

CONFERENCE PAPER

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Modern Management

by G.G. Fisch

*A Paper Prepared for the Conference
"Productivity Through New Technology"*

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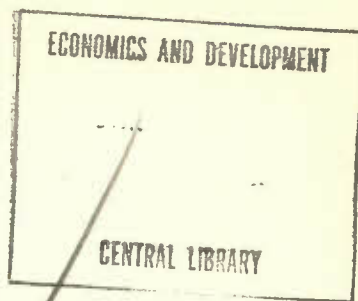


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by

Gerald G. Fisch

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FOREWORD

The author of this paper, Gerald G. Fisch, is Managing Partner of P. S. Ross & Partners, Management Consultants, and a Principal of Touche, Ross, Bailey and Smart, Chartered Accountants.

Mr. Fisch is one of several specialists commissioned jointly by the Economic Council of Canada and the Ontario Economic Council to undertake special studies and prepare papers, such as this one, for the Conference on Productivity Through New Technology, held at Ryerson Polytechnical Institute, Toronto, May 27 and 28, 1965.

The purpose of the Conference was to inform senior executives of small- and medium-sized businesses about the practical application of the new management, production and handling concepts, techniques and tools available to them, including the use of computers and automatic production equipment. The Conference participants -- approximately 300 businessmen -- were afforded the maximum opportunity of informal discussion with the authors of the papers.

In publishing these Conference papers, the Economic Council of Canada hopes that the material will be useful to others, and perhaps serve as the basis of similar conferences. A list of the studies being published, with a brief description of each, will be found at the end of this document. The views in these papers remain the responsibility of the authors.

MODERN MANAGEMENT

SECTION I

SOME PRELIMINARY CONSIDERATIONS

The purpose of this paper is to acquaint the senior manager in small to medium sized companies with an over-all view of the new management tools and techniques which are available to him. What are these new devices? How are they used? What is required to introduce them into a specific company? What benefits can be derived from each? What is the limitation of each device, or how should it not be used? These are some of the questions which this paper will attempt to answer.

The Challenge of Change

What we must learn is to move, where we have not done so already, from the old "seat of the pants" approach to management, to one of increased precision. All the new management devices can really be understood and described with that degree of simplicity. All that has happened is a situation where we simply do not have time for letting the "trial and error" approach, or "seat of the pants" thinking evolve the right answer because events are moving far too rapidly for that.

However, even if a company were very willing to move to a more precise approach to management decision making, the question arises as to where to begin. Business magazines, trade journals and even the more sophisticated management literature, like Western's Business Quarterly and Harvard's Harvard Business Review, seem to suggest such a wide range of new approaches that it seems difficult to sort them out. Is long range planning the answer? What is a PERT time and cost system? Should we use it? Surely we cannot

afford to buy a computer. That really is the main purpose of this paper: to sort out these seeming fads and gimmicks and try to put them in some sort of perspective. This is surely no easy task. Nevertheless, we can agree, perhaps we don't have as much time as we had before for trial and error, and we must learn to make the right decisions much more quickly than ever before.

The Response

If this is the challenge and this is the problem, then what basically should be our response? Is there a simplified way to look at some of the new approaches?

Practically nothing in this paper is new in the sense that it was thought up last year or even the year before. What is new is the widespread successful application of these techniques, approaches and concepts to business now. That is new. Historically, and we do not have time to go into detailed history, some of the ideas, concepts and notions have been a long time in developing and, in various forms, have been around for quite awhile. To just take one example, computers in some form have been used for awhile, but have not been commercially available until 1957 or 1958, and have not come down far enough in price, and have not been specifically designed for the smaller user, until relatively recently.

Basic Concepts

Before we consider the long lists of tools which we will discuss briefly, two main ideas need to be presented. These underpin most of what follows. Two very fundamental concepts need to be recognized. They are:

1. The analytical approach, and
2. The total systems concept.

In the analytical approach to management, the process of management has been analyzed and dissected. Various concepts and techniques have been developed -- from long range planning and organization planning, to management by objective and management by exception. That, in short, is one of the broad areas of newness -- the application of reasoned and intensive analysis to management practice.

The second major thought contribution to the new management -- the total systems concept -- is less well known and less well understood.

This suggests that any company -- your company -- can be viewed as a total business system, which in concept includes everything that goes on within your factory and office walls, everything that goes on within the operations of your customers and suppliers, the economy in which we all live, including the competitive economies, and competitive products. This concept of a total system is applied when we study information flow. Thus we can provide data not only on our own operations but on competitors', on the economy, on our customers and on our suppliers. We can make decisions based on total considerations rather than on an insular view of a particular problem. Without this approach, the real cause of a problem may elude us -- if we have taken too narrow an approach instead of looking at the total situation.

Universal Giants

We have available to us two Universal Giants to help us. Universal because of the many things they can do; and giants because inherent in their capability is enormous power to deal intelligently with immense complexity.

They are called:

1. The Computer, and
2. The New Mathematics.

1. The Computer

The computer is available for use on three bases: on the service centre basis, on the rental basis, and on a purchase basis. Computers are now priced low enough that many small- to medium-sized companies can afford them and should consider their use after careful analysis and study. The computer permits tricks in production, in marketing, in management control and information systems, in capital expenditure appraisal and in long range planning, which are pretty unusual and which give that company which uses it well, some unique advantages. It is fair to say that there is no company that either has not already been touched by the computer or will not soon be touched by it.

2. The New Mathematics

The new mathematics permits the precise handling of complex data in such a way as to:

1. Maximize profits.
2. Minimize costs.
3. Minimize the time it takes for a complex project.
4. Find the ideal compromise to meet competing customer demands, or
5. Achieve the most effective use of complex facilities.

These mathematical principles can be applied both manually or, when appropriate, with the use of a computer.

Two Words of Caution

Before we discuss specific new tools we now need only two reminders.

1. All these tools have the same objective and purpose -- contribution to profit. In this sense then they are related to one another. If you accept that -- which is fundamental --

then we can safely emphasize the uniqueness of the approaches rather than the similarities.

2. One of the by-products of this paper is to make the reader unafraid of buzz words. One must excuse the practitioner, inventor and designer of new business techniques for creating buzz words. He must find words and language to express ideas which previously may not have been expressed. The difficulty arises when the working manager hears conflicting words used to mean the same thing. That might discourage him from applying an excellent idea.

