

THE RELATIONSHIP BETWEEN DIFFERENT BUSINESS CONTROL TECHNIQUES

by

F. Clive de Paula, T.D., F.C.A., F.C.W.A., M.I.M.C.

INTRODUCTION

1 A newly qualified accountant might be forgiven for thinking that the art, which his examiners have just certified his having mastered, is the secret of the successful control of a modern business. But it is not. It is just one of many control techniques required to keep a business profitable and growing. This paper attempts to put the complex of control techniques in perspective, and to show how they are related to one another. At the same time, it may help to illustrate the many related areas of work in which an accountant in business must be ready (and trained) to help his colleagues.

Active and passive control

2 It must be remembered that control has two aspects. One is the active aspect of control, which directs activities with a view to attaining a given objective. The other is the passive aspect of control which monitors and checks results in order to see how far actual results are achieving the objective aimed at. The mother's hands on the hot and cold taps control the water going into the bath. Her elbow in the resultant mixture controls, or checks, whether the bath water is at the right temperature to bath the baby.

The main areas of control

3 The span of controls required to run a successful business can be described in various ways; but for the purpose of this paper, control is divided into the following main areas.

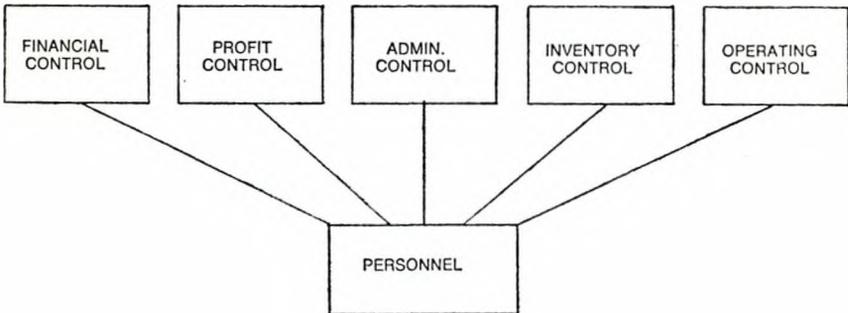


Figure 1

4 First comes the control of the finances of the business, since money is the life blood of business. If the supply is inadequate, the business may die of anæmia; and if the circulation of money round the business slows down and stops, the business is as doomed as a person with heart failure.

5 Next, a business in both capitalist and communist economies must ensure that it makes a profit, without which survival is in the long run impossible.

6 At the centre of all other forms of control lies the need for the administrative control of the different activities of the business, to ensure their smooth functioning.

7 In manufacturing and trading businesses, there is the further particular area of control of what is best described as inventories, which covers the whole range of raw materials, work in progress, and finished stocks. Clearly, this does not arise to any extent in commercial businesses such as banks, insurance companies and the like, nor in 'service' businesses such as professional offices.

8 All manufacturing and most service industries must establish control over their operating activities, whether these are the production processes of manufacture, or for example operating a fleet of transport lorries.

9 Finally, linking all these areas of control are people. Without people the business does not exist. It is as good or as bad, as efficient or inefficient, as the people who work in it and bring life into what is otherwise just an inanimate legal entity. It is through people that all the other controls are exercised, and therefore the control of people is itself fundamental to everything else.

FINANCIAL CONTROL

10 If we take first of all the field of financial control, we find that this embraces three main areas, which also contain some subsidiary activities:

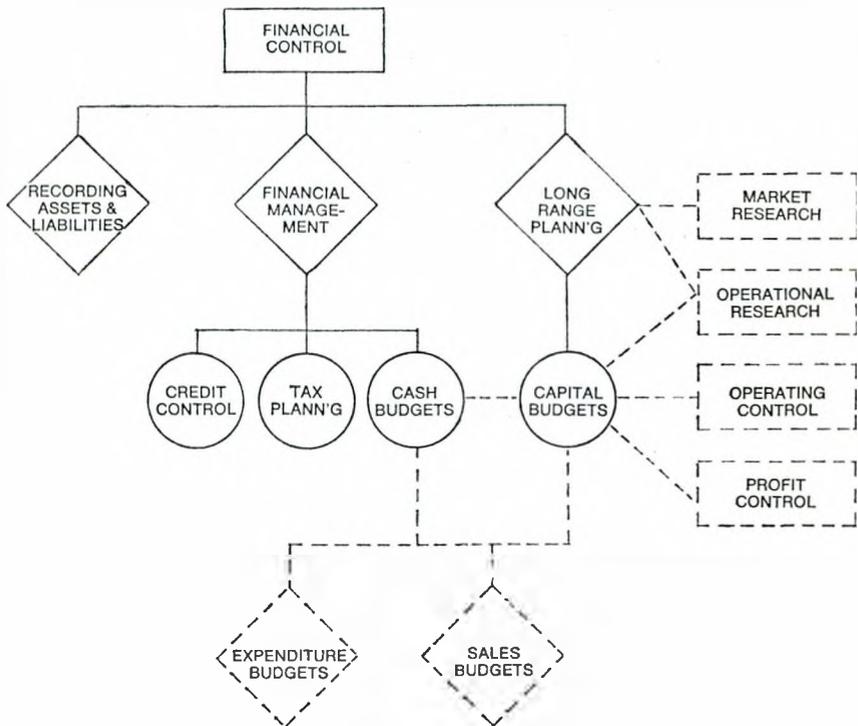


Figure 2

Book-keeping

11 The oldest form of financial control is the recording of assets and liabilities, on which accountants have worked for centuries, during the course of which they have developed the art of double entry book-keeping. As books of original entry and ledgers are replaced by punched paper and magnetic records, it is easy to lose sight of the simple discipline of debits and credits, which is the basic technique of business accountancy.

