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Electronics in Relation to Accounting Procedures and Records

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INTRODUCTION

A few years ago, a discussion on this subject would have been started by a review of the elementary concepts of electronic data processing. I believe it is safe to assume that such an elementary approach is no longer necessary in groups such as this. I base this assumption upon the work done in the field of electronic data processing by various utilities and utility organizations and upon the fact that some of the larger utility companies have been, in a sense, pioneers in this field. Evidence of this is the recent announcement made by Con Edison of New York that they have ordered three of the largest types of electronic data-processing machines - a Univac, an IBM Type 705, and a Univac II. Commonwealth Edison of Chicago are installing, or have installed, an IBM Type 702 and many other utilities are well advanced in their electronic programs. Of course, electric utilities have a good basic reason to advance the use of such machines - as you know, electronic data-processing equipment has a healthy appetite for electricity.

The subject assigned to me is "Electronics In Relation to Accounting Procedures and Records". I intend to limit my remarks to electronic data-processing systems. This means such equipment as Remington Rand's Univac and Univac File-Computer, International Business Machine's Types 650, 702, and 705, RCA's Bizmac, and a half dozen or so other systems, most of which are of a small capacity. All of the systems to which I refer can be characterized by the fact that each has the ability to store internally its own set of operating instructions, called a program.

The speed of this electronic equipment, as compared with other electro-mechanical data-processing equipment, is phenomenal. It is hard to talk about it without mentioning some statistics. For example, in a recent proposal, it was determined that all of the calculations required in a 50,000 man payroll could be accomplished in 2-1/2 hours

on one of the larger systems. A statistic that interests me more relates to Allstate Insurance Company and their medium-sized machine. At that Company, 1800 man-hours of work were reduced to 100 man-hours by mechanical means - and then reduced to 12 man-hours when the work was placed on their medium-sized data processor.

It is also difficult to talk about this new electronic equipment without mentioning some of the things, other than the impressive savings, that are expected from it. The speed of this electronic equipment makes possible the timely preparation of information which heretofore was obtainable only after such a lapse of time as to make the information relatively worthless. Beyond this ability to obtain conventional information on a more timely basis, much is expected from the use of electronic equipment in the areas of linear programming, operations research, and the like.

RELATION TO ACCOUNTING PROCEDURE AND RECORDS

With these few preliminary remarks, we can now begin to consider some of the problems connected with the introduction of electronics in the maintenance of records.

The installation and use of an electronic data-processing system requires a careful and critical analysis and evaluation of all records and procedures. The analysis and evaluation is not limited to accounting records and procedures but embraces all types - production records, sales records and statistics, personnel records, etc. The analysis required must be in complete detail for it forms the basis of preparing the instructions for the equipment. It is surprising what these studies have uncovered. In many cases, the savings resulting from these studies have been more than sufficient to cover the cost involved in the analysis.

In considering the use of electronic data-processing systems, there should be a completely different approach to record keeping. Record keeping is now associated with various departments of an organization. We think of the accounts receivable department, the accounts payable department, the payroll department, etc. This concept of separate record-keeping functions does not lend itself to electronics. Because of the capacities of this equipment, our thinking must be oriented to the concept of the effect of any transaction on the business as a whole. As an illustration, in an industrial enterprise the sale of a product should not be thought of solely as an increase in revenue, but

the related effect of this transaction on accounts receivable, inventory, purchase commitments, cash requirements, etc. must be considered at the same time. We must take a fresh look at this problem of record keeping and get away from the old concept that record keeping is related to various semi-independent organizational compartments. Each type of transaction must be considered from the viewpoint of its effect upon the operations of the entire enterprise.

There are many problems to be resolved because of the fact that many records will not be legible. As you are aware, magnetic spots on metal tape cannot be seen unless they are covered with metal filings. Even then, it may be mighty difficult, or even impossible, to read them when we consider that they may be packed as densely as 200 to an inch. Much of the basic information relating to an enterprise will be on magnetic tape, or otherwise will be coded so that it is not legible. A careful analysis will be required to know what information is to be coded into the language of the equipment, how information is to be withdrawn, when it is to be withdrawn, and in what form it will be required. As a very simple example, suppose customers accounts are to be maintained on magnetic tape. Certainly we must plan well in advance the times when a trial balance must be printed out in legible form, for once the information is up-dated it is no longer readily available; in fact, it may be unavailable.

Coupled with this problem of legibility of information is the possible elimination of some source documents. At the present time, the use of electronic systems is patterned around conventional source documents - invoices, time cards, stores requisitions, and the like. Also, present reports are used generally as patterns for the output required. But a great deal of consideration is being given to the need for many source documents in connection with input data and for many of the reports and journals in connection with output. Under development are time clocks which automatically record the in-time, out-time, and the elapsed working time, and which may be operated by some such permanent identification as a charge-a-plate. Why is it necessary to prepare storeroom requisitions? Why cannot a device be developed which automatically records the issuance of storeroom items? Some devices, such as those which prepare a coded record in the form of holes in paper tape, are presently available. And it is a simple matter to enter information on paper tapes into an electronic system, either directly or by conversion to magnetic tape. While the statement that some sort

of legible source document is required tends to persist, it is facing increasing challenge. There are many who feel that, in many cases, conventional source documents may be dispensed with, or adequate substitutes developed to make use of electronic equipment.