Where to Start

In looking for the application of new tools, there is one standard procedure that will never lead you astray. This procedure essentially takes a very pragmatic approach. "In my company at this point in time, what problems or opportunities do we have, and what is the order of urgency in which we must find solutions?"

Is it in the area of finding new products? Is it in expanding our market penetration? Is it in reducing costs? Is it in expanding our facilities? Is it in finding better people? Is it in making more money than we do now?

We should of course look for the obvious first. We must then assign priorities -- with due consideration of revised and up-dated company objectives. Then, and only then, can we select the most appropriate tools which suit us in our situation at a particular point in time.

SECTION II
THE NEW MANAGEMENT TOOLS

In each case, we will explore what the tool is, what it does, where it is applied, and how it is used. Segregating these tools into any particular groupings is not easy, but segregate them we must. The classification which is used below is as follows:

Group One - are called the internally oriented tools. These are tools which concentrate on what goes on within the enterprise.

Group Two - are externally oriented tools, or devices which concentrate on what goes on outside the enterprise but which is very important to the enterprise.

In both Group One and Group Two there is a concentration on mechanical, conceptual and mathematical devices which creates an opportunity for Group Three, which are the people oriented tools.

Group Four - are the total business oriented tools.

Group Five - are the functional tools.

Some functional tools are described in Group One and Two as well. However, the range of tools is so large and the complexity and interaction so great that without some classification attempt, the material would be impossible to present in any logical sequence.

1. Internally Oriented Tools

Let us first of all consider an over view of what they are.

One is an accounting approach called -

1.1 Profitability Accounting, or as it is sometimes called by some practitioners, responsibility accounting. Incidentally, they are not the same.

And then there is

1.2 CEE, short for the customer engineered environment.

And then . . .

1.3 Modern Inventory Control.

1.4 Work Measurement and Industrial Engineering - applications

1.5 Integrated Information Design.

1.6 Management Control Design.

1.7 Computers and Systems.

1.8 Detailed planning, control and scheduling - techniques including:

- A. PERT (time and cost).
- B. The new programming.
- C. Short cycle scheduling.
- D. Plant layout, facilities planning, scheduling and control.
- E. Gantt charts.
- F. Critical path method.
- G. Queuing theory.
- H. Charts in general.

1.9 The Learning Curve.

1.1 Profitability Accounting

Profitability accounting is an approach to accounting which states that historically, accounting developed to provide data after the fact in relationship to the past. But what is required for this day and age is management accounting, whereby management develops a plan from which the accounting system first of all meets the needs of management by measuring performance according to plan. Thus profitability accounting is a method of accounting which emphasizes the needs of management, gives each key person in the company a statement of how he is performing in relationship to plans and standards and only gives him information on items which he himself can control. Thus, under this system, we do not, as we do under many accounting systems, apportion the President's salary into a huge thing called overhead, and charge it against the factory department, with the foreman ultimately receiving a charge for overhead which he does not understand and about which he can do nothing. From a technical point of view, profitability accounting integrates into one accounting approach, most, if not all, of the modern concepts of accounting emphasizing the needs of the management. This system of accounting has been successfully applied to companies small and large, in many different industries. It has been effective in weeding out unprofitable items in the product line, and optimizing profits from more profitable products. It has also been a very effective tool for pinpointing responsibilities and achieving remedies, where aspects of the operations are either not well managed or are inefficient, or for various reasons have run into difficulties.

For example, one company manufactures two product groups, A and B. Under conventional accounting, overhead was distributed on a direct labour

content basis. On the basis of the profit contribution so determined, they decided to expand facilities for product group A and close out the B group.

In thinking about the magnitude of their decision, they decided to double-check their conclusions using profitability accounting. To their amazement, it was found that in fact their decision if implemented would have put them into bankruptcy in two years because product group B (which they thought was the loser) was in effect the winner. Why? Research, Development and Engineering Costs applied approximately 75% to product group A which happened to have the low labour content. All this expense was charged into overhead, completely distorting reality.

1.2 CEE, or the Customer Engineered Environment

This again, is an integration of approaches. It is a peculiar integration aimed at the retail/wholesale service industry situation. Its value lies in the fact that the average department store or retail store or gasoline service station, or bank -- all protestations to the contrary -- is not really designed in an integrated fashion to really concentrate on the customer. Just a quick example will suffice. In a department store normally the credit and cash and sales order procedures are dictated by the store controller or the Vice President of Finance of the store. The sales staffing and merchandise selection is normally dictated by the Buyer or Merchandising Manager, and the physical facilities are frequently determined by the Store Superintendent. Personnel practices are dictated by the Personnel Department. When the customer arrives, how these decisions (made frequently with little co-ordination) affect the individual customer is either not known or not sufficiently considered, but whatever it is, it makes shopping not too pleasant, and occasionally a nightmare. The cause of

the problem lies in the way these various aspects of operations impinge upon the customer and the fact that they have not even been related to a precise knowledge of the rate at which customers arrive on any given day in any given month in any given year.

Thus, in terms of sales staffing, we either have too many clerks or too few, hardly ever the right number. The total process of serving customers simply takes too long from the customer's point of view, and actually from the store's point of view as well, because when the customer is annoyed and frustrated, we do not optimize our sales, and usually our costs are excessive. Thus, CEE is a conceptual and mathematical approach to integrating everything that happens to the customer after he enters the store in such a way that he can be served within a reasonable time interval; from the store point of view efficiently and at a reasonable cost. Where this system has been applied, (and it is a new system which has not been applied on any large scale) sales have risen dramatically, customers have been more satisfied than ever before, and total costs, surprisingly, have gone down.

1.3 Modern Inventory Control

Everyone knows what inventory control is. But modern inventory control usually permits, practically without exception, either the maintenance of present service level at a substantially lower inventory level, or improved service or an improved out-of-stock position without raising the inventory level, or some combination of the two. I have never seen, regardless of size, any inventory control installation which has not resulted in one or both when it was properly installed and applied. It reduces the amount of capital required to operate; it normally increases sales because of better service; it cuts down a lot of internal aggravations, and it even has

a nice security aspect in that we have better knowledge of what is in stock and we can more quickly control pilfering when it occurs.