Financial management

12 As the book-keeper with his records of assets and liabilities increased his usefulness, one of the first fields into which he moved was that of financial management. In very simple terms, this is the problem of seeing that there is enough money available to pay the wages at the end of the week. In its turn this embraces:

- (a) *Credit control* - since the majority of business transactions are based on trust, or credit, and it is essential to ensure that business is done with credit-worthy customers, and that they pay their debts when they should;
- (b) *Cash budgets* - whereby the ebb and flow of cash receipts and payments are planned so as to make sure that the business can pay its creditors when it should; Cash budgets are of course concerned with the actual timing of receipts and payments of money, and are directly influenced by:
 - (i) Expenditure budgets, and
 - (ii) Sales budgetswhich control the volume of receipts and payments, the timing of which will be considerably influenced by the effectiveness of credit control. Longer term cash budgets are of course intimately bound up with
 - (iii) Capital budgetswhich control the major items of expenditure;
- (c) *Tax planning* - since taxation makes such large demands on every profitable business, it has become essential to plan the operations of the business in such a way as to minimize, so far as can legally be done, the impact of taxation upon it.

However this is not nearly so important as the question of the timing of the incidence of taxation, and the enormous impact that taxation has on the outflow of cash from the business. It is therefore of the highest importance that important administrative actions be planned and timed with an eye on the taxation consequences, and in particular with attention to the resultant effect on the timing of when taxation is consequently payable.

Long range planning

13 In the field of long range planning, the first and most important step is a thorough and fundamental study of the basic economics of the business concerned - of what its current and future markets are; of what it is selling in the way of skills or facilities; of how it really makes its profit and how it will do so in future; of the surrounding economic conditions in which it operates and future trends and developments that may affect it; of technical developments in its field and the future trend of research and development in the areas of activity in which it works. From these fundamental studies of what might be termed managerial economics,

management can then draw up long-term plans for the business. Obviously this work will be considerably influenced by the techniques of market research and of operational research.

14 In these fundamental studies of the economics of the business, the accountant has a most important part to play in conjunction with his colleagues from all the other major departments of management. Once the long range plans have been drawn up, the accountant's concern is to study these plans, in order to see what these will require in the way of capital investment for their implementation. In its turn this leads him on to a study of future requirements of finance, which must be combined with his budgets of cash flows.

15 More important still, he must realize that the capital budgets will set the pattern of technical operations for quite a long period ahead. Once committed to a certain line of technical development, this can largely set the entire framework of what is possible in the way of:

- (a) Sales;
- (b) Expenditure;
- (c) Operating methods and productivity;
- (d) Profit.

Annual and short-term plans can probably only effect relatively minor changes either side of the levels established by the long range plans and budgets. This is why so much attention is paid to the techniques of calculating return on investment, discounted cash flow, and other ways of relating capital budgets and profit control.

DIAGNOSTIC SURVEYS

16 Whilst not being an area of control in the strict sense of the word, there is a field of work that lies somewhere between financial control and profit control. It is mostly simply described as the field of diagnostic surveys.

17 It is concerned with trying to find out what went wrong; why profits were not as good as expected; why some particular aspect of operations is giving trouble; or why administration has failed in some respect.

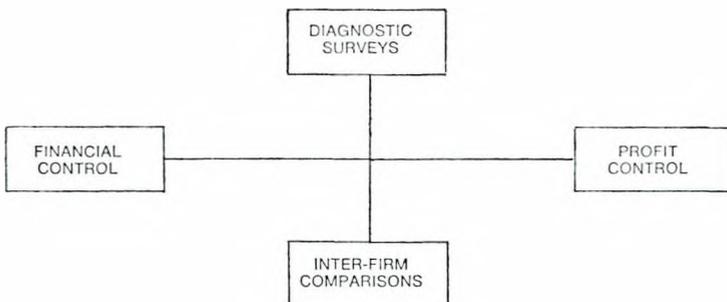


Figure 3

18 It may be concerned with:

- (a) Financial control;
- (b) Profit control;
- (c) Administrative control;
- (d) Operating control.

The accountant may therefore find himself working closely with his colleagues in these other fields, trying to find out what went wrong, in order to effect a cure.

INTER-FIRM COMPARISONS

19 When looking at both long-term and short-term budgets, and at the actual performance achieved by a business over a period of time, it may be difficult to judge whether the results are good, bad or indifferent.

20 To meet this problem, there is an increasing tendency for businesses to take part in inter-firm comparisons. This may be done by a simple comparison of published accounts. Or, it may be arranged for a trade association, or other independent body, to collect figures, collate them, summarize them and distribute them, in an anonymous form, normally expressed as key operating ratios but which may also include detailed figures. From a comparison of the results of one's own business with the results of other similar businesses, it is often possible to detect particular aspects which are capable of improvement. Likewise, these comparisons can be useful when carrying out a diagnostic survey of a particular problem.

