer audit packages (Will, 1972; Adams and Mullarkey, 1972), a detailed survey of techniques to be used in computer auditing (Cash, Bailey, and Whinston, 1977), a series of exploratory and descriptive articles (i.e. Burns and Loebbecke, 1975; Johnson, 1974) and a few papers advocating exposing CPA's to data processing (i.e. Blankenship and Scholler, 1976;

Muller, 1975).

None of these articles deal with the technical issues described earlier in the introduction of the problem area of this paper.

Cash et al. (1977) review "the extant literature concerning auditing and EDP systems" and propose new approaches to EDP auditing based on comparisons (similarities and differences) among techniques and relate these to the the auditors' professional responsibilities. These techniques are divided into three major classifications: (1) techniques to verify the phases of processing, (2) techniques to verify the results of processing and (3) new approaches. The problem with such an approach is that it examines current audit literature under a normative and prescriptive approach without actually understanding what the utilization of these techniques actually entails.

Miller (1975) points out the main areas of emphasis in EDP auditing:

- General control audits;
- Installation security audits;
- Application or systems audits;
- Operational audits:
 - performance auditing
 - production-throughput audit,

- post audit review or cost benefit analysis;
- Fraud audits;
- Computer-assisted audit.

This study, for the sake of focus and objectivity , will concentrate on the issues around computer-assisted audits .

The AAA (1974) report of the Committee on Auditing pointed out the basic functions to be performed by a computer auditing system:

- Create a work file from a client's files;
- Update work files;
- Perform a full set of arithmetic and conditional operations;
- Summarize the work files;
- Sort data in ascending and descending sequences;
- Print reports which meet a number of criteria prescribed by the auditor.

The usage of these basic functions will be compared with manual processes under a task environment throughout this research. In order to direct and focus this study, the next section asks the basic questions to guide this research

and states research hypotheses.

III. RESEARCH QUESTIONS

This section is divided into two main parts. The first states general research questions while the second lists specific research hypotheses. Initially questions concerning the process of computer auditing are asked.

Q1: Is the computer audit process inherently different from the traditional one?

Q2: Is the scope of the computer audit different from the traditional one?

Q3: Are costs affected by computer audit?

Q4: Did the advent of computer auditing change the reliability of audits?

Q5: Did the advent of computer auditing change the nature of auditors?

Kinney (1975) described the key steps of the audit process according to SAS No. 1 section 320. These encompass the evaluation of internal controls (through ICQs, flowcharts, etc.), compliance testing, analytical review and substantive testing. The balance of these steps may be considerably changed due to computer auditing. The scope of the audit itself may be enhanced by larger samples (where the incremental cost of sample size is negligible) or by a different balance in the cost x benefit tradeoffs between internal control evaluation, compliance testing and substantive testing. Changes in this balance may also lead to different needs of audit reliance as the cost of litigation may considerably outweigh the decreased costs of testing. These changes in the cost x benefit tradeoffs may lead to a different type of auditor more willing to perform substantive testing, relying less on procedural work, better trained in data processing and probably being paid at higher wages (Vasarhelyi and Pabst, 1978).

The second part of this section will state more specific research hypotheses. Unfortunately, as empirical research on computer audit is unavailable, only logical support can be given to the hypotheses being stated. These hypotheses will be further developed in the study being proposed during the stages of conceptual development and may be considerably different than the ones presented here. The main reason for their presentation is for illustration of

the lines of thought to be developed in the proposed monograph.

H1: Computer audit increases the reliance on substantive testing

Due to decreased incremental costs of examining additional records in algebraic and logic examinations, auditors will look at more records for summarization and logical testing purposes. Differences will be traceable to tradeoffs between setup and manual procedure costs.

H2: Computer auditors will deal with a larger set of audit objectives for a particular system

The marginal cost of incremental audit procedures to satisfy additional audit objectives is considerably decreased once the basic setup of the auditor's work file is completed. For example, if auditing an inventory file, the cost of checking for unexplained flags in supposedly blank fields is minimal.

H3: The substantive testing phase will provide improved feedback on the adequacy of the internal controls

SAS No. 20 prescribes the need for reporting to management material weaknesses in internal controls. Computer audit, with increased level of substantive testing and logical crosschecking, allows for more precise information on the nature and frequency of errors.

H4: Computer auditing allows for faster completion of similar audit tasks

H5: Computer auditing allows for cheaper completion of similar tasks

H6: Computer auditing will switch auditor's emphasis from judgement to hard evidence

Hypotheses 4 to 6 relate to the changed nature and costs of the computer auditing approach. Some of the practitioner literature seems to indicate that computer auditors are auditing entire files instead of sampling, but that the cost and time-frame of similar audit engagements is decreasing. Auditor time involvement is expected to significantly decrease, computer costs to increase, and auditor rate per hour to increase due to the need for increased specialization while the total costs would somewhat decrease.

The expected switch, away from judgement to statistical evidence, may or may not be a desirable event. Overemphasis on procedures may deter sound and objective financial evaluation of the nature and health of the client's business which is the ultimate responsibility and duty of an auditor.