A company with sales of less than \$7 million applied these techniques. After carefully observing the results, the President wrote an interested business acquaintance in part as follows:

1. In our purchasing the time required to do the work has been reduced 45%.
2. Our basic product stock-outs are less than 2% with total stock-outs less than 4% -- down from the previous average of 15%.
3. Our total inventory is down about \$150,000 over last year with a considerable increase in sales.

1.4 Work Measurement and Industrial Engineering Application

This is an "oldie" in some ways. However, it is included here, since many, many small- to medium-sized companies are not using industrial engineering or work measurement in their operations. There are substantial savings to be achieved in most instances through the application of work measurement and industrial engineering techniques. This applies not merely to factory operations, but indeed to any operation which is repetitive in nature on any basis, whether it involves factory people, clerical people or maintenance people. It is used to find better ways of doing things, to identify opportunities for cost reduction, and to establish standards against which performance can be measured. In its broadest sense, it includes the specification of the best machines to use, the description of the best ways of doing the work for any given person or in any given operation, and establishes in no uncertain terms standards against which performance can be measured. It is safe to say that there is no company, regardless of size,

that cannot benefit from industrial engineering and work measurement in terms of reducing costs and improving efficiency. It is regrettable that these techniques which, without the latest refinements, have been known in substance probably for at least sixty-five years, have not yet found full acceptance by all small- to medium-sized companies in Canada. With the new business and industrial environment in which we now find ourselves, this kind of lag between opportunity and application will probably not occur again, simply because the companies that are that slow in adopting new approaches will not be in business in the future.

1.5 Integrated Information Systems Design

This is an application of the total systems concept discussed earlier. Like all of the new management techniques, this is, in a sense, "a rebellion" or an attempt to correct an apparent malfunction. The malpractice, which is intended to be corrected here, is that most companies use a profusion of seemingly unrelated information systems. Even though the systems are not related in practice, each describes or attempts to control operations which are indeed related. In this way, in total, we process data wastefully, duplicate a lot of clerical work, and provide conflicting information to management. These so called "fragmented" information systems which result from this common practice, include: one information system for sales statistics, another information system for production control, yet another for quality control, another one for general accounting, another for cost accounting, another one for labour standards, another one for machine down time, another one for product quality control and inspection, another one for control of salesmen, and so on ad infinitum, ad nauseum.

An integrated information design or an integrated information system is one which begins by analyzing carefully what the total information requirements of the operation are. Then one system is designed that provides all the data required at minimum cost. It gives much improved management control, provides a much more efficient operation, usually at a lower cost, and can be applied to any company, regardless of size, usually with devastating effects in terms of improvements and efficiency, and also with devastating effects in terms of cutting down arguments. Getting it accepted and moving from a fragmented system to this new integrated system takes a lot of intestinal fortitude, a lot of hard work and a great deal of ingenuity. The savings aspect is best illustrated by taking a document such as the sales order. Under an integrated systems concept, the sales order is the basic source document for the following activities, or the following output documents: sales statistics, pricing analysis, customer analysis, production control and scheduling, inventory control, cash flow, accounts receivable, revenue accounting, product line analysis and product profitability studies. It can be readily seen that under fragmented systems, the data provided by the sales order is processed and re-processed and re-typed many, many different times to take care of these various uses. In an integrated approach this duplication is avoided.

1.6 Modern Management Control Design

Management control is simply another word for a planned information system. It usually refers to an information system which emphasizes rough and ready controls for management. Normally, such systems are neither fully integrated either in a profitability accounting sense or in a total information systems sense. It really is an early beginning normally toward either something like profitability accounting or something like integrated

information systems design and might be a useful first step in achieving better information for basic management decision making in the most critical areas. It is applied very much like profitability accounting and integrated information systems design. It can be applied to companies of any size, and usually it takes a lot of short cuts in order to reduce clerical work and avoid complexity of information design. For example, in controlling direct labour it may depend on "numbers counts" of how many people were at work, what was the average dollar value of goods shipped that day, or what was the output per man in numbers of units of product.

1.7 Computers and Systems

The computer has many uses including the control of production and the handling of vast masses of business data. Many a small manufacturer and even a medium-sized one will say, "I am not big enough for a computer". The true answer is, "If you are not right now, you soon will be". With the new type of computer known as a "multiple access computer", it is possible to computerize or to use computers for both manufacturing and business systems economically for any application. These new machines permit groups of manufacturers to band together and derive the benefits of one machine, conceivably even in conjunction with dozens of retailers, a hospital and a university. The users do not even have to be located in the same city. Computer utilities are already as practical as a common source of electricity. All that is required is enterprise and imagination. This field will no doubt mushroom within the next few years.

Most large manufacturers who are using computers are using them inefficiently. Many think that by sending a few of their trusted old employees to a computer course, they will get an efficient use of computers.

Nothing could be further from the truth. The fact of the matter is that most manual systems in use, whether they be for production control, production scheduling or for accounting, are woefully inefficient to begin with, even as manual systems. When these routines are then put on computers, the inefficiency is perpetuated. As a result, most computers are inefficient in that they do twice as much work to get a given result as they should be doing.

Thus, in effect, when you arrive at the point in size where you can justify a computer, either as a part time user or as a full time user, the first job is to redesign all your systems before they go onto computers. Even in your justification studies of computers it is necessary to consider the inefficiencies inherent in your present systems, some of which by the way can be cured without the use of computers. Thus, try to think of the computer and the system as absolutely inseparable. If you do that, with or without computers, you will save yourself a lot of money. The biggest reason, of course, for talking computers at all to small- to medium-sized manufacturers, is not merely that they are efficient on a data centre basis, but the computer business itself is becoming highly competitive, and of course, the vast untapped market that does exist is the small- to medium-sized company user. He is now the target. So get ready. The computer salesmen are coming and if you know how to handle them, they can do you a lot of good.

