THE IMPACT OF AUTOMATION ON THE FIELD OF ACCOUNTING*

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I am glad to have this opportunity to discuss with you some recent developments in office automation, and their possible effects on accounting.

The National Cash Register Company has been concerned with record-keeping in the general sense for almost three quarters of a century. And since the 1920's, we have developed and manufactured various types of accounting machinery as well as our more traditional product—the cash register. It is indicative, I think, of the growing function of accounting in business management, that this year, for the first time in NCR's history, our accounting machine sales are exceeding our cash register sales. We are in the happy position of having outgrown our company name.

Naturally, our ties with accountants have been strong. As a major supplier of accounting machines we have worked closely with members of the profession. It has also been our privilege to have had extensive contacts with the teaching profession. For many years our company has conducted educational programs beamed at junior, senior and graduate students in business administration. The purpose of these programs has been to familiarize these potential business executives with the latest trends in mechanized accounting and, more specifically, with NCR machines and systems.

For these reasons I feel that we share many areas of mutual interest, and I hope that my discussion today of some of these areas, will be of help in your own explorations of a truly fascinating subject.

Let's examine that subject in more detail. What will increased office automation mean to the accountant? I should like to point out at the start: I am not in a position now—nor do I expect to be in the near future—to present to you, wrapped up in a neat little package, all of the ramifications of office automation. Nor do I believe that any single person can hope to do so.

Actually, the advent of electronics in record-keeping and data-processing has placed the office equipment industry in the most challenging, yet potentially rewarding, role in its history. And I think the same thing can be said for accountants. We are like the would-be interplanetary explorer who previously had to confine his efforts to gazing into telescopes and dreaming, but who has suddenly been presented with a means for visiting any planet he desires.

Electronics is that new mode of transportation for you, and for us. Because of its tremendous speed in carrying out our errands, the electron can take us just about anywhere, statistically speaking. But we are still in the process of deciding just where we want to go and whether each given trip is worth the cost and effort involved.

We do know of course that we are in the early stages of an accounting and business management revolution which, in some respects, will rival the industrial revolution in its effect on the lives of everyone. This revolution in office procedures and data-processing, promises to do for man's

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mind what the industrial revolution did for his body. By harnessing the electron, we will be able to multiply a single clerical employee's efforts many times.

Economically speaking, we are making the electron our servant in the nick of time. In a few more years American business would have been figuratively snowed under by its ever mounting volume of paperwork. At the start of the 20th century, for example, only one man in every 40 employees was a paper worker. With pen and ink as his chief tools, this early-day clerical was able to keep up with all of the demands placed on accounting by business.

Forty years later, however, just prior to World War II, our record-keeping task had mushroomed into awesome proportions. Despite the advent of electromechanical accounting machines, the development of punched-card tabulating systems, and the invention of other posting and analytical office machinery, by 1940 it took one employee in every 10—instead of one in every 40—to keep up with the necessary paperwork.

But still the tide of record-keeping continued to rise. On the crest of this tide, the office equipment industry achieved new sales records. Business spent hundreds of millions of dollars a year for labor-saving office equipment. Despite this investment, despite the concentrated developmental efforts of the entire office equipment industry, the volume of paperwork has multiplied faster than the tools for handling it. Last year, according to Census Bureau estimates, one out of every six employees—instead of one in every 10—was a paper worker. There are actually more clerical employees in our country today than agricultural workers. Clearly, the cost of record-keeping has become a major economic and management problem. It is a dilemma which faces businessmen everywhere.

Fortunately, our technology has a pair of trump cards with which to meet this challenge.

The first of these is the concept of Integrated Data Processing, which in our alphabetical era quickly became IDP. As you know, Integrated Data Processing is built around a common machine language which can link together, in a continuous automatic chain, different machines and operations. Its goal is to minimize manual effort in data processing. The punched card was the earliest means of using the IDP concept on an extensive scale, and will remain an important tool in this area.

Our second trump card is the tiny and often misunderstood electron. Prior to a decade ago, its major service had been in bringing entertainment to us—through radio and later television—instead of helping to keep our businesses economically solvent.