Perhaps of even greater importance, insofar as savings are concerned, is the elimination of many output documents - journals, registers, reports, and so on. The issuance of reports based upon the exception principle is being emphasized more and more. In fact, this idea is simply a natural result of progress not only in electronic equipment but in electro-mechanical equipment as well. Printing speeds are becoming nearly as phenomenal as the speeds of the other components of electronic systems. The effect is simply that management will not have the time to read, let alone digest, the printed output of modern record-keeping equipment. Thus, there is of necessity a trend to reporting upon only those items requiring attention - that is, reporting by exception.

As we know, a great deal of work and considerable time must be spent in preparation before any record-keeping procedure can be handled by this electronic equipment. Each procedure must be analyzed in complete detail and the output required, whether it be documents or reports, must be precisely determined. Management must now plan well in advance the contents of each report required. No longer will it be possible to insist on the immediate preparation of some special report, for in most cases it will be impossible to prepare upon short notice the necessary instructions to obtain the information from the electronic equipment.

As in the case of any new type of record, there will undoubtedly be many legal implications in the maintenance of records by electronic equipment. While it is not the purpose here to explore these considerations, suffice it to state that the legal aspect of the maintenance of records electronically must be borne in mind.

RELIABILITY OF ELECTRONIC DATA-PROCESSING EQUIPMENT

Naturally, the reliability of electronic data-processing equipment is of prime importance. Reliability of the equipment can be discussed from three viewpoints - its reliability in manipulation functions, that is, its accuracy, the reliability of magnetic tapes, and the reliability of the electronic hardware itself.

As to freedom from errors in manipulation functions, there have

been two distinct approaches to the problem. At least two electronic systems contain duplicate circuitry. In these two, all calculations are made in duplicate and for all practical purposes, it is impossible to make the same error in both circuits at the same time. The other approach is based upon the premise that electronic equipment is far more reliable than any other method of record keeping previously devised. In the electronic systems built by the proponents of this belief, duplicate circuitry is not incorporated. However, when duplicate circuitry is not built-in, assurance of accuracy in the manipulation functions can be obtained by programming critical calculations in duplicate, by control totals, or by other conventional control techniques. Ultimately these two points of view must be resolved for the incorporation of duplicate circuitry in electronic equipment is very costly and eventually its cost must be justified.

Extensive work has been done to test the reliability of magnetic tape and to ascertain how it can be improved. Two statistics from IBM are interesting. Early in 1952 IBM found on the average 25 defects in each 2400 feet of magnetic tape. In 1954, this had been reduced to an average of 0.5 defects to each 2400 feet of tape. At the present time, IBM will guarantee the tape delivered to customers as being completely free of defects. The other aspect of tape reliability concerns the reliability of its use - that is, the accuracy of reading and writing information on tape. I shall not attempt to describe the devices which have been arranged to check the accuracy of these operations. But in the IBM 702 tape testing programs, it has been determined that errors in tape reading are in the range of three errors a year on the basis of a single shift operation. Undoubtedly, other manufacturers of electronic equipment could quote similar statistics. Needless to say, magnetic tape has proved to be highly reliable.

Operating reliability of the equipment has also proved to be very good. Most of the credit for the reliability of the electronic data-processing systems probably is due to the extensive preplanned preventative maintenance programs, including diagnostic operating routines. Through these procedures, which are usually on a daily basis in the larger systems, any weak component is forced to break down. Most equipment is of unitized construction so that a faulty part can be easily removed and a spare inserted in its place. As an example of operating reliability, the Elecom 100 - an obsolete electronic machine built five years ago, and which contained no built-in checking features - often

runs continuously for a period of 300 hours without error. During this period it is unattended two-thirds of the time. In more understandable terms, the 300 hours of work accomplished by the Elecom 100 is equivalent to about eight years work on a desk calculator.

AUDIT IMPLICATIONS OF ELECTRONIC EQUIPMENT

The use of electronic data-processing equipment presents some interesting audit implications. In recognition of this, the American Institute of Accountants has designated a special committee to study this subject.

We have noted that the proper utilization of these electronic systems requires a very detailed analysis of all operations. To use the equipment properly, programmers and operators must know the ramifications of each operation and accordingly will know how it affects the various records. These individuals are in a position to know the effect of any irregularity and to know whether it is possible to cover it up.

The speed of electronic equipment alone will be a substantial aid to the perpetration of irregularities. Electronic processing is much too fast for the human being to follow. Also, when the system is halted momentarily to inspect the data, a trained operator is required to interpret the coded information. The fact that input information is used in coded form tends to aid the perpetration of irregularities.