PROFIT CONTROL

21 The next major area in which the accountant is called upon to exercise his skills is in the field of profit control. In the past this has often been referred to as the field of management accounting - but it is as well to appreciate that in reality this whole group of controls is focussed on the need to ensure that the business operates at a profit. This group of controls is as follows:

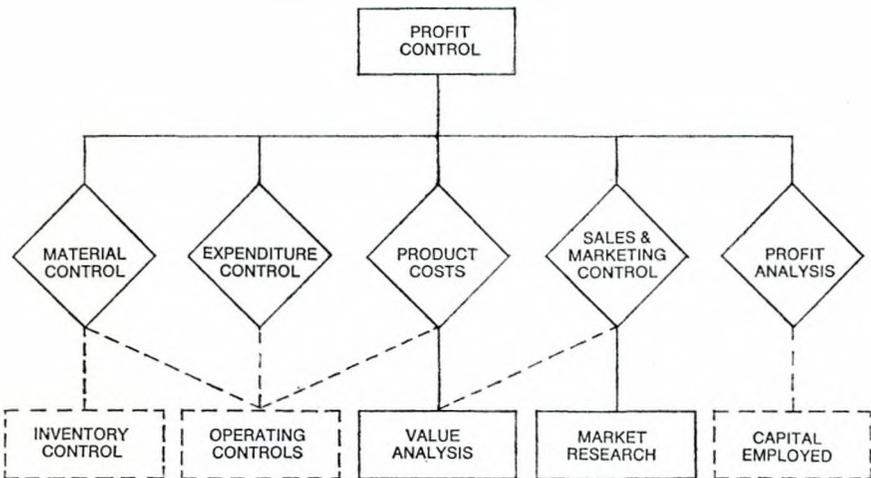


Figure 4

Material control

22 In a very large proportion of manufacturing businesses materials make up anything from 60 % - 80 % of the cost of the finished product. In such circumstances, control of material is the most important of all the profit control group. This involves controlling:

- (a) The quantity of material used;
- (b) Material quality;
- (c) Off-cuts, wastage percentages, impurities; moisture contents, etc.

Furthermore, it is closely related to the field of inventory control and the price at which materials are purchased. It has, of course, an important influence on product costs, and may be linked with the materials handling aspects of operating control.

Expenditure control

23 Control of expenditure is normally effected by the technique of budgetary control, which, as has already been noted, is closely connected with the problem of cash budgeting.

24 The expenditure budgets themselves are, of course, the reflection of the long range planning carried out some time in the past, and are closely linked with the various aspects of operating control, particularly those that deal with such problems as:

- (a) Technical processes and methods;
- (b) Factory layout;
- (c) Materials handling;
- (d) Factory work study.

Product costs

25 It is the relationship of the expenditure budgets and the output budgets for the same period which produces costing rates for the production processes. Then in their turn, these costing rates are related to the time studies which establish how long it takes to make each product so as to calculate the conversion cost of the end-products.

26 The product cost figures are completed by the calculation of the material content of each product, and thus is calculated the standard cost of all products. It is then possible to see whether the different products can be made at a cost which is less than the price for which they can be sold - a price which is often established as a result of market research.

Value analysis

27 Once standard product costs have been established, a concerted attack can be made on all the components of cost that go to make up the total. The value of each component can be assessed in relation to the function it has to perform as part of the total product. Each element of cost can be analysed in conjunction with both sales and operating people to see if there are not alternative ways of producing the product at a lower cost. These techniques of value analysis can sometimes have a very dynamic effect in reducing product costs, thereby enabling selling prices to be regularly reduced. There is therefore an important link with sales and marketing control.

Sales and marketing control

28 Firstly, it is necessary to control marketing achievement, and then marketing expenditure needs to be controlled against budgets in the same way as has already been discussed above under the heading of expenditure control. Furthermore, it is often worthwhile finding out the difference in the cost of obtaining different types of business, and also in the cost of distributing different products through different types of sales outlet channel. A far more difficult problem is the analysis and evaluation of the cost of sales promotion and advertising through different channels, which may involve both mathematical and computer techniques.

29 In addition it is common for sales statistics to be compiled showing analyses of sales:

- (a) by product;
- (b) by salesman;
- (c) by sales area;
- (d) by type of customer.

This is mainly a problem of analysis, but it may draw on the techniques of statistical analysis.

Market research

30 Clearly, the whole field of sales and market development is bound up with market research work, which in turn may draw on some of the different operational research techniques, and, as has already been pointed out, it may be affected by the work done on the field of value analysis. Market research is, of course, a pre-requisite to most forms of long range planning and capital budgeting.

Profit analysis

31 The techniques of standard costing and budgetary control, together with the information reported by the material control procedures, combine to provide a regular analysis of why profits differ from what was aimed at. These variance reports constitute a complete account of profits and losses, which measures actual results against each of the budgeted elements of the original profit budget. From this analysis it can be seen where, and to what extent, action is required to improve the profitability of the business.

32 Further, these profits can be related to the capital employed in the different parts of the business, to which reference was made above.

ADMINISTRATIVE CONTROL

33 Lying at the heart, as it were, of the control of any business is the problem of orderly and efficient administration, which ensures that the organization carries out its different functions in a smooth and disciplined manner, which can be illustrated as follows:

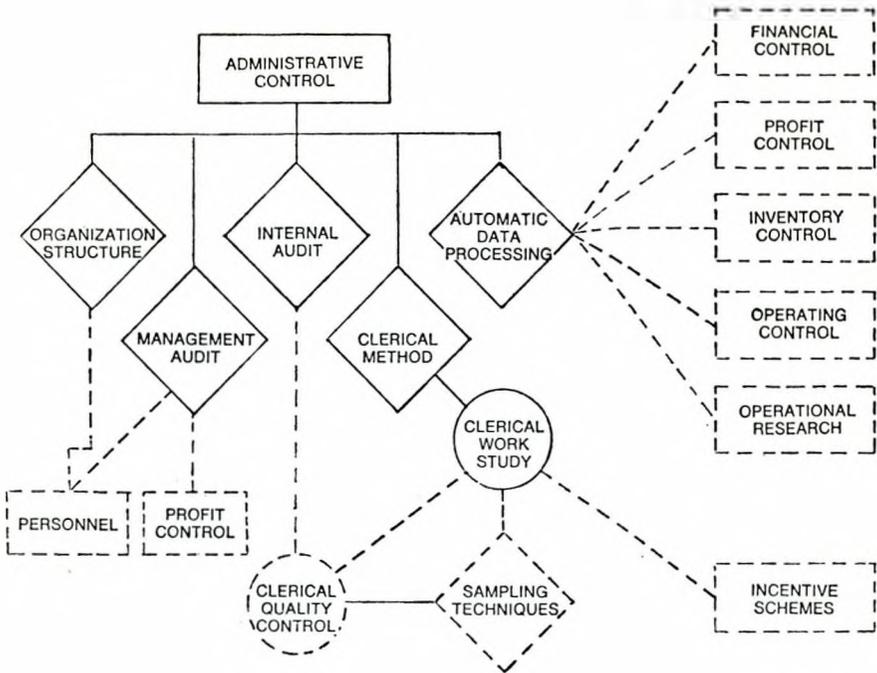


Figure 5

Organization structure

34 The first requirement for effective administration is a sound organization structure. To obtain this, it is first necessary to study the objectives of the business, and the functions that need to be performed in order to achieve those objectives. From this a study can be made of the relationships between the different functions; of the decisions that need to be taken; and of the flow of communications between different people in different parts of the business so that decisions can be taken at the right places at the right time. Ultimately the organization structure of the business must be designed to meet these basic requirements.

35 However, an organization structure is not just a chart on a piece of paper. It is people. It functions through people; and therefore it is closely linked to the personnel function. In practice, the ideal organization structure (designed as described above) will have to be modified to some extent to fit the people available to fill it. Then, as time goes by, the objectives of the company will change, the people will change, and the organization structure in turn will change.

Management audit

36 Closely linked with the problem of the people who fill the organization structure is the problem of ensuring that managers do in fact manage. In simple terms it can be said that an organization structure is simply a decision taking mechanism. It exists so that decisions get taken. If no decisions were required, no organization would be necessary. It is therefore necessary to check that the individuals concerned are taking the decisions which they should and carrying out the

responsibilities that flow from the authority entrusted to them. Likewise, it is necessary to measure the success with which they have exercised their authority. 37 In fact this function of management audit is probably the most important responsibility of the chief executive of the business. His main concern should be about people, without whom his business would not exist. In a very large business, he may need assistance in carrying out any detailed investigations that may be required; but it is not a responsibility that he can very easily delegate.

38 When it comes to measuring the success of managers at different levels, this will probably have to be done by means of the techniques already referred to under profit control. In its simplest form a manager's success is measured by the profit he earns on the capital he employs. But in particular cases this can not be calculated in respect of some managers as for example a works maintenance engineer and then other criteria must be used to measure their success.

Internal audit

39 Closely related to management audit is the field of internal audit. There are many different interpretations as to what is meant by this function. At worst it is regarded merely as an extension of the routine "ticking" work which may be carried out by the independent external auditors. But, whereas management audit is concerned with seeing that managers have in fact managed, internal audit is concerned with seeing that the administrative system is operating correctly. It is probably more concerned with the work of clerical and administrative staff than with that of executive management.

40 Internal audit is concerned to see that the internal control procedures are functioning correctly, and furthermore it should be checking that the agreed policies of the business are being correctly put into practice by all levels of management. These policies would include such things as:

- (a) Credit policies;
 - (b) Capital expenditure policies;
 - (c) Policies for setting output budgets, expenditure budgets, and material standards;
 - (d) Selling price policies;
 - (e) Marketing policies;
 - (f) Personnel training and promotion policies;
 - (g) Salary, wage, and bonus policies;
 - (h) Inventory stocking policies;
- etc., etc.

41 In the course of this work, internal audit is also concerned with the operation of clerical and administrative procedures, and may advise generally on ways of improving these. With the application of work study to clerical work has also come the application of statistical sampling techniques, which are extensively used for production quality control. They might be equally useful in establishing levels of quality control of clerical work. This could be a valuable technique in the work of internal audit, but has still to be developed.

Clerical methods

42 Having established the administrative organization, clerical procedures must

be devised to achieve the necessary control and communications both within the business and with the world around it. Hence the common juxtaposition of O. & M. (Organization and Methods). Increasingly it is coming to be realized that bulk clerical work is a production operation just as much as is manufacture; and so work study techniques are being applied to the study of clerical operations, as was mentioned above. In its turn this leads on to the application of time standards, and even of time study, and the introduction of incentive schemes similar to those used in the manufacturing departments.

Automatic data processing

43 In the search for better ways of carrying out clerical and administrative work, attention has become focussed on the electronic digital computer, from which has stemmed a series of new techniques for the automatic processing of business data. Fundamentally, the computer is no more than a sophisticated instrument - but its ability to carry out processes of logical analysis, to modify its own instructions in the light of actual results which it encounters, and its power to carry out some decision making processes, makes it an instrument of such power that it can have a profound influence on all the main areas of control.

44 In the field of financial control, it may be used to perform the basic function of recording assets and liabilities, as well as to carry out the mechanical operations of credit control. In conjunction with the operational research techniques, it may be used in long range planning and capital budgeting.

45 Throughout the area of profit control, computers may be used to process data and produce all the different types of information required in each of the detailed areas of control.

46 In planning the purchasing of raw materials, their progressing through the production processes, and the holding of inventories, to meet a marketing plan, the computer gives us a chance to do well something we have hitherto tended to do rather badly.

47 Used as an on-line device for the direct control of machines and industrial processes, the computer can be a powerful instrument in the hands of operating management.

