THE AUTOMATIC HANDLING OF BUSINESS DATA

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Introduction

Probably the most impelling factor behind the desire of business to mechanize the handling of the data with which it is concerned is the astounding growth in the volume of these data in the last two decades. The productive capacity of every factory worker has increased greatly in this period, but it is doubtful whether or not that of the office worker has changed greatly. Many businesses, therefore, are now faced with office costs, the control of which spells the difference between profit and loss.

Obligatory reports to regulatory bodies have grown in number and the data demanded by these agencies is often so completely different from that needed to run a commercial enterprise that many businesses have essentially to maintain duplicate sets of records. The calculation of payroll has developed from a simple multiplication of rate times hours to an exceedingly complex one involving bonuses, overtime hours, and quite often ten or more deductions, many of which bear no relation to the pay. Further, as a business increases in size and geographical scope the reports which management must have become numerous.

Operations Where Mechanization Yields Greatest Returns

Where large volumes of business data are handled through routine operations with relatively few exceptional cases there is always a good possibility for the economic use of electronic equipment. While the mechanization of many existing operations of this sort can be handled by present day data processing equipment with great savings, still more economies may be expected when business operations are thought out anew from the machine point of view. This attack on the problem of mechanization results in what is coming to be known as the "consolidated functions approach."

Because the maximum rate at which human beings can process business data is relatively low, multiple files are often needed to allow access by a large numbers of clerks. The use of high speed electronic equipment permits hitherto separate files to be consolidated and, because the variable data or transactions can be manipulated entirely within the machine through several formerly disjointed operations, many transcriptions from paper to keyboard are completely done away with. A study of businesses dealing directly with the public soon brings to light the fact that a very large percentage of their total clerical effort is spent in checking processes. Many of the checks are designed to catch errors made during the very transcriptions which mechanization does much to eliminate.

The descriptive or index portions of business data often contain much redundancy which might be used to advantage by electronic computers with internal checking circuits, but unfortunately this redundancy is usually
better adapted to the way in which human beings rather than machines catch errors and inconsistencies in the data. It is to be hoped that mathematicians and programmers will eventually make their voices heard in those circles where the category codes of insurance coverage and merchandise code numbers are generated.

Perhaps the least often mentioned yet the most far reaching gain to business will be the use of data handling equipment in analyzing sales trends and in helping to lay business strategy. Anyone who has read that fascinating volume entitled "Strategy in Business, Poker, and War" by John McDonald will feel that, once the specter of office costs eating up profit has been laid to rest by the adoption of machine methods, management will be able to conduct the business on the basis of up-to-the-minute facts, provided by these same machines. As more and more businesses follow the trend, operations based on out-of-date information about a business will become more and more costly in a competitive sense.

**Outstanding Technical Problems**

When the density of posting of items to a voluminous file is low or when a few items have to be interfiled in such a file a serious problem is posed to the computer designer today. If punched card techniques are compared with hand methods, machines fail to compete economically when fewer than ten percent of the records in the file is to be affected during a single pass. Electronic computers can hold their own against manual pulling from the file for much lower densities of posting, but they too fail on many very interesting problems. Until a random access memory of vast capacity with much lower latency than magnetic tapes provide is developed, clever indexing schemes and ingeniously devised operating schedules seem to be the only solutions possible in many cases of this nature. The problem of handling the records of Treasury bonds is a case in point.

Computer engineers who have received their training on machines for handling scientific problems are finding that in commercial applications the matter of making the input data available to the computer holds many more stumbling blocks than the design of the computer proper. The shibboleth for any input scheme is whether or not it puts the essential data into machine language at the earliest possible juncture in the operating procedure. Furthermore, no repetitious entries should be permitted except for checking purposes. Great gains can be made even with present day mechanical and punched card office equipment by adopting the so-called "common language" link between these machines. It is no secret that several office machine companies are working with punched paper tape toward this end for applications too small for large scale electronic machines. It should be noted, however, that devices to transcribe the basic input data into machine language often have to pass most stringent economic tests. The "mark-sense" card used to record public utility meter readings succeeds where printing devices attached to the meter are bound to fail, simply because the cost is only about one dollar a year to read the meter by eye.

It must be conceded that much of the demand for high speed printing with which we are faced is illusory. Many of the listings and output printings
which the potential users of data processing equipment call for are not logically necessary. However, because auditors believe little magnetized spots on tape much as they would spots before their eyes, perhaps with justification for the time being, these lists must be produced. It is to be hoped that the demand will lessen. Nevertheless, every insurance policy holder wants a premium notice so we must concede a real need here, the answering of which raises real problems. One of these is that the cost of the printer system is too high. There is too much electronic gear associated with the printing head. A costlier head that would lower the overall expense of the system is the boon being sought, particularly by the makers and users of machines priced at under a quarter of a million dollars.