I am sure you are all familiar, at least in a general way, with the IDP concept. You also have watched the spectacular rise of the electronic computer—the fair-haired child of our laboratories and drawing boards. It is not my assignment to discuss in detail today these dramatic developments in the field of data-processing. Volumes have been written and hundreds of speeches made about the giant brain and how it will help the large corporation or government agency solve many of its problems. Instead, I should like to move along to some areas of business automation with which you may be less familiar. I refer to the impact that electronic computers and their associated equipment will have on the small manufacturer, the small retailer, the small wholesaler, and indeed the average housewife. After all, the number of small businesses in the country exceeds the large ones by many times. With over 170,000,000 people in the United States, anything that affects the lives of these people directly, will have a profound in-
fluence on our way of life and can’t help but influence our present accounting and auditing practices.

The first of these might be described as the extension of the punched card concept—and therefore the IDP concept—to additional types of media. For example, if data can be punched into a card and thereafter used and re-used whenever needed, then it is conceivable that similar means of preserving data can be developed. From this realization came the punched price tag for the garment industry, which is essentially a miniature punched card designed for a specific purpose.

It also seemed probable that if data could be preserved in various types of cards through different configurations of holes, then by the same token information could be punched into a strip of paper tape, to be deciphered and extracted later when needed. From this concept has emerged the punched paper tape recorder. This device—a plain-looking box about a foot square—seems likely within the next decade to become one of the most important machines in tomorrow’s automatic office.

What are some of the potentialities of these extensions of the Integrated Data Processing concept?

First, consider retailing. There are approximately 1,500,000 small, single-owner retail and service establishments in the United States. The list includes just about any kind of enterprise you could think of—service stations, bakeries, apparel shops, shoe, hardware, camera, drug, small food stores, and so on.

In practically all of these enterprises, the person responsible for managing the business is primarily a merchandiser. At least we can be fairly sure that he is not often an accountant. And yet non-specialist that he is, this man, because of the complexities of doing business today, must have at his fingertips virtually the same type of information as a multi-million-dollar corporation with large accounting departments and expensive analytical machinery. The result is tedious, time-consuming and costly pencil-and-paper analysis. The small businessman, if he is to keep afloat in a sea of government reports and other bookkeeping chores, works long and hard after store hours; he may even enlist the fumbling help of members of his family. When paper work becomes too burdensome it is the first thing to be sacrificed. This can be fatal since present tax rates, forgotten expenses, purchases, charges, etc., can be the death blow to a struggling young business. While competition grows more intense, while the costs of doing business rise, the retailer fights the battle of paper work with his inept and inadequate hand methods. And all of this is done at a severe cost in time—time better spent in merchandising, sales promotion and other aspects of retailing.

Consider the possibilities offered to this retailer by extension of the Integrated Data Processing concept to which I referred earlier. Let us assume that the price tags on his merchandise contain—in addition to printed information on size, style, color, manufacturer and so forth—this same data in the form of punched holes. Let us also assume that each salesperson in his store has his or her individual token or card, again with essential information punched in code; and to go a step further, that each credit customer also carries a token or card with punched data including the customer’s account number, the kind of account, and so forth.

If, at the time of a transaction, all of this information—about merchandise, salesperson and customer—can be collected and preserved automatically, then clearly we have the beginning of truly automatic accounting in retailing.

However, we have considered so far only the fixed or nonvariable information
involved in a retail sale. What about all the factors that change from transaction to transaction, factors which cannot be covered by such inflexible media as pre-punched price tags and salesperson or customer tokens? What about prices which are subject to change in the form of markups or markdowns, discounts, taxes, gift wrapping, other charges, and so forth?

The answer will be a sales registering and recording device, a new and versatile version of this traditional cash register whose horizons have broadened as the concept of Integrated Data Processing has grown. For by means of this new type cash register, we can record all variable information about any transaction in a matter of seconds. This includes items other than sales, such as the recording of expenses, purchases, etc.

Thus, out of the need for more automatic data-processing in retailing will evolve what might be called the “Sales-Tronic” system. In its simplest form, a Sales-Tronic system could be made up of a special register linked electrically with a punched paper tape recorder. The recorder punches a paper tape record of all information entered into the register. The data on the tape can later be transferred automatically to punched cards and then processed on tabulating machines, or it can be fed directly into electronic data-processing systems equipped with a paper tape reader.

In more complete form, a Sales-Tronic system could include—in addition to the register and recorder—a media reader. This is a small sensing device which can “read” the information on pre-punched price tags and salespersons’ and customers’ tokens. The media reader then causes this information to be punched into paper tape by the recorder, along with the data entered through the register.

The implications of these developments are obvious. For the first time in the history of merchandising, the average retailer can possess the key to freedom from bookkeeping drudgery. Through sales registering equipment linked with automatic recording equipment, his entire day’s operations can be preserved on a strip of inexpensive paper tape.