1.8 Detailed Planning, Control and Scheduling Techniques

Next, we deal with a host of planning and scheduling techniques. There are probably more management techniques in the detailed planning, controlling and scheduling end of business than in any other field. They all have one thing in common: the fundamental idea of optimization; they all try to achieve a specific objective related either to efficiency or to

effective utilization of equipment or cutting down the time it takes to produce a product. The less sophisticated goal is to achieve order out of chaos when there is complexity. In their most sophisticated form, they use advanced mathematics and computers to find that secret combination in the production schedule which makes the most money for the company. By and large taken as a group, they are a hodge podge. Let us take the simplest one first.

A. Simple Charting

That is a technique where charts like the famous Gantt charts (bar charts) are used to plan formally in advance of all the steps in the production process, for example, by customer order. Gantt has been dead many years and some companies still are not using Gantt charts.

B. Short Cycle Scheduling

This is a more sophisticated approach to the old speed-up technique. You set goals for each person in terms of tasks on a short cycle. For example, for a secretary or a stenographer, the cycle might be the time she is allowed to type one page. Thus, you schedule her work by the page, and that is certainly a short time period, or it should be.

C. PERT(Time and Cost)

This is a more sophisticated scheduling technique which is really an extension of something else, called the critical path method. PERT means Program Evaluation and Review Technique. It was originally used by the United States Navy to speed up their polaris missile program. The method helps to determine the critical path. The critical path is that path which shows all "critical" (critical in

the sense that these operations take the longest time to execute) operations in sequence. If something goes wrong in the operations shown in the critical path, then whatever happens to the rest of it does not really matter very much. Of course, this critical path changes as a project progresses, because the facts on which the critical path is based change. For example, you may estimate that in a construction project it takes you 20 days to obtain steel, and once the steel arrives, it will take 5 days to get it up. But if there is suddenly a steel strike this routine thing of estimating the time for the steel to arrive suddenly becomes anything but routine, and of course, will throw the whole schedule off. It is, I suppose, a very sophisticated way of identifying the most urgent bottlenecks so that you do not waste effort trying to expedite something which really does not matter anyway in the light of something else which is more critical. The chief applications of PERT are in major construction and complex scheduling. Then, of course, there are other scheduling techniques such as:

D. Queuing Theory

This is just a mathematical way of approaching a scheduling problem where a whole bunch of things line up, if you like. It really permits you to handle mathematically the problem of a line-up, and of course, when a line-up bunches up you get a special kind of a bottleneck.

E. Linear Programming

This is another operations research technique. It is again a mathematical way of handling some peculiar scheduling problems.

Linear programming has been applied to many problems including problems of scheduling for the railways.

Let us summarize what these techniques have in common. They are essentially highly sophisticated mathematical ways for scheduling production, construction, and in fact any series of operating events, at absolutely top efficiency. They are not out of the reach of the small- to medium-sized manufacturer. On the contrary, they can be applied on a sampling basis of study using modern statistics. Once the mathematical behaviour of the problem has been determined, a technique can be selected which might well fit your problem. Subsequently, either by manual calculation or after using computers for a short period of time, tables can be prepared which, provided conditions do not change too much from month to month, an ordinary clerk without much education can pick what is at near optimal scheduling without demanding table revisions more frequently perhaps than once a year, or when conditions change drastically. Thus, the right technique can be applied to your operation. These methods can save you a lot of money and a lot of heartaches. Essentially, it is a way of dealing with complexities, which without advanced mathematics and without the computer, we just could not optimize, because the human mind just is not so constructed. It moves precision from "sun dial" methods to the level of effectiveness of a precision watch.

1.9 The Learning Curve*

The learning curve is a result of psychological research. It is the name applied to the phenomenon in which people learn very slowly at first,

* Hirschman, Profit From The Learning Curve, Harvard Business Review, January/February 1964, pp. 125-139.

next achieve rapid progress, and finally level off at a higher plateau. The principle, and techniques which use the learning curve, have been applied successfully to a wide variety of industrial problems. These include the training of workmen with the learning curve becoming the flexible performance standard; the teaching of complex and simple tasks, and the introduction of new models and new products to full-scale manufacturing. Recent developments apply the learning curve -- without the plateau -- to the establishment of performance targets for an organizational unit and the setting of performance standards for a whole company.

2. Externally Oriented Tools

Marketing, Planning and Control Techniques

The techniques in this area relate again to more sophistication and less "seat of the pants" management in the marketing area. Thus:

2.1 Market Analysis

This consists of research as to who buys your products, why they buy them, and what they think of them in relationship to competitors' products. You then base your market strategy on that particular analysis. The technique is not so obvious. How it is applied is pretty clear. You make sound decisions based on facts. The opportunities inherent in such analysis are substantial. Most companies make such decisions largely unburdened by the facts and literally cost themselves a fortune and sometimes even put themselves out of business by playing a guessing game which they would not dream of playing when they buy a machine, say, for \$50,000. The truth of the matter is that when we make a wrong marketing decision, we often cost the company a lot more money than \$50,000 and it does not occur to us that we really have no business making that type of decision without adequate

facts. Techniques are now available for getting such facts and for making sounder decisions.

2.2 Marketing Planning

This group of techniques is based on the assumption that just as you need a production plan to obtain efficiency in production, you need a marketing plan to obtain efficiency in sales. Such a marketing plan must encompass everything you do in your strategy, and applies whether you sell industrial products or consumer products. You must indicate the dollar amounts you intend to spend on every item of marketing effort, and indicate also the sales results you expect from this effort. Subsequently, you measure performance according to plan, both in terms of expenditures and in terms of results. Here again, it is a more sophisticated way of approaching the selling job. It can be applied to any company and to any group of products regardless of volume. It is used both to increase sales and, even more important, to obtain value from the sales or marketing dollar.

2.3 Marketing Mix Analysis

Marketing Mix Analysis consists of looking at the various tools you have available to do your selling, such as advertising, sales promotion, public relations, direct selling, technical sales, indeed all the ingredients in the sales effort or total marketing mix, as it is called. Next, we analyze each product in each market in terms of which proportion of the marketing mix is most appropriate to that product and that market. Subsequently, we develop a detailed marketing budget, and make sure that we adhere to it. Of course, this marketing mix has to be based on a continual flow of information or research. Here we have another area which is neglected, which most of us do not work at consciously, and which has inherent in it a fair amount of "pay dirt".

