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Four or five years ago lots of people in the accounting world were making very sophisticated prognostications concerning the future of record-keeping in a world that would be virtually saturated with electronic data-processing equipment. The equipment salesmen were quoting tremendous backlogs of orders and predicting even greater backlogs when their low-priced, all-purpose equipment of the future was announced. "Computer experts" were confidently discussing the automated offices of the future in which management would be confronted only with the task of solving the business problems that a computer had identified and reported to them as exceptions. And about this time a lot of auditors were busy speculating as to how they would analyze a collection of magnetic spots.

Now, with just a few years' hindsight, much of that electronic hysteria appears to have been unwarranted, or at least not justified by subsequent developments. What has happened in the meantime? Truly, the only thing that has happened in this respect is that when the first of these electronic toys were delivered and we at last had an opportunity to play with them, they lost a great deal of their pie-in-the-sky glamour. They became recognized for what they really were—just bigger, better, and much more expensive pieces of hardware.

With the EDP equipment presently available and in use we are not faced with any earthshaking audit problems that cannot be solved by proper planning. It is when electronic applications are in the planning stage that the auditor can be most effective. It is at this stage that he is in a position to inject his audit requirements as additional specifications, or parameters, for the EDP application. This thought that we can, and should, place restrictions on the use of EDP equipment may cause screams of anguish from EDP purists; it may even cause us to be labeled procedural reactionaries. Be that as it may, we must recognize that procedures designed for the convenience of electronic machinery do not necessarily produce records susceptible of reference, analysis, or audit. If the management of a business feels disposed to support an internal auditing department, if they feel that the production of this group is vital to the orderly processes of the

business, then that management cannot, in good conscience, condone records developed in an unauditable manner. And let us not deceive ourselves into believing that EDP equipment cannot produce unauditable records.

If you will reflect upon your audit activities I think that you will find that the auditor makes very few references and performs very few steps that are peculiar to the audit. Normal managerial inquiry usually demands that the clerical personnel make, or at least be in a position to make, these same references and to take these same steps. It is true the auditor may use the information he obtains through these steps and references in different contexts and for different purposes than the clerk does, but essentially the audit trails he requires are the same as those required by accounting and other personnel within the business. For this reason I do not feel that our insisting upon readily auditable records is imposing any substantial burden upon a well conceived EDP application. In reality we are only asking that information be preserved in a manner in which it will probably be needed with or without an audit. There are two essential differences, however, in the use of these audit trails. The first is a difference in timing of the use of these trails. The second is the volume of reference.

TIMING OF AUDIT STEPS

It is not at all unlikely that a business using EDP equipment, especially one using magnetic tapes and large random-access memories, will have readily available only current information regarding items subject to change; for example, personnel information used in payroll preparation might be updated prior to the preparation of each payroll. This practice will probably serve most clerical-type inquiries since the primary concern of such inquiries is likely to be related to the current situation. The auditor, however, is accustomed to making his payroll tests retrospectively. Clearly, if the auditor is going to refer to this dynamic information he is going to have to do it while the information is extant, or, in the alternative, he is going to have to be provided with some sort of "change register." If he is dealing with low-activity items a change register may be entirely satisfactory. If he is dealing with a high-activity item, however, a change register might be so voluminous as to be practically useless. In this latter case he will probably have to perform his audit tests on a current basis. Whereas this may restrict the auditor's activities timewise, it offers him an opportunity to make a much more effective appraisal of the internal controls than he could possibly make by inquiry at a later date.

This appraisal of the internal controls should take the form of a continuous systematic review of all clerical activities, not only in the EDP installation, but also in the departments feeding information into the EDP installation. I like to refer to this review as a clerical procedures audit. Without such policing there can be no assurance as to the validity of the information arriving at the EDP installation, or of its proper use once it is in that sanctum. This policing must establish that the standard procedures at each source of EDP information were being followed, that the paper-flow into the EDP installation is not being impeded in such a way as to invalidate any reports drawn from the contained data, and that the proper controls are established at the EDP installation. And certainly it must establish whether there is a reliable source for instruction when the standard procedures prove inadequate, as most formalized procedures are prone to do under unanticipated circumstances.

VOLUME OF REFERENCE

The EDP applications with which I have acquaintance have caused neither the elimination of source records nor any substantial reduction of *significant* output information. As a matter of fact, in some cases, the result has been just the opposite as far as the output is concerned. This, in itself, may be an indication of either misuse of the equipment or of outdated records-retention schedules. Revision of records-retention schedules is an item all too often overlooked in planning an EDP application. This should be of some concern to the auditor, since frequently the audit requirements are the determining factor in establishing the retention period for certain of the records. I personally feel that the proper time to establish the retention period is the time at which we give birth to the record. If the auditor can get his two-cents' worth in at this point he will be in a position to insure the availability, or at least the existence, of records at the time he proposes to use them.