At the end of the day the tape can be delivered or mailed to a nearby processing center. There, either on tabulating equipment or through an electronic computer, it is processed. Back to the retailer comes just about any kind of report he requires. Certainly this would include a statement of his sales, purchases, expenses, accounts receivable and accounts payable figures broken down by department or classification. The reports might also contain cumulative and comparative information. The retailer might want to know, for example, how his sales and expenses compare with those of a year ago. The possibilities as you can see, are virtually unlimited. For the first time at a price he can afford the little fellow would have access to the same type of information that is usually reserved for the large size corporation.

You will also note that the sales recording system of the future is built upon a single basic assumption—the correctness of the original entry. From this fact we can draw a conclusion which is of considerable significance to accounting. It is simply this:

Never in the history of accounting have sound audit and rigid control, at the point of original entry assumed such importance. A Sales-Tronic system places in the hands of one person—the sales clerk—the only manual handling of entries. All subsequent data perpetuation is automatic.

Clearly then, it is imperative that the basic documents for control and audit be sufficiently detailed to compensate for the lack of checks and balances of earlier, more traditional data-processing systems. Otherwise, we shall have built our house on
a poor foundation indeed.

To meet the requirements for auditing and control of data entered into the system, the device which makes the record of original entry takes on added importance. First it must produce a detailed journal of each entry. It must also have the ability to print the same information on the original document, i.e., sales slip, purchase invoices, expense vouchers, etc. By printing the same reference number on the original document and the detailed journal we can audit the accuracy and authenticity of the information entering the system.

The new original entry machine should also provide daily control information for the merchant. This does two important things. It provides him with a daily statement of business so that he knows at all times where he stands in relation to sales, purchases, expenses, etc. Secondly, since his detailed information will be supplied by an outside concern it is important that the owner of the business possess the control figures against which all other figures must balance. I don't believe many merchants would be content to wait several days before they knew if their cash was in balance, or if their sales for the day had reached the break-even point. Even more important, since the detailed report regarding sales, expenses, purchases, accounts receivable, etc., will be supplied by a service bureau the control figures must be determined and controlled by the merchant and not determined as a by-product of adding up the detail information.

In many respects, the Sales-Tronic system will be similar to conventional sales registering systems of today. The point is, however, that if audit and control at the point of original entry are urgently required today, they will be even more essential tomorrow.

So far, I have mentioned only a single area in which the highly versatile paper tape recorder can integrate the processing of data—that is, the recording of sales in almost every type of retail establishment, from the small shoe outlet around the corner to the giant department store. The paper tape principle is equally applicable to almost every type of original-entry business machine. In each case it preserves, as a by-product of the creation of necessary documents, a complete record of original entries for subsequent analytical or statistical breakdowns.

I believe you will agree that although less famous than its bigger brother, the electronic computer, the paper tape recorder is destined to play a steadily growing role in the field of record-keeping. In fact, our Company alone has approximately 1,000 of these recorders installed and working successfully, with every indication that the trend will spread and grow at a very rapid rate.

Up to now I have talked about punched cards, punched price tags and punched paper tape. You may have wondered why it is necessary to print Arabic numerals for us to read and produce the same information in the form of coded holes for machines to read. The answer is fairly simple. When the Arabs invented their numerals they didn't know anything about electronics, and the electronic brains that have been developed to date are not smart enough to read the Arabic figures in their present form.

Though little-heralded, a major breakthrough in data processing is just around the corner. I refer to direct character recognition. This of course is the ability of a machine to literally read the same Arabic figures you and I read when these figures are printed in magnetic ink. As a technological advance, direct character recognition clearly goes far beyond the principle of magnetic tape recording with which we are all familiar.

Direct character recognition is achieved through electronic reading heads which
scan magnetic-ink figures. The reading heads then send wave patterns to a device which compares the patterns with those stored in a magnetic "memory." Here, the patterns are translated back to figures in machine language.

Again, the implications of such an advance in record-keeping techniques are almost self-evident. Certainly, the banking industry has been quick to turn to this principle as the long-sought key to automatic handling of checks and other documents. It is not surprising that bankers are excited by this potentiality. During the past 15 years, for example, the number of checking accounts in the United States has doubled—to 50 million. More than 9 billion checks are being written each year. And with each check being handled five or six times you can imagine the fond expectations which bankers have attached to the concept of direct character recognition.