2.4 Pricing Analysis and Strategy

As in most areas of marketing, most companies do not do a very sophisticated job on pricing, particularly when they are small- to medium-sized companies. Everyone knows, of course, that there are price pressures on every company from the customer, or that is what we believe. However, for many products, raising the price, for example, will increase sales. For others, profits can be optimized by lowering the price. At any rate, there are a series of techniques for studying what the right price is at any given moment under any given circumstances for each class of customers in order to optimize profits. Few companies apply these techniques. These techniques do not require computers; they do require a series of marketing and economic techniques plus some very astute "horse sense", and they invariably can be a great factor in improving profitability.

To conclude the section on the externally oriented tools and marketing and planning techniques, we can safely say that we could break out a lot more than these four techniques. However, they are indicative of the fact that most companies approach the marketing of their products very crudely without enough knowledge of what is going on and with far too much trial and error. We take many unnecessary risks which can be readily avoided through taking a good hard look at some of the newer techniques. There is probably more money for most companies in this marketing area than in any other because it is one of the neglected areas of management. Just as one example of marketing mix analysis, through advertising research, it is possible in some situations to achieve better effectiveness in advertising at half the dollar amounts spent on a previous advertising campaign.

We now come to the third major grouping of techniques or management tools, which for want of a better word, we will call:

3. People Oriented Tools

By and large, people work because they must. They also work (at least many do) because they obtain some satisfaction out of working, some feeling of accomplishment and achievement. You, in turn, are in business mostly to make money, but also because you obtain some satisfaction. The whole notion of the people-based management technique is that when you enjoy what you are doing, you will be efficient. In turn, when a company creates an environment where employees can be most effective and enjoy working, then the whole operation will be happier and more efficient than in a less favourable environment.

There is, and has been, much research going on, particularly in North America, relating to people at work. The researchers come up with a lot of ideas, and much technical data. Some of this material is very difficult to apply to a specific business situation. Nevertheless, this research has influenced and is continuing to influence management thinking, and it undoubtedly underlies some of the techniques which will be discussed below.

3.1 Manpower Inventories, Planning and Control

This is a mechanical or clerical device for treating your human inventory at all levels very much as you would treat your physical inventory if you had a modern inventory control system. When constructed, it tells you well in advance when your manpower resources seem to be getting out of balance and suggests what to do about it. This is a technique which formally is used by very few companies. In a sort of casual haphazard way, I suppose it is used by most; but in its formal proper sense, very few companies can be said to have an effective manpower inventory, planning and control technique operative at all levels of the organization. In fact, without such an inventory, you probably are not using your human resources very efficiently.

With it, if you are not willing to believe the data and what it shows or, worse still, if you are willing to believe it but not willing to act on it, you will sooner or later have serious management problems. Here again, the system need not be so sophisticated that it could not be applied to a company of any size.

3.2 Selection Techniques

Personnel selection techniques for all levels in most companies vary all over the map. The worst are as arbitrary as, "Oh, yes, I like the cut of his jib", or "He is too tall", meaning, I never did like tall men, therefore, I won't hire this one.

There are a host of selection techniques, ranging all the way from aids to selecting the best clerical workers to selection techniques for senior management. None of them are perfect, but they are far better than "seat of the pants" selection. By and large, at the lower middle level, they give you an almost 9 to 1 chance of picking the best available people for the job, and at the senior level, they probably give you a much better than even odds that you will pick the right people. All modern selection techniques have a basic principle in common. This is well illustrated by the following procedure and example:

Analyze the situation, that is, analyze the work itself and if it is repetitive, study carefully those people who have succeeded, those people who are just doing average work and those people who are doing poorly. Then isolate the criteria which make for success and do not hire anybody that does not match those criteria. Do not assume that you want the highest qualifications for every job.

For example, some years ago, I did a study of a foundry in the United States, and found that the best people for certain types of work in a foundry were poorly educated men, around 35, (that is, two or three years schooling at the most) married with two or three children, and some reasonable reliability in their work record so that they did not jump jobs too often.

Probably it is impossible to talk about selection techniques without mentioning psychological tests. A psychological test is just another "bit" of information that you can get on a person like his references, or his education or his age, or his marital status, and they are just as useful. There are just as many pitfalls in the use of psychological tests as, for example, in the use of specific references. The reference can be very misleading, and on occasion, so can the psychological data. The key to selection, particularly for the senior posts, is to obtain as much information independently from as many different sources as you can and make sure it fits. If it does not fit, you probably do not have the whole story.

3.3 Turnover Reduction Techniques

These constitute an analytical way to look at situations where there is unusually high turnover and you truly wish to take appropriate action to reduce it. The method is to "coldbloodedly" analyze the situation. You cannot assume that your superintendent is inefficient or your supervisor is incompetent. The principle underlying the technique suggests that there is a situation where the type of people we are bringing in do not like what is happening to them and leave; that is all. Thus, the method consists of a dispassionate analysis of the work situation to determine the causes of high turnover. Of course, the best sources of information are both the people who

left and the people who stayed. However, it is necessary to verify "what they say" and then to take corrective action. Turnover reduction techniques can be applied at all levels and should be applied wherever a turnover rate becomes costly in the form of replacements and training expenses.

3.4 Recruiting Techniques

Many small- to medium-sized companies have considerable difficulty recruiting just the right people for their needs. Since most such firms are not too well known to the general public and sometimes not even in their own industry, perhaps the best suggestion one could make is that the application of modern recruiting techniques should be left to larger companies or specialists. Any company, regardless of size, should use modern recruiting techniques when faced with an input of at least 100 people of a given category per year. Then promotional and other costs have a chance of paying off. If this is not the case, then depending on the class of personnel, outside agencies are recommended. Here, a host of helpers are available to an Ontario manufacturer. First, there is the National Employment Service, which has divisions for men and women, as well as an executive and professional division. The National Employment Service has just recently been split off from the Unemployment Insurance Commission, and now has become part of the Federal Department of Labour. The Department is making a considerable effort to help companies find people. With their offices from coast to coast, they naturally have a very fine network through which to work. In addition, the Ontario government and other provincial governments have departments of labour and they too are engaged and concerned with training workers of various types and in assisting companies in finding such workers. Also, the Federal Department of Immigration will help a company if it wants to import workers.

