—— *And How to Avoid Them*

by D. T. Caminer

Summary: Much has been heard recently of failures in business data processing in the United States. It is now accepted that getting full-scale commercial jobs into routine operation is not easy. Companies entering the field need a guide with experience of such work. With such a guide the failures can be avoided.

The *motif* of Spring 1958 in British commercial computer circles has been the message of the Diebold brochure—"Failures in Business Data Processing and How to Avoid Them" (Diebold, 1958).

Executives, who have been studying the practicability of a computer in their organizations for years, have drawn back from the ultimate step, asking themselves, 'Have we studied long or deeply enough? Has our working party been sufficiently broadly based? Have we sufficiently integrated our plans for the several procedures?

For, despite the complacency in even the more responsible Press, which has rejoiced in the belief that "it can't happen here," the fact is well known that, though the scale is smaller, much of the American shortcoming can equally be seen in this country. Computers have been installed without their programs ready and even with vital technical facilities inadequately tried. Of one installation, the very able team, charged with the task of bringing it into operation, have said that they were getting little out of it beyond what previously could be obtained from their punched card installation. Another, whatever the initial intentions, is being devoted wholly to experimental purposes and even those are to be fulfilled only when several hundred hours of program trials have been completed. Above all, a tour of computers engaged on ordinary day-to-day routine clerical work here would be a very short one.

If one thing has at last sunk home it is that getting full-scale, realistic clerical work into regular operation on a computer is not at all easy. That is a good thing; for to those who did not appreciate the difficulties to be encountered, rapid success was extremely unlikely to be vouchsafed. It was about as improbable that they would quickly get a computer to productive work as it would be for a committee, that had hitherto confined itself to hill climbing in the Lake District, to organize successfully a Himalayan expedition.

Having gained a proper respect for the difficulties, a well-found team can master them. But the mountaineering analogy holds good: the proper way to gain experience of what is to be encountered is by the use of a guide. The guide will pass on the knowledge of what has been learnt before, the techniques that have been developed, and the safeguards to be observed. It would, I suppose, be possible for some enterprising spirit, having fitted himself out with the correct equipment and a copy of Sir John Hunt's book, to scramble his way up, but the survival rate would necessarily be low. As an American aircraft man wrote privately eighteen months ago: "This business can really be a primrose path if we do not watch ourselves. I have seen millions of dollars spent. I have seen heads roll."

The primrose path is the route up the heights taken by those who have resolved that they must find their own way. The language of this group is normally that of the swimming-pool rather than that of the mountain ranges. They declare that they want to dive in off the deep-end and learn to swim that way. When told that the likely alternatives consequent upon such a course are that they will either drown, unless someone more expert stands by to pull them out, or that they will at best learn to swim in very poor style, they have often in the past responded with more courage than appreciation of what lay ahead of them.

Not all of those, however, who have decided to find their own way have done so from considered choice. Sometimes it has been thrust upon them. They have placed an order for a computer on the basis of an optimistic survey and have been told by the manufacturers that programming would present no problem to them. Above all, they have needed little convincing that "If *x* are capable of preparing clerical work for a computer, surely you with your excellent methods organization are able to do so, too?"

Perhaps it is the representation of the work of preparing for a computer installation as a simple extension of conventional methods work that is at the root of much of the trouble both in the States and here. For the tools now placed at the disposal of the Methods man are quite different. As the National Office Management Association of America declared in a recent survey report on Office Automation (N.O.M.A., 1957):

> "From the turn of the century until the end of World War II virtually no radically new and different office machines had been introduced on the office scene. Therefore, when the need for new equipment was felt, the equipment available to be evaluated was familiar equipment, its usage concepts were relatively well known and there was considerable experience of previous users to draw upon.
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> "The concepts and equipment of Integrated Data Processing and Electronic Data Processing were quite different from the normal pattern. This caused two unusual and opposite reactions in different groups of potential users. One group immediately decided that these tools of Office Automation were too complicated or too expensive, and dismissed the subject without further evaluation. Another group decided that there was great potential value in Office Automation and

proceeded to install hardware without regard for its practicability or the situation at hand."