The mere fact that all of the records are available, by one means or another, is not the whole story though. In the audit of records maintained under conventional procedures we have usually relied upon intermediate records for an audit trail to simplify our testing procedures. These intermediate records—such as worksheet, grouping sheets, proration schedules, and the like—have existed almost solely because of the necessity for breaking the clerical tasks down into components within the capacity of one person. This unit of meas-

ure for paperwork ceases to have meaning in a fully integrated EDP program. Under the "record it once" approach, the fantastic speed of the EDP equipment is utilized to use and reuse the raw data, frequently without the necessity of intermediate summarization. With this in mind it seems obvious that in an EDP installation some of our audit tests have to cover a broader span of clerical activity than we have been used to in the audit of conventionally kept records. In this broader span, the audit trail may lead directly from the final reports back to the source documents. The validity of these references, and of the internal manipulation of the data, is subject to audit tests, but obviously the test is complicated by the breadth of this span. To me this has but one implication. We auditors have to increase the effectiveness of our testing procedures. Our tests are going to have to be less extensive, but they must not be any less conclusive. One possible way of increasing this effectiveness, particularly for the internal auditor, is through the use of statistical sampling techniques. In deductive auditing, such as is practiced by independent CPAs, these statistical sampling techniques have been found useable, but not nearly to the degree that is practical for internal auditing purposes.

INTERNAL CONTROLS

A few moments ago I mentioned but passed over very quickly the matter of the internal controls affecting an EDP installation. These controls can generally be classified into four main types: (1) mechanical controls, (2) program controls, (3) controls within the EDP installation, and (4) controls from outside the EDP installation.

Control over the mechanical accuracy of the EDP equipment, i.e., preventative maintenance, may be the manufacturer's responsibility but the auditor has an inherent interest in it. He can determine whether such maintenance is being performed by reference to the daily log that should be maintained for each installation. Absence of scheduled maintenance for any protracted period and excessive unscheduled downtime due to equipment failures are easily recognizable clues to inadequate attention to this control.

Program control really has two facets. One is the control exercised *over* the program, and the other is the control exercised *by* the program. Both are intended to insure the validity of the machine output. Protecting the sanctity of the program is a matter of physical control, which should be exercised by a control group entirely independent of the EDP operators. If the equipment permits, the

physical control of the program can be supplemented by the control group monitoring all information introduced into the EDP system through the console of the equipment. In any event, a second program deck, or program tape, should be retained by the control group for periodic comparison with the working program. For a while we heard savants suggesting that it was feasible to scrutinize EDP programs or to test them as a means of determining their sanctity. That is so much nonsense. A program for any really justifiable application is generally so large and so complex that scrutiny is impractical even if the auditors were adequately trained in programming. Even skilled programmers have difficulty in working with their own programs once the programs have gone cold. The notion of testing a program through the use of test problems is completely futile. For such a test to be effective it would have to test every decision and combination of decisions made in the machine, including any concealed decisions which the tester wouldn't know about in the first place.

The controls exercised *by* the program can be an answer to the auditor's prayers, or their absence can be the bane of his existence. With the machine's ability to compare and take alternate courses of action based upon the results of the comparisons, it is possible to isolate and identify possible error conditions in such a way as substantially to reduce the monotonous pile of detail that auditors sift through in locating the items of interest to them. Failure of the auditor to insist upon provision for exception reports for his own use is no one's responsibility but his own. A number of techniques are available to the programmer in building controls into a computer program. To evaluate these the auditor need not be a programmer himself, *but* he must be adequately schooled in the systems approach and in the general characteristics, capacities, and limitations of the EDP equipment with which he is concerned. He must be able to review a block diagram of an EDP application and locate the points at which control checks should be introduced into the program. These control checks may be used to determine that control totals have been met, that the proper number of transactions have been entered into the machine, that the account distribution entered into the machine was correct (or at least not impossible), or that the proper reel of tape is being used. These checks are as numerous and diverse as EDP applications themselves. It should be the auditor's job to insure that these checks have been inserted so as to provide the maximum practical assurance.

Control within the EDP installation, including the peripheral equipment and the related conventional tabulating equipment, must be maintained in such a manner as to insure the proper recording, manipulation, and reporting of all required data. Control over recording of the data is essentially the same as the control that should be exercised in a conventional tabulating operation. Keypunch operations (which will probably continue to be the primary means of initial recording) should be explicitly described on specification sheets, which should be kept up to date. Verification of the initial recording, whether such verification is by mechanical means or otherwise, should be performed by a person other than the initial recorder. All input data should be marked by both the initial recorder and the verifier. A control group should ascertain that these steps were performed and that the resulting data are in agreement with all appropriate control totals.

Control over the manipulation of the data should be exercised by physical control over the input data, the programs, and the permanently wired control panels. This physical control must be supplemented by explicitly drawn, up-to-date operator instructions covering the proper uses of the machine and the action to be taken by the operators.

Control over the reporting of data from the EDP installation should include a review of the output data for obvious errors, and a comparison of the report totals with any predetermined totals created either inside or outside of the machine itself.

Control from outside the EDP installation must be such as to give assurance of a high degree of accuracy in the input data to the EDP installation. In this regard I have previously mentioned the necessity for a continuous policing of the procedures affecting these input data. In addition it is entirely practical to exercise a quality control over the detail in the input data through well established statistical quality-control procedures. This step, though very much an in-line operation, might very well be a function of the internal auditing department.

SUMMARY

To summarize this discussion, I would say that the most serious problems of EDP can be solved by:

- Making provision for adequate audit trails and exception reports at the time that the EDP applications are being designed;

- Making audit tests of dynamic records on a current basis;
- Making a continuous clerical procedures audit to insure that standard procedures are being followed and internal controls rigidly maintained;
- Making tests of the validity of the output of the EDP system by statistical sampling or similar techniques that permit interpretation of relatively small tests, and
- Making quality-control type tests of the EDP input data to be assured of an acceptable degree of accuracy in this data.