Turning to the private sector, we have a few non-profit institutions, very few, like the Technical Service Council, who do find people. Finally, there is a range of private companies, which range from employment agencies to large complex management consulting firms who again each have their own peculiar specialties and their own peculiar skills. For example, some employment agencies are very good for clerical people, whereas others such as some of the larger management consulting firms may concentrate on finding executives and technical specialists. At least one firm is very active in international technical and executive search for Canadian companies, obtaining skills which are not available in Canada. Thus, both for fee and for free, perhaps the best recruiting technique for the small- and medium-sized manufacturer is to use the host of agencies that exist for helping him find the right people. Before visiting an outside agency each company needs to develop definitive information, i.e., the work to be done, the qualifications required and the compensation range. Company background and growth potential both for the company and new employees are also important.

3.5 Wage and Salary Control Techniques

Perhaps it is logical to shift from selection techniques to wage and salary control techniques. If the wage and salary structure of the company is not in tune with the market, we are going to have great difficulty recruiting the right people. But more than that, an imaginative wage and salary administration scheme is a wonderful aid to improving efficiency and reducing costs. The basic principle, which is generally recognized as the most modern principle of wage and salary administration, is that you want to compensate each person fairly in terms of both effort and results. Secondly, appropriate relative compensation by position, achievement and seniority is

important. Recognizing next that people's efforts and the results they achieve are not static and do change, it is essential that a mechanism exist both for upgrading employees and for downgrading them.

Since World War II, and in fact, since 1940, companies have been very very loath to downgrade people and have often been quite mechanical in upgrading them. The result has been that money as a motivating factor has been more abused than used. Modern wage and salary administration techniques can bring many benefits in terms of attracting and holding the best people and repelling those that are neither competent nor efficient.

3.6 Motivation Techniques

There has been a great deal of research done on how to motivate people. This research has led to techniques of total man management, which in turn can be very very helpful to any company be it small- or medium-sized or large. As with all man management techniques, they should not be introduced in isolation. The techniques for motivating people include methods of improved supervision, methods of reward and punishment, specific profit sharing and incentive programs, the fringe benefit program, company sponsored social activities and other expressions of humanity in business, which can and often do improve productivity as well as breeding loyalty, affection and devotion.

3.7 Training and Development Techniques

Training and manpower development techniques are closely related to motivational techniques and to other techniques already discussed. Here, we have a host of devices: They range from one called "The Managerial Grid"^{1/}

^{1/} Blake, Robert R. and Mouton, Jane S., The Managerial Grid, Gulf Publishing Company, Houston, Texas, 1964.

which identifies the style of management of any manager or supervisor, to some of the more well known training devices such as the application of the learning curve.

Here, a word of caution is in order. With all the many devices that are available, ask yourself first what you are trying to accomplish, what sort of people you are trying to train and develop. Then prepare a total program for all classes of personnel.

Do not consider a one-hour lecture once a month a training program. The training and development of people is a total job which cannot be separated very well from day-to-day supervision. Nor can you say that you have an effective training program for future managers, by sending one man to the University of Western Ontario summer school. Here again, there is no substitute for looking at the total job to be done in terms of training for improved productivity and achievement and then designing a program which fits your company at any particular point in time. It will suffice to say that there are a great many new things known in this field which permit us to obtain a better end result with less waste effort.

3.8 Specialization and Deskilling

This group of techniques too has been around for a long time, and yet it is surprising how few small- to medium-sized companies really apply them well. For example, there are still a great many small manufacturing plants where an expensive machine operator, who might be earning \$2.30 an hour, spends 30% of his time doing work which could easily be done by an unskilled worker at \$1.00 an hour. That essentially is the key to specialization and deskilling. Firstly, it is a device where you arrange all the work to be done in such a way that specialists only work at their specialties,

and the more menial work or less skilled work is done by less skilled men at a lower rate. Why we are loath to apply this in small- to medium-sized companies is not quite clear, but there seems to be a great reluctance to apply it well. The savings inherent in the application of this technique are quite substantial.

4. Total Business Oriented Tools

Total Business Oriented Tools and devices, like all the other management techniques, deal with reasoned analysis, rather than guesswork.

4.1 Business Definition

This is simply an approach for defining an enterprise, by answering the question, "What sort of business are we in?" It is not an easy thing to do. We begin by defining a company's strengths and weaknesses in a specific market and in specific economy.

Every company should attempt it regularly, at least once a year and if that is not possible, at least every five years. Thinking logically about our business is not all that easy to do, because most managers believe they know when often here and there the business has changed or should change, while the manager's perception may be in tune with earlier times. Thus, the justification for business definition at least once a year is that the economic climate in which we live is changing so quickly that while we may be in the right business in May 1965, if by May 1966, we have not made too many changes, we may be in the wrong business, or may be beginning to be in the wrong business.

A group of companies in manufacturing, retailing and wholesaling had started many years ago as wholesalers. At that time, "power" was concentrated in manufacturing. In their operations up to three years ago the

emphasis remained on wholesaling and manufacturing. For some years, while business had increased, profits were declining. A careful study showed that the company was really now a retailer. The wholesale operations were changed into a merchandising operation and the manufacturing plans were made subsidiary in terms of product decisions to merchandising requirements. This basic conceptual business change has resulted in accelerated growth and improved profits.

4.2 Success Formula Analysis

This is an approach or a technique for analyzing a company's fundamental success strategy in a given business, and of testing this strategy at regular intervals against the realities of the market and the competition. For example, for a retailer the strategy might be "We won't be undersold", "satisfaction guaranteed or money refunded" and so on.

The regular review of the very foundation on which most management decisions are made is particularly important in the small- to medium-sized business in our particular time. Here again, it is something that most companies "sort of do" and "sort of don't do", but they do not do it systematically in most instances. Thus, it is recommended that success formula analysis be done once a year at least, formally. It cannot be done more often in the small- to medium-sized company.

4.3 Product Line Management

Calling this a new management technique may seem weird to you, but it is a fact that most companies do not manage their product line effectively. They do not deliberately at regular intervals sit down and say: "Our sales in these products are growing; our sales in other products are holding steady; our sales in yet other products are declining; our true profit contribution

for each product group is this and this and this." Nor are sales targets by product, by market, by end use carefully studied as to opportunities for profit improvement through better total planning with the product as the hub of the plan. What must we do in terms of adding and deleting products to achieve our objectives? How do we obtain the new products we need? That is a job which, years ago, in small- to medium-sized companies, was done when they first went into business and then maybe forgotten for a long time. Today, product lines are changing so quickly that the total job of managing a company's product line has become very important. It has to be done almost on a day-by-day basis.