In this country, the problems posed by the conceptual differences between the new and the old equipment are, perhaps, even more acutely felt than in the States. Before the war there were precious few senior personnel here wholly engaged on office methods work. Even, of those, a considerable proportion were devoting much of their time to what might be described as first stage mechanization of accounting work. They were introducing the calculator and posting machine and the tabulator to do for the ledgers and the statistics what the typewriter had done for the correspondence a generation before.

Since the war the number of O. and M. men has multiplied. One way or another, the need for methods work as distinct from what might be described as one-to-one mechanization has become appreciated. It has not, however, been easy for this new profession to gain experience or standing in so short a time and often the horizons have remained limited. Indeed, it is commonly the man whose experience goes back to the days when calculations and ledger posting were done by hand, who can the more easily reach out to the new concepts of the Automatic Office.

Frequently in the past, the methods work has had to be carried out in restricted self-contained areas delineated by the boundaries between the responsibilities of different executives. From company to company the pattern varies, but the general picture of fragmentation of responsibility for clerical activities is so often the same: sales invoicing and sales statistics systems under the control of the sales manager; sales ledger and bought ledger systems under the accountant; costing under the cost accountant; stock control under the stores manager; purchase control and invoice verification under the buyer; forward forecasting of sales and purchases and manufacturing requirements under the aegis of the production control department or the statistician or, perhaps, not formally done at all.

When the Methods man has been called in it has generally been to deal with some immediate situation: the customers were not getting billed quickly enough, or the stock accounts were showing a growing discrepancy between the records in kind and those in cash, or increased sales competition had caused the sales management to require more statistics to help them to withstand it. Speed has often been the essence of such requirements, and the Methods man, to meet what has been demanded of him, has had to be at pains to link in that part of the line, on which he had been making improvements, to the remainder of the network with as little dislocation as possible.

Methods work, then, has tended to be localized and departmentalized, and to some extent this process has been accentuated by the admirable service provided by the accounting machine manufacturers within each limited area. Given that a company was prepared to carry out part of the work that was distinctive to it, then the machine manufacturers were prepared themselves to provide, with their accounting machines, the common kernel of the system. Supposing, for example, that a company had arrived at the gross pay of its employees—for therein lie company to company variations—then the machine manufacturer would very ably provide the best method of using his machine to calculate net pay from the gross thus provided. And so, there has sometimes been a contraction as well as a localization of methods work, albeit not always a conscious one.

These observations do not always hold good. Side by side with those who have carried on methods work in the limited sense there are others whose standing in their respective companies has been such that they have been able to work on the larger canvas. They have been in the better position to judge the difference between making productive, economic use of a computer and the straightforward mechanization of an existing process. Some, at least, of them have recognized that it was a new situation with which they had to deal. Consequently they have felt able to consult expert assistance without any inhibitions about their standing in their own field being thereby called into question.

How can "expert assistance" be defined in this field of commercial data processing? It can only mean sustained assistance at the outset from people with first-hand experience of getting large-scale *commercial* work operating on a digital computer. Experience of preparing mathematical work for a computer is insufficient to enable a person, however proficient or, indeed, brilliant he might be in his own sphere, to give the guidance required on the crags of commercial systems. Obviously, given a first-class methods team on the one side and a first-class mathematical program planner on the other, there is every reason to believe that, in time, successful clerical programs will be worked out. But there is that time element to be considered, and however talented the team as a whole, it would be an outstanding achievement for them to have prepared any considerable load of work for a computer between the placing of an order and its execution. In any event, it is a course which means discovering afresh what has been discovered already and learning randomly what can now be acquired in a more ordered fashion.

It may be questioned: "What are the special factors which give rise to this, almost compelling, need for guidance in the preparations for installing a digital computer in the office?" Those factors may be simply stated:

First, to achieve its potential, an Automatic Office must tackle a *whole job*.

Secondly, it must meet the *productive* requirements of the job.

Thirdly, it must aim to do the job *automatically*.