Additional hypotheses will be formulated on the nature of the auditor, the nature of the assignment of reliance to procedures, on different steps being performed, on evidence being used, and on the processes necessary to arrive at an attestation decision.

IV. RESEARCH PLANS

The questions being asked range from the normative to the descriptive domain. Most of current research in computer auditing could fall into what Buckley (1976) calls "opinion research" whereby the author states his views or advocates an approach (individual opinion) without major emphasis on research methodology.

This pragmatic approach must be complemented by a more systematic search in order to set the basis of a science. Empirical survey and laboratory experimentation are being proposed to link computer audit practice to the traditional audit theory (see Lin et al., 1979).

Laboratory Experimentation

In order to study and experiment with the differences between computer and traditional audit a controlled environment is desirable. Kerlinger (1973) divides social scientific research into four major categories: laboratory experiments, field experiments, field studies and survey research. "A laboratory experiment is a research study in which the variance of all or nearly all of the possible influential independent variables not pertinent to the immediate problem of investigation are kept at a minimum" (Kerlinger, p. 398).

This laboratory experiment will have the use of computers in the audit of data processable records as an experimental variable. Unfortunately a confounding variable is the training of auditors as computer auditors will be individuals of different training and background than traditional auditors. Also, audit experience, nature of past clients, experience in computer auditing, age, sex, etc are additional confounding variables.

As a result the experiment will be performed with students of the same course (B8103 - Auditing) at Columbia University. They will be drawn from two sections of the same course, however, each section will have different declared emphases. One session will be taught by a

traditional auditing instructor while the other will be announced in advance as emphasizing "computer auditing and sampling". A matching procedure of subjects will serve to decrease the differences discussed above therefore leading to a "matched experimental group-control group design". After matching is accomplished groups will be formed to create audit teams with ranks assigned based on experience and other factors. The problems of using students as experimental subjects have been extensively discussed in the literature (e.g. Cunningham et al., 1974 or Abdel-Khalik, 1974) with mixed results. In this particular design, the usage of groups instead of individuals and the use of students to homogenize subject experience backgrounds may be a positive factor in the design.

Audit groups will be composed of two subjects (a "senior" and a "junior"), given a detailed case description, a printout of an inventory file, a file cabinet with supporting documents (to be vouched), a report on the ICQ of their inventory cycle and a basic set of audit objectives. Subjects will be asked to operationalize these objectives throughout the audit, complete time sheets with detailed specification of their time use, prepare working papers and suggest an opinion. These are to be presented to the "partner" (a cohort of the experimenter) in-charge of the engagement for evaluation. This meeting with the surrogate partner will be used as a debriefing and for process tracing

purposes (AAA, 1977) .

In additon, a surrogate system analyst will be provided to help in the besides footing, crosschecking and logical checking and he will be provided with inventory ledger cards, purchase orders and shipping orders for vouching, authorization verification, etc.

This experimental environment, will be supplemented for the experimental group with the TREAT (Vasarhelyi and Lin, 1978) system which is an emulation of Touche Ross nad Co's STRATA and allows for unobtrusive tracing of EDP activities. Students of the special section of B8103 will have been instructed in TREAT and have experience using it for accounts receivable and property, plant and equipment applications.

Hypotheses will be tested by non-parametric and t tests for one-way analysis of variance as sample sizes are expected to be rather small with about 15 audit teams per experimental category. Qualitative analysis (Filstead, 1970) will be applied in the examination of the intrinsic characteristics of the audit processes in each group throughout the experiment.

The same questions and hypotheses examined in a laboratory experimental approach will also be examined under a survey methodology.

Survey Methodology

"Survey research studies large and small populations (or universes) by selecting and studying samples chosen from the populations to discover the relative incidence, distribution, and interrelations of sociological and psychological variables " (Kerlinger, p. 410).

This survey will be an in depth analysis of computer and traditional auditor perceptions and opinions concerning the issues being examined both in the research questions as well as in the research hypotheses.

The survey population will be composed of seniors and managers of large CPA firms with pairing to control for subject rank, background and firm therefore limiting the effects of these variables particularly interfirm variations. Seniors and managers are still very aware of technical and procedural issues while many partners have been away from the field for some time. In addition large firms will be utilized as these seem to have more established and higher quality practices as well better quality controls. If possible subjects will be drawn from a single firm at the cost of some generalizability of results but decreasing interfirm variation factors. Written questionnaires will be administered to subjects and followed up by a short tape-recorded interview. Due to the intricacy

of the questionnaire-interview process and to the process tracing methodology to be used in analyzing the data only 10 subject will be procured for each experimental category.

CPA firms notorious for competent computer audit activity will be contacted and requested to assign four to six auditors to the research on a random basis (if no single firm can be found to provide all subjects). These subjects will receive a questionnaire to be completed at a determinate site at a scheduled time. Upon completion of the questionnaire the subject will be interviewed by the researcher for classification of protocols, additional answers left unclear in the questionnaire and debriefing.