48 In the field of operational research, a computer is not an essential tool, but nevertheless the development of many aspects of these techniques has been dependent on the availability of computers to carry out the tedious and involved calculations.

49 From the above it can be seen how the computer can spread its tentacles into the control of all aspects of the business. From this flows the move towards the automatic processing of data, and ultimately to completely integrated systems, in the course of which the computer plays an increasingly important part in the decision making process. Therefore, since a management organization structure is only a decision taking mechanism (as was mentioned above), once a business installs a computer it is probably true to say that it will never be the same again.

INVENTORY CONTROL

50 In a business, it is not only cash that has to be accounted for but also stock and work in progress. Whilst the accountant is not necessarily the person held

primarily responsible for this, he is nevertheless vitally interested that proper account is kept of inventories. For, if stock recording breaks down, or if production control ceases to be effective, then the accountant may find that he is unable to account for the assets and liabilities of the business. The main areas of control are:

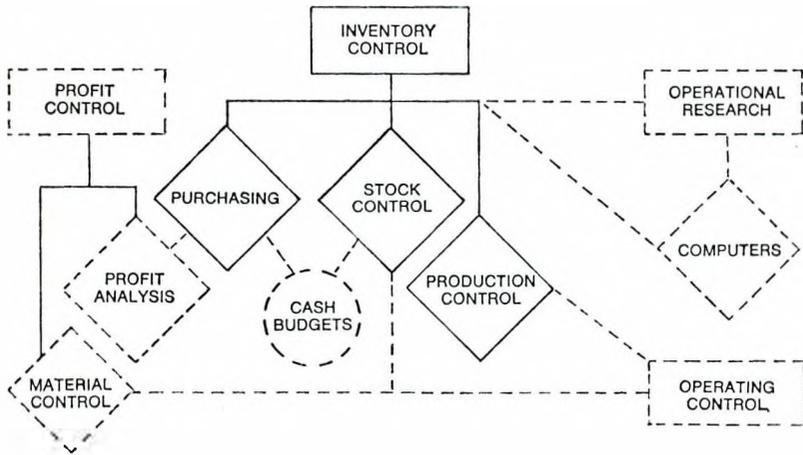


Figure 6

Purchasing

51 The control of profit in many businesses is profoundly influenced by the skill with which purchasing is carried out, and on the extent to which the prices paid for outside purchase of materials, components, sub-contracted work, supplies and services have varied from those anticipated or laid down as standard.

Stock control

52 Reference has been made earlier to the need to control the utilization of materials and components in the course of manufacture. In its turn this is linked to the problems of keeping stocks and work in progress, and controlling the cash investment in inventories. The ruthless disposal of slow-moving and obsolete stocks is a discipline which is often lacking in business. Stock control is of course closely tied in with production control, and with the methods employed to control operations on the production floor.

Production control

53 Production control is inevitably closely tied up with both purchasing and stock control, and must be closely tied in with the actual operating control of production processes.

54 The application of operational research techniques to production control has enabled considerable advances to be made in the ability of businesses to plan their activities more effectively, and to optimize the utilization of their resources of men, machines, materials and money. On account of the tedious and complex nature of the calculations involved this may well create a need to use computers to do this work.

PERSONNEL

55 As was said earlier, it is the people who work in a business who give that business its life and existence; and it is only by utilizing the skills and experience of people that the business can operate at all. The personnel function of the business is therefore one of the most fundamental that there is. It comprises:

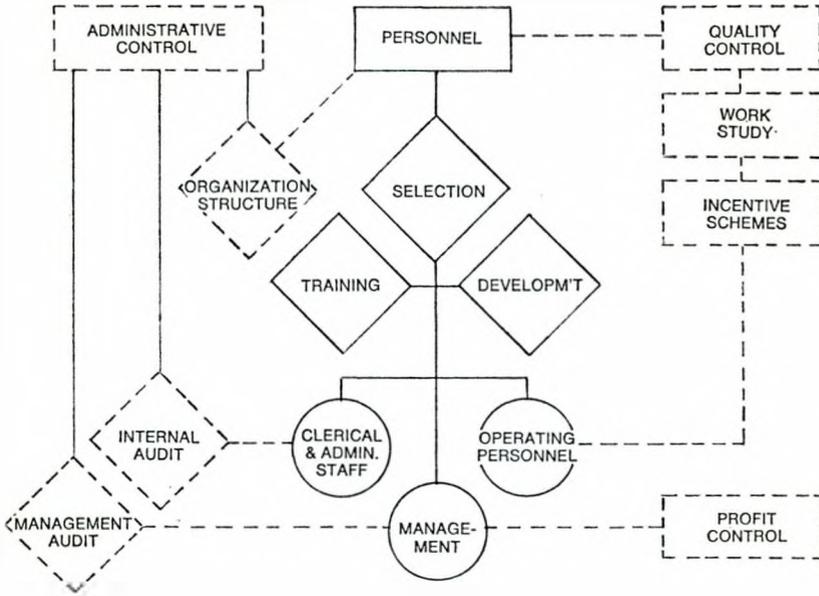


Figure 7

Selection, training and development

56 The definition of the objectives, and subsequently the functions to be carried out, lays the foundations of the organization structure that is defined for the business. From this can be drawn up the job specifications which define the responsibilities and duties that must be undertaken at each point in the organization. From this can be defined the skills, aptitudes and experience required in the individuals in each job. From this the salary structure of the whole organization can be drawn up and correlated, having due regard to the external pressures of supply and demand in respect of the different types of people required.

57 Against this background, it is then possible to plan the intake of new recruits at different levels, and the training requirements of different people throughout the organization. At times re-training may have to take place.