It is much less easy to define what is meant by a "whole job." Whilst a *whole job* cannot be limited to an existing office job, in the sense of, say, sales invoicing, it equally cannot be made to embrace every related

clerical and management accounting task within a company. For it is in the nature of business accounts that *all* the processes are linked, if not at a lower level, at least through the balance sheet. The chain is an endless one. If the start is made with payroll, then the obvious first link is with labour costs; they link with material costs; material costs link with output from stores and, thence, with stores control; stores control links with stock replenishment; these, in turn, link with stock requirements and sales forecasting and so on and on. It is good to start with a sight of the whole panorama as seen from a balcony high up. But dizziness will inevitably develop if the controlling mind ranges over the whole expanse too long!

There have been one or two abortive attempts in the United States to achieve *ab initio* program suites covering whole clerical continents. The view has been, that if everything is not tied in together right from the outset, then laborious re-programming and re-planning of clerical systems must be faced at a later stage. It would be idle to suggest that there is not the element of truth in this standpoint. Yet one thing, that is taught by experience on the operating floor of an Automatic Office, is that men are not gods, and it is not for them to hope to plan once and for all, without any subsequent risk of major revision.

Experience in operation of a viable part of the work will yield far greater dividends than an endlessly protracted analysing and scheming and charting of the whole. When, section by section, the major divisions have been set working, the problem of total integration can be faced, but that is not a problem that generally need for long exercise the mind of the prospective purchaser. There are, of course, some cases where the nature of the business is such that two or three major programs will cover the greater part of the field, and where the inter-links can clearly be seen from the outset, but certainly in most manufacturing businesses of sufficient size to profit from the use of an Automatic Office, this generalization will be found to hold good.

The swing of the pendulum from the global job is the islet job, that is really too small to give experience of what a full-scale job is like in action, of the problems to be faced in preparing one, and of the advantages to be gained from the use of an Automatic Office. Yet given that something can be brought quickly into operation, the confidence and sense of participation that it engenders in those concerned, more than outweighs the shortcomings of the job in the wider sense. This type of job, however, is something to be established on a service basis long before delivery, or preferably even before the order of a computer, rather than to be looked to as an adequate first step after its delivery.

To find the middle course between what is initially impractical and what is insufficiently significant must necessarily be a prime purpose motivating the potential purchaser in approaching those with experience for guidance. If the purchaser wishes quickly to bring an installation into productive activity, and it cannot be stressed too often that therein lies the most likely road to success, then he may have to be content with the advice that some comparatively unadventurous job be pushed ahead with first, to ensure that the computer is ready to earn a fair slice of bread and butter as soon as it is brought into running order. Ideally, indeed, the job selected should be such that it can be actually run on a pilot basis, if no more, at the manufacturer's service-station for some time before the purchaser's own equipment is installed. The transition should then be made with a running job, sufficient in range and productive computer time to give an adequate earnest of the potential to follow.

In its fourth annual progress report on the development and use of commercial data processing systems in Britain, the journal *Business* draws attention to the fact that payroll is high up on the list of jobs planned for machines on order and that top priority is, in general, being given to routine figure work. *Business* goes on to comment (Spooner, 1957):

> "So in one respect there is a gap between theory and practice. After Lyons inaugurated their electronic office in 1954, payroll was held up as the prime example of commercial data processing possibilities. Then it became fashionable to sneer at the bread-and-butter jobs and to suggest that the real possibilities lay in more advanced spheres."

No one, I suppose, would venture to quarrel with an assertion that the real possibilities of the Automatic Office lie in more advanced spheres than payroll, or that there is more to be gained in providing management with information to enable them to make their businesses more efficient than in merely economizing on existing clerical costs. But what is not so apparent is the fact that the will to provide better management information and the impending arrival of a computer are in themselves no guarantee, that all the preliminaries to be gone through in probing the fundamentals of the business can be completed to everyone's satisfaction, and a program produced, in time.

The choice of a bread-and-butter job need not deprive it of all savour. Even payroll, quite apart from the fact that it costs wages, machine hire or depreciation charges and rent to get it completed each week by existing methods, has its attractions when it stands fully revealed. For from the working hours can come not only hours to pay, but also overtime, absence and lateness statistics if such are required. From the wages paid can come job costing and comparative average labour rates. From the deductions, the job can be naturally extended to embrace the provision of schedules for National Insurance for bulk payment schemes; the aggregation of savings and their documentation to the Post Office or Trustee Savings Bank; the maintenance of loan accounts for employees paying off debts; the provision of the annual returns to the tax authorities; the calculation of superannuation fund contributions; and so on. From the details of the employee's grade and date of birth

and date of joining the company, all of which would very properly be held on the employee's record maintained by the computer, useful statistics on the age and service distributions can be derived as a by-product of the main object. These but touch upon the multitude of tasks that the experienced eye sees as falling within the term *whole job* as referring to payroll. The tasks will vary from industry to industry and company to company, for the corporate personality of an organization is nowhere more clearly reflected than in its payroll and related personnel practices.