The questionnaire will be organized along the following lines:

- part 1- steps in a hypothetical audit
- part 2- objectives in an inventory audit
- part 3- emphases on testing
- part 4- determinants of an opinion
- part 5- differences between a traditional and a computer audit
- part 6- auditor training and characteristics
- part 7- content of working papers

Responses will be content analyzed and placed in a large table of results. Statistics will be used where applicable.

Concluding Analyses

In spite of parallel design of both empirical phases, results will not be available for all variables in all dimensions for both approaches. For example laboratory experimentation will provide performance measurements not available in the survey. On the other hand the survey will provide generalizations on processes which are very difficult to gather, if at all possible, from the laboratory experiment. Summarizing, the laboratory experiment will allow the gathering of objective data on performance and insights on the process while the survey will provide a descriptive model of auditor perceptions of the process. These two approaches will be compared and contrasted with the conceptual models developed in the conceptual part of the research.

V. CURRENT STATUS

This research is still at a design stage; comments from colleagues and discussions with practitioners may still considerably change the scope and approach of this proposed research. Pilot testing of the experiment and of the survey

will be designed to streamline the design, sharpen the focus, clean up the instruments and decrease the range of alternatives. The literature search and examination stage of this research is partially completed. Previous work by the author (Vasarhelyi, 1978 and Vasarhelyi and Lin, 1978) required considerable analysis of the literature leading to several of the ideas in this proposal. Contacts with CPA firms and one business organization seem to indicate that subjects can be obtained as well as the desired inventory cycle documents. Furthermore, no major problems are expected in obtaining student participation in the experiment.

VI. OUTLINE OF THE STUDY IN ACCOUNTING RESEARCH

The first chapter of this research discusses the background, importance and key problems of research into computer auditing. In addition the problems being examined are placed within the context of traditional audit theory and the scientific method. A short summary of findings and areas for future research is presented together with an outline of the ARS.

The second chapter discusses the literature by relating the work in computer auditing to all the steps in the audit process. This will lead to a formal description in comparative terms of the traditional and computer audit processes as prescribed by the extant literature. This normative model associated with the behavioral model presented in chapter three will be compared with the descriptive approaches obtained from the simulation, process tracing and surveys.

The third chapter proposes a behavioral model involving the human factors that may influence the prescribed audit process. Among these are the effect of individual and group resistance to computers, motivation according to expectancy theory and the expected effects of computers on the nature of auditor judgement processes.

The fourth chapter formulates the key research

questions being asked on two levels: 1) conceptual questions related to processes and behavioral factors and 2) particular research hypotheses formulated to detect the differences between the manual and computerized audit processes. Research hypotheses and general questions are related to the literature in general and to the models in chapters two and three for theoretical support.

The fifth chapter discusses the methodology of the study both for its laboratory as well as its survey steps. The laboratory experimental design is justified with its key parameters established. The population sample, nature and type of questions in the survey are derived from the laboratory experimental design for ex-ante and ex-post comparability purposes.

The sixth sixth and seventh chapters relate the separate results of the laboratory experiment and the survey respectively encompassing the statistical analysis of the results and the responses to the formulated hypotheses.

The eight and last chapter compares the results in the two preceding chapters, relates these to the conceptual models proposed and states the conclusions, strengths and shortcomings of the study. Paths for future research are proposed.

VII. TIMETABLE

Assuming that this study is commissioned by the AAA in late February the following timetable is planned:

March 1979	Literature search and analysis
April 1979	Normative model
May 1979	Behavioral model
June 1979	Laboratory experiment -development and pilot runs
July 1979	Laboratory experiment, Survey design and pilot
Aug.-Sept. 1979	Survey
Oct.-Dec. 1979	Analysis of results
Jan.-March 1980	Writeup of ARS
May 1980	Revisions and completion

The consulting committee will be kept informed by interim reports submitted after the completion of the models (June 1979), after the experimental steps (July 1979, October 1979), and at the completion of the draft of the report (April 1980). Interim reports will resemble drafts of the equivalent chapters of the ARS.

VIII. BUDGET

Faculty summer support	\$5,000.00
Out of pocket computer storage costs	\$ 200,00
Out of pocket miscellaneous	\$ 200,00

TOTAL	\$5,400.00

IX. CONCLUSIONS

Will (1972) and Cash et al. (1977) are among the few academic studies in the area of computer auditing. Recent notorious events related to computer fraud (Allen, 1977) led to considerable interest in the audit of data processable records. However the academic community has been slow to respond in providing conceptual groundwork for this field.

This study proposes exploratory as well as hypothetic-deductive approaches to the examination of the audit of computer readable records. On a methodological level it will contribute by utilizing a simulated audit environment for audit research, by using role-playing to improve the external validity of the surrogate environment

and by comparing results of alternate methodologies examining the same research questions.

On a practical level it will provide insights into the computer audit process, into the nature of the computer audit task, into the behavioral factors affecting its performance and into the nature of the computer auditor.

These contributions may serve as foundations for the comprehension of the computer audit process and may spur further interest into this line of research. Multiple avenues of further research may be derived from this basic research effort.

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