58 If the business is to live a dynamic existence, attention must also be paid to the development of potential within individuals at all levels, so that their careers can advance and the business can make the best use of the human material available to it.

59 In the selection, training and development of staff at all levels it is important that proper attention be given to ensuring that everyone understands the economic "facts of life" of the business concerned. In the past, far too little attention has been paid to this. This has resulted, amongst other things, in dangerous ignorance on

the factory floor. Furthermore, all those who take decisions of different kinds at every level of the business must understand the financial effects of the decisions they take. Too often individuals are trained in the technicalities of their own particular branch of business activity without learning how their own work affects the profit earning power of the business. If, then, people take decisions without understanding the financial effect of these decisions, then it can be said that to some degree they are taking decisions recklessly.

Clerical and administrative staff

60 As was pointed out earlier, the internal audit function is particularly concerned with seeing that clerical and administrative systems are working efficiently. Whilst clearly it must not be accused of "spying" on the staff, nevertheless it can provide a most valuable feed back of information to the personnel function. It may be able to indicate areas where the organization structure needs changing to meet changed conditions; where training appears to be inadequate; or where latent skills and talents are not being developed to the best advantage.

Management

61 Likewise, in the case of management, the operation of management audit techniques should throw valuable light on what needs to be done in the way of the training and development of managers. And, in the last analysis, it is the figures disclosed by the various techniques of profit control, which have already been discussed, which measure the ultimate effectiveness of individual managers.

Operating personnel

62 There are several control techniques which have a considerable impact on operating personnel on the factory floor. But it must not be overlooked that these same techniques can also be used in connexion with clerical and administrative procedures. In fact most clerical operations, particularly the large scale ones, are best treated as production-line problems if they are to be organized efficiently.

63 Incentive schemes have probably the greatest impact on personnel. But they in their turn are often influenced very considerably by the operation of work study techniques. Finally, output is checked by the sampling techniques of quality control, which may have an influence on the operation of the incentive schemes.

INCENTIVE SCHEMES

64 To some extent incentive schemes might perhaps not be regarded as a separate business control technique. On the other hand, they can have a very profound affect on the work of the personnel function, and also on production speeds and procedures. The field concerned is:

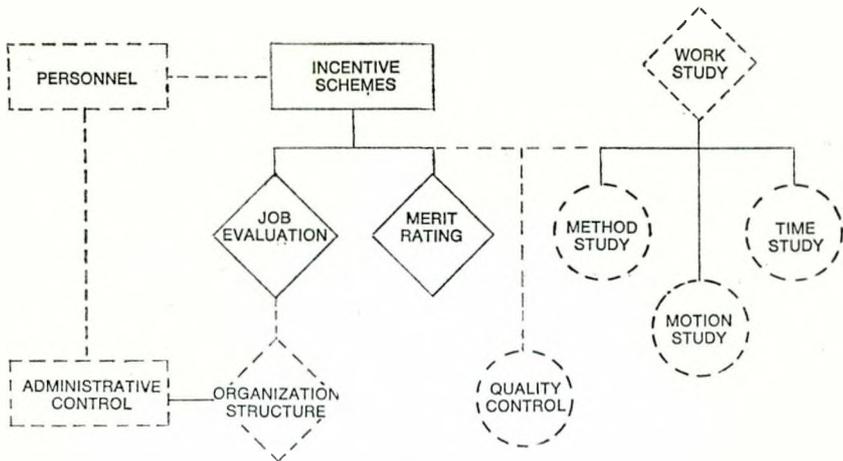


Figure 8

Job evaluation

65 As was discussed earlier, the basic study of the organization requirements of the business sets the whole pattern of its personnel requirements. From this can be made an evaluation of all the jobs that need to be performed from which it is then possible to identify the skills and attributes that need to be developed if each job is to be performed to the best advantage of the business. It is only then that incentive schemes should be designed, to encourage those factors of performance which are most needed in each job.

Merit rating

66 Having set standards as a basis for incentives, it is then necessary to measure against these standards the actual performance of individuals. This may be done by the process of merit rating. By this method the performance of each individual is rated by management in relation to all the different skills and attributes which have previously been evaluated as being required for the best performance of the job concerned.

67 However, it is common to find incentive schemes which judge performance almost entirely on the speed with which the work is performed. These incentive schemes are generally linked closely to the techniques of work study, and in particular to the connected trio - method study, motion study and time study.

68 As it is commonly recognized that speed of work alone is an unsatisfactory criterion of performance, incentive schemes are also commonly linked to quality control, so that the performance of individuals is measured in terms of both speed and quality of output.

69 If the original job evaluation had established that speed and quality were the *only* important factors of performance, then incentive schemes of this type may be entirely satisfactory. However, there may be other factors which ought to be taken into account, and then job evaluation together with a bonus scheme based on merit rating may provide more satisfactory results. But since this requires a qua-

litative assessment by management of a number of different factors in the performance of individuals, it is more difficult to operate and it is much more difficult to satisfy all individuals that it is in fact operated fairly. An incentive scheme based on factual measurement of speed may be less open to charges of unfairness, but it too gives rise to many problems.