However, most companies do not do it on a day-to-day basis. Some companies do not even do it on a once-a-year basis, and some companies do not even know what the job of product line management is. The technique essentially is to bring to bear on management decision-making relating to the product line, all technical knowledge, all market analysis, pilot plant production testing, and financial analysis under one organizational umbrella, and considering all these facets together: fiscal, production, marketing, technical, in order to decide what products to add and which to delete. When this technique is applied, no company is ever quite the same afterwards.

A company with sales of less than \$4,000,000, a manufacturer in business for over 70 years, had a problem of performance which declined near bankruptcy every 20 years. The reason lay in the fact that product lines were never reviewed until the basic business nearly dried out. In 1947, the company faced the same old problems. A product line management function was established using only two people full time at a total cost of \$25,000 a year. By 1956, sales had risen to \$15,000,000, mostly from new products, and profits were very satisfactory.

4.4 Organization Planning and Control Techniques

This is another area where most companies do very little formal work. Essentially, the technique consists in defining a company's objectives, deciding on the work to be done by each organizational sub-unit to achieve these objectives, and finding the ideal organization structure and the ideal manning required.

The next step is to see the amount of deviation from the ideal in the present organization, before working toward the ideal. In a small- to medium-sized company, organization plans should be made five years ahead and should be revised annually. There are specific detailed techniques (such as organization centre analysis) which are very useful in doing this work and which can be most helpful to a company in achieving its objectives.

4.5 Long and Short Range Planning

There is a host of techniques, albeit developed to varying degrees of sophistication, which are applicable to small- to medium-sized companies, which permit the company to set realistic objectives and draw up and execute specific over-all detailed plans for achieving these objectives. It is, unfortunately, a series of techniques which is much talked about, much written about and often very poorly executed.

4.6 Distribution Techniques

These are techniques for analyzing a company's product distribution system, but more than that, of looking at materials flow from supplier through manufacturing to customer as one total business system. The method allows the design of this distribution system so that it will operate at optimal efficiency. This again, is a technique which can be applied by any size company and is particularly useful where distribution is a major

problem or cost factor, or where there are distribution difficulties, or where the distribution system is changing.

As always, the objective here is to achieve increased efficiency, to reach customers more economically, and to give better customer service at minimum total cost.

These are just some of the more important examples of general management techniques which have been most useful to the odd sophisticated small- to medium-sized manufacturer in achieving tough economic objectives. It is difficult to conceive how a given company can play its optimal role in our economy without some long and short range planning and the effective use of some of the other techniques which have been discussed above.

5. Functional Tools

There are a whole series of devices, some of which we have already discussed, which are particularly useful in a given functional area, such as manufacturing or marketing. Many of the scheduling techniques we have already discussed could be classified as manufacturing and operations techniques, and certainly the externally oriented techniques fall into the marketing area. The techniques which we will discuss below are techniques which have not been discussed already, which fall into functional specialties. They are only illustrative of the fact that there are other techniques besides the ones we have discussed above that are particularly useful in the efficient administration of a function.

5.1 Techniques of New Product Development and Introduction

The field of research and development and new product introduction has had a lot of work done on it. The techniques here are quite specialised

and not universally applicable. For example, techniques for introducing new consumer products are obviously very different from a technique for introducing a new industrial product. Suffice it to say that new products should not be introduced without applying some of the more modern techniques of market pretesting, pilot plant manufacturing or manufacturing engineering, combined with careful financial analysis and planning.

5.2 Maintenance Control Techniques

Here, work sampling and industrial engineering techniques are used to reduce maintenance costs and increase general effectiveness. The techniques are quite ingenious and are unusual applications of industrial engineering to reduce maintenance costs while at the same time reducing machine down time.

5.3 Advertising Research Techniques

Here the specific advertisements are researched in terms of whether they communicate effectively the message that the manufacturer should communicate to the potential buyer. To the extent that a specific advertising campaign, or ad, or medium is found ineffective, adjustments can be made which can improve the effectiveness of such advertising sometimes from practically zero to 100%.

For example, a certain hair tonic was advertised emphasizing its dandruff killing qualities. Research showed that no reader, or very few readers believed that it could kill dandruff and most of them did not care. It was found what they did care about was good grooming. When the good grooming characteristics of the product were advertised, without increase in the total advertising budget, sales went up 30%.

5.4 New Engineering Tools

Perhaps one of the most exciting of the new devices is the new approach to engineering design. Here, instead of a drafting pen, a light pen is used, together with a specially programmed computer to design all manner of articles and to make all manner of calculations. With this device one engineer can literally do the work of several hundred draftsmen. Of all the new tools, this is a good one to finish on because it is such an exciting new tool. In effect, it can make a very small manufacturer a very large one in a very short period of time, because he can presumably design a new product with ingenious characteristics at a very low engineering cost, using the computer to produce production drawings, and put himself into "the big league". With multiple access computers, it is conceivable for a large group of non-competing manufacturers to join together to obtain for the group this new device.

SECTION III

SOME FINAL CONSIDERATIONS

Putting it All Together

Putting all these techniques together, what do they mean? What do they consist of? They mean more precision. In the factory they suggest the further reduction of unskilled and semi-skilled personnel in relation to volume of goods produced; they mean the increasing use and management of machines, particularly computers, and they demand a much more sophisticated approach to management and technology than has ever before been demanded of small- to medium-sized manufacturers. In effect, this brief review of new techniques ought to say to you, "It is no longer a matter of standing still. It is really grow with the new techniques or perish". In effect, as a small- to medium-sized manufacturer, you very much have to behave like a leopard, who has to change his spots, not just once, but maybe every year. That is how the new tools of management fit together.

A Work Program

If that is how it fits together, what do you have to do to get started? Presumably, you have started already, but assuming you are a little behind, how might you approach your own productivity improvement program?