Just as in the recording of a retail sale, a commercial bank transaction involves both fixed and variable information. For example, an identifying number can be given both the bank and the depositor. Incidentally, I believe that the time is not far off when one of the first things that will happen to our children after birth is that they will be fingerprinted and given a number. This number will be synonymous with our name and will be used to identify us insofar as checking accounts, charge accounts, social security accounts, etc. are concerned. This information will not change, and therefore can be preprinted—with magnetic ink—on the depositor's check and deposit slips.

However, the amount for which each check is written is a variable factor. It cannot be printed on the depositor's check with magnetic ink until after the check has been written. The ideal time for imprinting this amount is during the check's processing through a bank's central control and proof operation. Following this step, the check is ready for truly automatic sorting and processing. The possibilities here for greater efficiency in paper handling are enormous. Nor is that the end of the story. The advent of Integrated Data Processing including electronic character recognition, will make it feasible for banks to offer hitherto undreamed-of bookkeeping services to their depositors.

Clearly, the miracles of electronics are about to be extended to millions of average Americans who are, and will remain, far removed from the realm of giant electronic "brains."

I have discussed recent advances toward Integrated Data Processing, as achieved through punched paper tape and through magnetic character recognition, because I felt these areas would be of interest to you. Now, in the time remaining, I should like to view the implications of these, and other recent data-processing developments, to your profession.

I stated earlier that accounting is facing the most challenging, yet potentially rewarding era in its history. By "challenging," I mean that today, as never before, the accountant must remain abreast of every major development in data-processing. By "potentially rewarding," I refer to the profession's golden opportunity to offer ever-broadening services to management.

Truly, management is looking to you to translate into practical benefits the new concepts in record-keeping which technology is producing. Thus, although bookkeeping will tend to become more and more automated in the years ahead, the functions of the accountant will increase in stature. There will be a growing demand for intelligent counseling in the use of our new electronic tools—their advantages and disadvantages. Top management will find a pressing need for constructive recommendations on reports and reporting methods. And here, perhaps, it is advisable
to add a word of caution: Be prepared when that time arrives to fill the greater responsibility which tomorrow will require. For if the accountant is found inadequate in knowledge, or capacity to adjust to new techniques, there is a very real danger that his traditional functions will be usurped by the technician.

I do not believe that many accountants will find themselves in that undesirable position. Through your professional organizations you are doing a competent job of studying forthcoming accounting requirements in the light of new technological advances. Meetings such as this are also contributing immeasurably to the broadening of the profession's horizons.

The teaching profession, I believe, is equally alert to the potentialities that have been opened in the field of data-processing during the past few years. There is a widespread realization that the student coming from the high school, college or university must be instructed in accounting machinery as well as in basic accounting principles. Otherwise, business will founder in the quagmire of mounting paperwork.

All of us—the business machine manufacturer, the accountant and the teacher—must go down this road together. Our futures are interdependent. We must comprehend and then weigh the desirability of the new reports which for the first time in accounting history are becoming economically feasible for the average business. There has long been need, for example, for more analytical information on sales, inventory and usage, and manufacturing and distribution costs. At the same time, we must resist the temptation to over-report, to produce such a bulk of information that management is left with a severe case of statistical indigestion and resultant disillusionment.

We must also realize that we can no longer guide the accounting process through every single step as it takes place. We shall be dealing increasingly with invisible figures and statistics. We shall have to decide where we are going and why; set up the mechanism for capturing and auditing necessary data at their source; and then defend our integrated system against such inroads as outmoded company traditions, interdepartmental rivalries or frictions, and fear of change caused by misunderstanding of what the system has been designed to accomplish.

In this latter respect, I cannot stress too strongly the necessity of obtaining—and maintaining—the active cooperation of top management. This support is the only foundation upon which a truly integrated system can stand. Without this support even the best system will eventually fall prey to internal pressures which tend to diminish its effectiveness.

From the standpoint of audit, our fundamental control will be at the point of original entry, as previously mentioned. Then, if our basic system concepts are sound, subsequent audits can be limited to only those protective print-outs which safety requires.

On one of the buildings at The National Cash Register Company's Dayton factory, there is a maxim in large letters, which I believe points up what we have been discussing here today. It reads, "We Progress Through Change."

If that is true—and I believe it is—then record-keeping is about to enter its period of greatest progress. Never have more changes been in the offing.

Because of these pending changes, you and I are faced with heavy responsibilities. But we must also remember that responsibilities bring opportunities. This is the yardstick by which we should measure the forthcoming era of office automation.