OPERATING CONTROL

70 The speed with which work is performed is equally of concern to those who have to control the physical operations of manufacture, or of the provision of a service (such as transport). For speed of work vitally affects the utilization of physical assets, and is one of the important aspects of operating control, which covers:

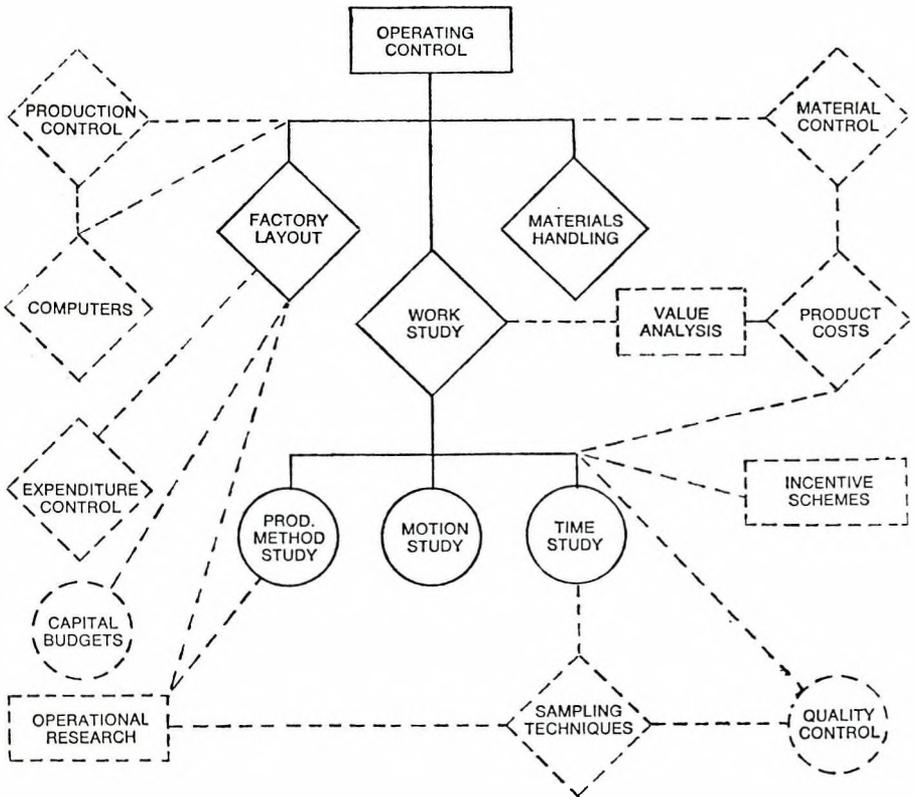


Figure 9

Factory layout

71 The provision of the physical assets used by the business is covered here by the general term factory layout. Because these physical assets may be in use over many years, their provision is one of the most important aspects of long range planning and capital budgeting. For this reason, the techniques of operational

research can usefully be brought to bear on the problem of what facilities should be provided.

72 Once the operating facilities have been provided they freeze to a large extent the process techniques used by the business. Likewise they fix many of the operating costs and have a profound effect on expenditure control. They also fix a large element of product costs.

73 Because of the rigidity imposed by the investment in physical assets, attention has been focussed on the principal means of minimizing this rigidity - namely by improving the utilization of fixed facilities. This has been done by improving methods of production control, which itself has been improved by the use of computer techniques. Furthermore, computers are used directly controlling production machines and processes to improve plant utilization.

74 Likewise operational research techniques are used to reduce the down time of machines due to maintenance or waiting for other services, such as cranes. But the aim is still the same - to reduce costs through increased plant utilization.

Materials handling

75 Many of these problems are inextricably mixed up with that of materials handling, which - in the immortal words of the Anglo-American Productivity Team report on the subject - "adds nothing to the product except cost". For, in many manufacturing businesses the cost of moving partly processed material from one process to another can add a substantial amount to the cost of the finished product, with the cost of which it is therefore intimately linked.

76 Methods used for handling materials, measuring them, and dealing with waste, off-cuts and scrap are also directly connected to the problem of material control.

Work study

77 Both the provision of factory facilities, and the techniques of material handling adopted, are closely tied up with the whole range of work study techniques. However, in deciding the direction in which to apply work study, close attention should be paid to the analysis of the make-up of the costs of the end-products that emerges as part of the process of value analysis.

78 Insofar as work study investigates the methods used for carrying out the job, it may need to draw on operational research techniques. Having got the process method right, it is then possible to study the human motions required to perform the task. This study may well then cause a modification of the method. Finally having improved and simplified the process method and the human motions required, it is then possible to study the time required to execute each individual movement, and so establish the total time required to perform each operation. This process of studying the time required to perform the individual operations may utilize statistical sampling techniques to reduce the number of separate time-observations required.

79 These statistical sampling techniques are also used in most production quality control techniques; and as has already been explained quality control may be linked up with incentive schemes which are based on time study.

80 The operation times established by time study are one of the most important

ingredients in establishing what it costs to make each product or provide a given service.

OPERATIONAL RESEARCH

81 In the earlier paragraphs, the discussion has been principally concerned with the main areas of control described at the outset in paragraphs 3 to 8 - namely financial control, profit control, administrative control, inventory control, and operating control. Linking all these are people, through whom all the other controls operate. However, frequent reference has also been made to the use of operational research techniques, which have a bearing on many of the other control procedures. It is therefore worth finally giving consideration to this technique and its relationship with other controls.