Types of Applications

In view of these difficulties, both administrative and technical, what are the sort of business applications to which data handling computers are being put? In large industrial companies it is often possible to find a single operation, such as payroll, the routine of which is well understood because it is now being handled by punched card equipment. Such an operation can be put lock, stock, and barrel onto a computer. The file problem is not acute, the arithmetic calculations are relatively simple, and “on-line” operation is not required. This application has, therefore, offered an excellent opening wedge for computers in several companies.

The development of actuarial data in the process of writing and servicing insurance policies is important to all insurance companies. However, the work is not as sensitive from the point of view of the insured as is the accountancy. Further, the actuarial tasks are usually handled centrally in contradistinction to jobs involving the insured more directly. In addition, the similarity of the actuarial studies to scientific calculations makes this field a good point at which some companies are choosing to initiate their automatic data handling programs. An additional and immediate bonus to be gained from such piecemeal applications is the operational experience which can be come by in no other way.

The matter of keeping up-to-date information on inventory and pseudo-inventory problems is of vital concern to those companies whose businesses involve mainly merchandise and not paper work like insurance companies. As a consequence, these companies have tended to lean toward small special purpose machines designed for inventory work rather than to large general purpose machines for their first installations.

Actual Installations for Business Work

If we confine ourselves to computer installations used in the processing of normal business data, we find the list headed by a number of UNIVAC machines: the Franklin Life Insurance Co. and the Metropolitan Life Insurance Co. are both reported to be about to use their machines first for actuarial calculations; and the General Electric Company in Louisville is to use its computer for payroll and cost accounting. In addition, some of the aircraft companies which have IBM 701 installations, primarily for aerodynamic computations, are undoubtedly finding them of service in cost accounting work.
In what is essentially the inventory field there are now operating some very interesting machines. The "Reservisor" of American Airlines, known now to most people, while not a true inventory machine, is doing yeoman service for that company in helping to fill their airplanes. Another most ingenious magnetic drum machine is the one which now stores bid and asked figures for stocks traded on the Toronto Stock Exchange. The drum may be remotely addressed for quick reference to any of these data.

There are three special purpose electronic drum computers at present being used in the retail merchandizing field for unit inventory control. The J. L. Hudson Co. of Detroit and B. Altman's of New York are using Magnafile machines made by W. S. MacDonald Co. for keeping track of their furniture inventory. In Chicago the John Plain Company is using a larger machine called the Speed Tally or Distributon manufactured by Engineering Research Associates, for inventory purposes in a mail order business.

The Position of Unit Inventory Control in Department Store Accounting

Because the following four papers will deal with the details of maintaining unit inventory control for a department store with an electronic system, a few remarks about the relationship of the inventory to the rest of the accounting system might not be out of place.

The flow diagram of Figure No. 1 shows the movement of the main bodies of information in the over-all system. Consider first the information which must go from the point of sale to the rest of the system. To the customer billing section must go an identification of the customer and the amount of the sale; to the general store accounting must go a record of cash intake; and to the inventory section must go a full description of the item or items sold.

The customer billing section sends statements to the charge customers and receives payments in response to these. The functioning of this part of the system is more or less automatically controlled by the two inputs. This, however, is not true of the inventory section. From it originate orders to vendors and in response invoices are received, but the orders are actually instigated by the buyers following an examination of the condition of the inventory. The two paired inputs and outputs to customer billing and to inventory are in turn monitored as accounts receivable and accounts payable for the store's general accounting section.

There is a very important link from customer billing to the point of sale which has not yet been considered; that is the credit authorization which follows an examination of the state of the customer's credit inventory, so to speak. Finally, a very vital piece of information, usually totally missing, which should be fed to inventory from the point of sale, is that about any unfulfilled demands by the customer for goods.

Generally it may be said that unit inventory control is maintained on the more valuable items of inventory. If, however, the basic approach is to minimize the total dollar inventory while at the same time staying in business and achieving a reasonable degree of customer satisfaction (synonymous in the long run), unit inventory control should be applied in a more flexible fashion. It is felt that a recording of unfulfilled customer demand is the missing link in inventory control. If an electronic inventory control system can make this link a practical possibility such a single achievement may well be fully as important as automatic inventory control in reducing the cost of inventory in department stores.
Fig. 1. The place of inventory in department store accounting