1. Define the problems or challenges facing your company.
2. Define and up-date the objectives that you want to achieve.
3. Establish priorities in getting the job done.
4. Set specific sub-goals and develop specific programs.
5. Do feasibility studies and prove out the various action steps that you want to take and make sure that they will achieve the end result that you intend.

6. Install one program after another while carrying on "as usual"; because even while we change and improve, we have to continue to operate and make a profit, perhaps using the old way, until the new way can properly supplant less effective techniques.

In Conclusion

I would like to conclude this paper in part by referring to two lectures, which Dr. Peter Drucker of New York University gave in Toronto on March 2 and 3 under the auspices of the School of Business of the University of Toronto, and sponsored by the Canadian Imperial Bank of Commerce. Dr. Drucker made many points during those lectures, but I would like to refer to one in particular. He pointed out that historically, we have come a long way in terms of our ability as managers to handle complexity and size. He pointed out, for example, that in the old days of the city-states in Italy, the Medici bank went bankrupt. The owners of the Medici bank explained to the state government that the reason they went bankrupt was that they had to supervise sixty-five employees and no one could surely be expected to operate efficiently and effectively supervising that many people. This excuse would appear laughable today, and as Dr. Drucker suggested, perhaps to our sons and grandsons, our own methods of today will appear crude indeed. Thus, we have come a long way and we have a long way to go.

Throughout this paper, there are several common themes. In any company today there are at work two performance standards:

1. The demands of the "chosen" economic environment, and
2. The company's own objectives.

We have tried to stress that a company can and must choose and evaluate regularly the business in which it wants to compete, and having done so, it must be astute in selecting attainable objectives.

Secondly, we have tried to emphasize that the accelerating rate of change, the demands of a growing ambitious population, and the pressures of a rapidly developing technology are forcing increased precision and the effective use of new management techniques to achieve this precision on all companies, small and large. I am convinced that those companies who fail to recognize this truth may not survive for long. Those who do embrace this realization in daily business practice will undoubtedly grow and prosper.

Finally, in considering "new tools for management", one cannot overstress that all of these devices are lifeless and useless without the key figures "on stage" - the industrialists and the managers. Without entrepreneurs, without venturesome individuals, without risk-taking, without personal and corporate daring, no progress has ever been made in the past, nor will there be the achievement of our economic goals, without such a spirit of adventure coupled with a vision. The techniques we have discussed can only be the humble servants of the daring manager, never his master.

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The following two addresses delivered at the Conference are available without charge from the Economic Council of Canada, Post Office Box 527, Ottawa.

OUR CHANGING ECONOMY, by John J. Deutsch
Chairman, Economic Council of Canada

TECHNOLOGY AND PEOPLE, by William Dodge
Executive Vice-President
Canadian Labour Congress

PRACTICAL APPLICATION OF DATA PROCESSING IN MEDIUM-SIZED AND SMALLER MANUFACTURING COMPANIES by Dr. H. S. Gellman and R. C. Carroll

Dr. Gellman is Vice-President, Research and Analysis, and Mr. Carroll is Chief Analyst, of DCF Systems Limited, Malton, Ontario.

At the beginning of 1965 there were more than 24,000 computers at work in the United States and approximately 650 in Canada. This paper is designed to show the managers of small- or medium-sized manufacturing companies what can be done with some of the modern equipment for automatic data processing, towards improving the operation and control of the business. The paper includes the results of a questionnaire survey of several hundred Ontario companies on their use of data processing. Thirteen case studies show the actual cost, application and benefits of ADP in the individual companies.

ADVANCES IN METAL WORKING by Dr. John Vande Vegte

Dr. Vande Vegte is Assistant Professor of Mechanical Engineering at the University of Toronto, and a Principal in the consulting firm of Systems Engineering Associates Limited, Toronto.

His paper is designed to acquaint owners and managers in the metal-working industry with a wide range of new developments in manufacturing technology. Discussed at length is one of the most important of these new developments, numerical control of machine tools. There are about 5,000 of these machine tools in operation in the United States, and the U. S. Labor Department estimates that 12,000 may be in operation by 1967. Canada at the start of 1965 had 46 "NC" machines in operation. This paper also reviews developments in cutting and forming, and discusses improvements in the productivity of machine tools by the addition of modern attachments and accessories.

IMPROVING MATERIAL MOVEMENT THROUGH THE MANUFACTURING CYCLE by James A. Brown and B. D. Beamish

Mr. Brown is a Partner in Woods, Gordon and Company, Toronto.
Mr. Beamish is an automation consultant in Toronto.

This paper is broad in scope, describing how firms might reduce or eliminate material handling and minimize the movement of material through the manufacturing process and to the customer. It pays particular attention to the new developments in the shipment of raw materials and finished goods, warehousing, in-plant handling, and handling at the workplace. One of the authors' findings from a survey of manufacturing companies in Ontario was that few if any of the firms had useable data on their material-handling costs.

A PRACTICAL APPROACH TO AUTOMATIC PRODUCTION by J. W. Abrams, R. W. P. Anderson, and Donald J. Clough.

Mr. Abrams and Mr. Clough are Associate Professors, and Mr. Anderson an Assistant Professor, at the University of Toronto. All are members of Systems Engineering Associates Limited, Toronto.

Their paper is designed to focus attention on some of the thorny, practical problems faced by small Canadian manufacturing companies as a result of technological change. The objective is to give small companies some indication of the major factors in mechanization. The paper includes a definition of automation and mechanization; a discussion of ways that automation was approached by 12 representative Ontario firms surveyed by the authors; certain observations and conclusions resulting from that survey; and an outline of the more important technological, economic and other factors that must be considered as mechanization is implemented.

THE ECONOMIC JUSTIFICATION OF NEW EQUIPMENT by C. G. Edge

Mr. Edge is Director of Management Services for Chemcell (1963) Limited, and Assistant to the President, Columbia Cellulose Limited.

This is a paper on how to appraise capital expenditures through the use of sound methods of relating the future benefits to the outlay, estimating future benefits, and administering and controlling projects. Various methods of determining the economic justification of capital expenditures are discussed but emphasis is given to the use of the Discounted Cash Flow method. Three ways of using the DCF general method are described -- internal rate of return, present value, and equivalent annual costs. Adequate examples plus tables and charts provide sufficient information for the understanding of the significance of each of these methods.

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