As a general rule, the immediate uses of electronic equipment do not seem to present any unusual audit problems. To the present time, electronic data-processing systems have been used only to sort, classify, and accumulate information in a more efficient, faster, or economical manner. Auditors still have conventional source documents to which they can refer and conventional reports, journals, and ledgers from which they can check. But consider the audit difficulties that will arise as the thinking progresses toward the elimination of source documents. While it is too early to predict the alternative audit procedures that may be developed, nevertheless, I feel confident that auditors will develop adequate alternative procedures when the need arises.

The problems stemming from the elimination of legible output are equally important to the auditor. The retention of data in the electronic system, either on magnetic tape or otherwise, will require careful planning in auditing. For example, if personnel files are updated currently in connection with a payroll procedure and the auditor plans to check a particular payroll, it will be necessary to arrange in

advance that the personnel information relating to that payroll be withdrawn from the equipment in legible form at the appropriate time.

The preparation of reports on the basis of the exception principle presents another interesting audit problem. Much audit work is accomplished by checking transactions on a test basis. In the absence of a complete record of transactions, how is the selection of the item to be tested to be made? Also, if the record is incomplete, the possibility that irregular transactions may escape scrutiny is increased. Again, it is too early to predict what audit procedures will be developed to cope with such a situation, but I am sure adequate alternative procedures will be found.

It is apparent that the use of electronic data-processing equipment will place great emphasis upon internal controls. Present controls, such as prenumbered checks and other documents, batch and other control totals, segregation of duties, and the like, will be continued. The use of the new electronic equipment may require that responsibilities be fixed even more carefully. It is my belief that with electronic systems internal controls will be investigated and emphasized to an extent far beyond anything we now consider necessary.

DIFFICULTIES CONNECTED WITH USE OF ELECTRONIC EQUIPMENT

Almost any advance which holds forth as much promise as the new electronic data-processing equipment has attached to it some shortcomings. The new equipment is no exception to the rule.

The cost of electronic equipment is a major expenditure to most users and in itself may preclude its use by some enterprises. If purchased, a complete electronic system will cost in the range of \$250,000 to well over \$2,000,000. The physical installation of the equipment also is a major cost, for an installation cost of \$150,000 is not uncommon. In some cases, special buildings are being erected to house the installation. Generally the equipment requires special air conditioning and very exacting humidity and dust controls. Special wiring will often be required and some equipment will require special flooring.

But the cost most difficult to determine is associated with the required system analysis and programming. This preparatory work may easily require up to 50 man-years of effort for one of the largest systems with a related cost of \$300,000 or even more. On the other hand, this cost may well be offset, in part or entirely, by savings in

present record-keeping procedures which results from the detailed system analysis required in preparing for an electronic system - even before an electronic system is installed.

The switch to electronic equipment will have a major effect in many cases. The installation of one of the larger systems will usually displace a great number of personnel. This may or may not be serious. If the organization is large enough and the problem is recognized early it is possible that the displacement of personnel can be offset by normal attrition and by reassignments and retirements.

To obtain maximum benefits from the installation of electronic equipment requires many changes in present record-keeping procedures. Such changes probably will be extensive and will affect many departments. It is not unlikely that some company policies may be changed. Any extensive changes in record-keeping procedures is, of course, a disrupting influence. However, we all know that occasionally a shakeup such as this may have some definite advantages.

The use of electronic equipment is directly related to the policy of centralization or decentralization. A business enterprise that is highly centralized can make use of electronic equipment easier than a decentralized enterprise. However, the fact that an enterprise is decentralized does not preclude the use of an electronic system on a centralized basis. By setting up an adequate communication network, the decentralized enterprise can take advantage of the benefits of electronic equipment.

The use of the new equipment carries with it the hazard of having all records in one place. This hazard may be substantially reduced by the retention at separate locations of duplicate records and all current transactions data for a reasonable length of time. The cost of these precautionary measures will be relatively small.

At the present time a serious shortcoming to the use of electronic equipment is that alternate facilities are generally not readily available. This situation will be corrected as more and more electronic data-processing systems are installed throughout the country.

A relatively small number of personnel are required to operate an electronic system, thus placing reliance upon a limited number of people in this important phase of business operation. Also, there may be a problem of obtaining adequate personnel in the early stages of the use of electronic equipment, when the supply of adequately trained people is limited.

The difficulties connected with the preparation of special or one-time reports when records are retained electronically have already been described. Nevertheless this is worth repeating. Here too this shortcoming has a corollary benefit. Once it becomes known that such one-time reports cannot be obtained without advance notice, management will of necessity have to plan for such reports in sufficient time. It is not unlikely that a good many of such requests will be eliminated when the time and cost of their preparation become known.

The maintenance of records in a form not readily legible presents a condition some will find hard to accept. But similar to the gradual acceptance of punched cards as a means of record keeping, so too will there be the gradual acceptance of electronic devices. But there must be pioneers in this new concept of record keeping - as there were pioneers in the early days of punched-card accounting.

Although there are difficulties which surround the use of electronic data-processing systems, the possibilities for savings or for cost reductions from their use are so impressive that they cannot be passed over lightly. Each enterprise of any reasonable size should investigate the possibilities of electronics in relation to its record keeping and be familiar with the current changes for, as developments are made, electronics will become a major factor in smaller and smaller enterprises.