Strip payroll of job costings or its accounting by voteheads and all the other appendages, and the job fails to satisfy the first criterion to which reference was made above. It is not a whole job that is being done. A computer system designed to deal only with the rump cannot hope to find comparison, with a well-conceived orthodox accounting machine system, altogether flattering. And this is true in many other areas of routine clerical work. The *whole job* must be done or the effort might well not be equalled by the rewards. The management information will often come as a very nearly free bonus for doing the whole job, for so much data will have had to be brought together when doing the routine side of the job that only selection and analysis will generally be necessary to give those directing the business at the different levels all that they require.

The area of deciding the scope merges naturally with that of determining the precise requirements. An insight into business aims is, perhaps, more important here than experience of office procedures. The great pit, into which it is exceedingly easy to fall, is the more or less precise reproduction on a digital computer of what previously was done on orthodox equipment. Requirements so defined necessarily lead to carrying out much work that is quite unproductive save as a link in the existing system. On the other hand, they fail to take advantage of the special facilities offered by the computer for providing results more readily convertible into business decisions than hitherto.

The third criterion for a successful installation has been stated as being that it should aim to do its job *automatically*. It should not side-step the exceptions; it should not need run after run to achieve its objectives; it should be able to absorb its data in its natural streams; it should produce documented proof of the accuracy of the work carried out.

The part played by exceptions in clerical work may perhaps have resulted from the past history of the craft. It has been so easy to instruct a clerk to do something different in a particular case, that it has scarcely been worth considering whether it was, in fact, really necessary to do something different. What could be more straightforward than for the sales manager to tell his office supervisor that, in future, Bloggs and Bloggs alone were to receive an extra 6d. in the £ discount on top of their 30s. a ton discount, if they purchased more than 20 tons in one consignment? It is true that the passing on, from one office generation to another, of all the exceptions, has been by no means easy, nor have the exceptions, when viewed collectively, had the same innocence as when viewed alone.

Nonetheless, a computer department which informs its executive customers that it will only take over their straightforward work will not be greeted by a rapid or enthusiastic acceptance of its services. The establishment of the requirements with regard to exceptions, the sorting of the wheat from the chaff, the charting of the maze of *ifs* and *buts* and its eventual coding are time-absorbing, and call for patience, understanding and skill. The fact that exceptions can play so prominent a part in a clerical job will often appal the mathematical programmer, but it is part of the stake that must be paid if the job as a whole is to be done automatically.

I do not want to go in any detail into the other aspects of automatic running that I have mentioned. They have been put on record because they are three aspects which experience has shown to be of importance if satisfactory results are to be achieved. It does not seem a good system if a payroll has to go through a score of processes—and more have been known in the States—to carry out one detailed task after another. It does not seem a good system if a preparatory punched card routine has to be used to collate all manner of data into a single input channel. Nor does it seem adequate to produce less tangible signs of the reconciliation of the accounts than were provided, as a matter of course, by previous methods. The capacity and speed of a well-contrived automatic office system are such that it is possible not only to balance meticulously, but also to give manifest proof of those balances.

It need scarcely be stated now that even though a routine job is selected to launch the computer project, the work involved will not be something to be tossed off lightly, if it is the *whole job* that is tackled and if every effort is made to deal with it truly automatically. It is work that is not only sizeable in quantity, but is also novel in quality. It is not work that can be undertaken with confidence by fledglings trying their wings after a training course of a few weeks' duration. There must be a period of guidance, a period in which those with greater experience accept the responsibility. Given that period, and given acceptance of that situation on both sides, there is no reason whatsoever why we in Britain should not avoid the failures that have marred the introduction of electronic data processing elsewhere.

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