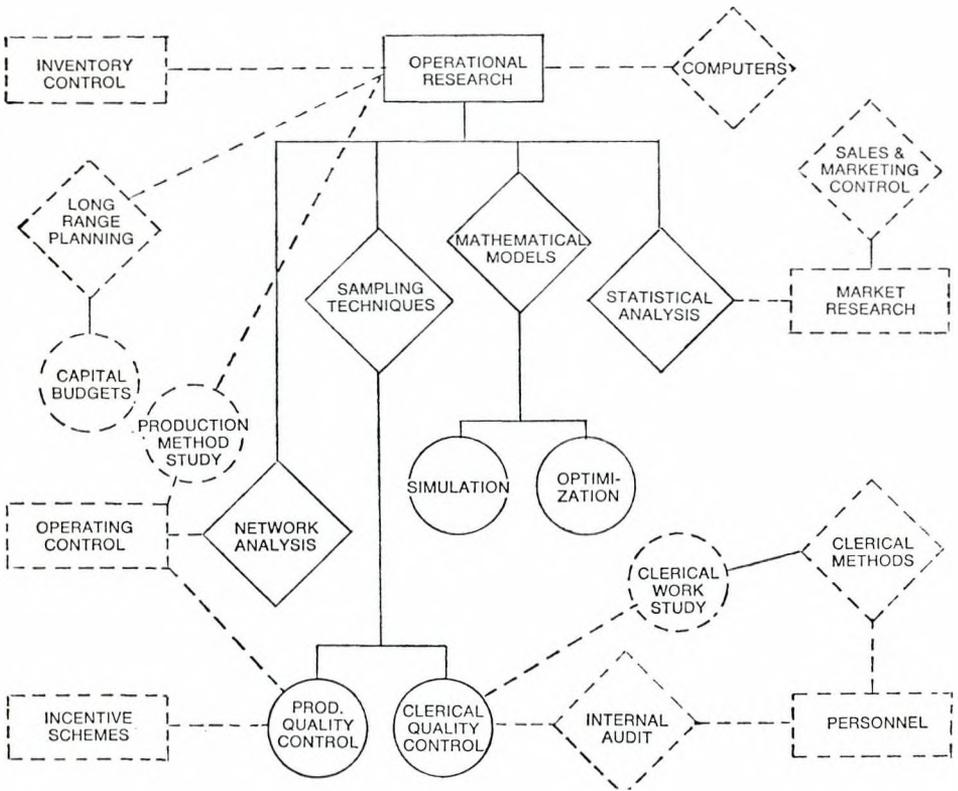


Figure 10

Network analysis

82 In complex operations, many activities may depend on the completion of other activities, and the successful control of the whole operation may depend on an accurate understanding of the inter-relationship and interaction of the different activities on each other. Simple bar charts are often inadequate for this purpose,

and advanced techniques of network analysis have been developed. This technique can therefore be of great value in the operating control field.

83 Owing to the complexity, and tedious nature, of the calculations required in this, and also in nearly all the other fields of operational research, it is almost inevitable that computers must be used to calculate the solutions required. In fact it was the advent of the computer that made these techniques a practical proposition for business purposes.

84 In the fields of operating control, operational research techniques can be valuable in the analysis of production methods, in reducing the non-productive time of machines, and improving plant utilization.

Sampling techniques

85 Likewise, sampling techniques have an important part to play in the field of operating control and the establishment of quality control. This can affect also the operation of incentive schemes.

86 Similarly, sampling can be used to establish quality control in the clerical field, where it may be used by the internal audit function, as well as in the course of clerical work study as part of the technique of improving clerical methods. In this latter field it is commonly referred to as activity sampling, which is used to analyse the proportion of time spent by individuals on different aspects of their work.

87 Inevitably, then, these sampling techniques have an ultimate impact on people, whether in factory or office, because they are used to measure the quality of output produced by people.

Mathematical models

88 It is perhaps by the technique of mathematical model building that operational research has achieved its most notable successes. By this technique a mathematical equation is constructed to represent a given situation. By inserting different figures into different parts of the equation, and by using a computer to do the calculations, it is then possible to obtain a series of answers to the question "What would happen if . . .?"

89 This method of simulating actual situations makes it possible to obtain, in a few hours of computer calculation, information which might otherwise have required many years of actual operating experience.

90 These techniques present a serious problem to the accountant, who must provide the mathematician with the financial figures required to bring the equations to life. As often as not this necessitates marshalling figures on quite a different basis to that normally adopted for conventional accounting. It also necessitates the accountant having a clear understanding of the use to which the mathematician is going to put the figures - and the mathematician having a clear understanding of the limitations of the figures provided by the accountant and an understanding of their probable degree of accuracy.

91 Initially these techniques have an important impact in the field of long range planning and capital budgeting; but they can also be used extensively in other areas of control such as inventory and production control.

92 As an extension of these mathematical methods, they can also be used to optimize a complex situation which is subject to a number of different constraints -

as for example to plan the best use of available productive capacity, manpower, stocks and finance. These optimization techniques therefore have an important part to play in both operating control and inventory control, as well as in the whole area of financial control.

Statistical analysis

93 The techniques of statistical analysis are not of necessity separated from the other operational research techniques already discussed. They are, for example, directly connected with the sampling techniques already discussed.

94 Perhaps the main area in which these techniques are extensively used is in the field of market research and the whole related field of sales and marketing control.

CONCLUSION

95 No business, except perhaps one of the giants, is likely to be using at the same time all the techniques referred to in this paper. An average business will use some of them all the time; others occasionally; and some of them never. It is therefore important that all those concerned with the management of business should understand what techniques are available to assist them. Then, as they diagnose the different problems that face them, they will know which techniques to bring to bear to solve those particular problems.

96 At the same time it is particularly important that accountants should understand the inter-relationship of these different techniques. For, in the last analysis, all these techniques are concerned with making the business more profitable. And, next in line after the chief executive of the business, it is the accountant who is by tradition charged with the prime responsibility for watching over the profitability of business.

97 However, if one looks back over the various techniques described in this paper there would seem to be three that have the most impact on all the others. First is planning in all its forms, including long range planning, medium-term planning and short-term budgeting. Then there is the computer which is an instrument which can influence the way all other forms of control are operated. And finally, there are the mathematical techniques of operational research, which is another instrument that can be used with considerable benefit in trying to solve problems in most of the major areas of control.

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